United States
Department of
Agriculture

Forest
Service

September 2008

Record of Decision

And

Final

Environmental Impact Statement

South Project

Hell Canyon Ranger District, Black Hills National Forest
Custer County, South Dakota

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, DC 20250-9410, or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

South Project
Final Environmental Impact Statement
Custer County, South Dakota

Lead Agency: USDA Forest Service

Responsible Official: Michael D. Lloyd, District Ranger
330 Mt. Rushmore Rd.
Custer, SD 57730

For Information, Contact: Betsy Koncerak
330 Mount Rushmore Road
Custer, SD 57730
(605) 673-4853

Abstract: The Hell Canyon Ranger District of the Black Hills National Forest prepared this Final Environmental Impact statement in compliance with the National Environmental Policy Act and other relevant Federal and State laws and regulations. The District proposes multiple resource management actions within the South project area.

The intent of the proposed actions is to reduce hazards associated with wildfire to the At-Risk Communities of Custer, Pringle and Argyle, South Dakota, to reduce risk of insect infestations, to provide diverse habitats for wildlife, to provide a future supply of timber products, and to manage the road system.

Three alternatives are considered in detail. Alternative 1 is the No Action alternative. Alternative 2 is the proposed action that was developed by the Interdisciplinary Team (IDT) prior to public scoping. Alternative 3 responds to issues which were raised during public and internal scoping, and is the preferred alternative. Issues that were identified by the IDT, and were used to develop Alternative 3 include: 1) susceptibility of residual timber stands to wind damage; 2) big-game cover and security near State of South Dakota property; 3) lack of prescribed burning within restoration treatments in Management Area 5.1A; and 4) high occurrence of storm-damaged trees within dense sites of Ponderosa pine which increases fuels hazard and suppresses understory vegetation development.

This Final EIS discloses the direct, indirect and cumulative environmental impacts resulting from each alternative.

SUMMARY

The Hell Canyon Ranger District of the Black Hills National Forest proposes to implement multiple resource management actions within the South project area. Proposed resource management actions apply only to National Forest lands.

The South project area covers approximately 52,081 acres in the Upper and Lower Pleasant Valley watersheds approximately five miles west of the town of Custer in Custer County, South Dakota. National Forest land comprises 43,044 acres, State of South Dakota owns 1,197 acres, and 7,840 acres within the South project boundary are privately-owned.

The southernmost point of the project area lies at T6S R4E Section 6 (approximately 10 miles northwest of Hot Springs, SD) and the northernmost point is at T3S R3E Section 9, Black Hills meridian (approximately nine miles WNW of Custer; see vicinity Map 1 in Appendix A of this document). The major arterial roads which access the project area include National Forest system roads (FSR) 715, 288, 307, 315, 273, 287, 292, 309, 402, 275 and US Highway 16.

Comments received during scoping defined issues which were used to develop alternatives to the proposed action. The following four issues were identified and led to development of an additional alternative: 1) susceptibility of residual timber stands to wind damage; 2) big-game cover and security near State of South Dakota property; 3) lack of prescribed burning within restoration treatments in Management Area 5.1A; and 4) high occurrence of storm-damaged trees within dense sites of Ponderosa pine which increases fuels hazard and suppresses understory vegetation development.

Alternative 1 – No Action

NEPA (National Environmental Policy Act) requires the study of the No Action Alternative as a basis for comparing effects of the proposed action and other alternatives. The No Action alternative assumes no implementation of any elements of the proposed action or other action alternatives would take place within the South project area. This alternative represents no attempt to actively respond to the purpose and need for action or the issues identified during scoping. For example, there would be no effort to modify existing vegetation or related fuel conditions in the project area; current active timber sales, fire suppression efforts, noxious weed treatments and regular system road maintenance would continue on National Forest lands.

Alternative 2 – Proposed Action

This alternative was developed to meet the Purpose of and Need for Action. This alternative represents the agency's recommendations prior to public scoping.

This alternative proposes commercial and non-commercial vegetation treatments and management of system and non-system roads on National Forest lands.

Alternative 3

This alternative addresses the key issues identified during scoping: 1) susceptibility of residual timber stands to wind damage; 2) big-game cover and security near State of South Dakota property; 3) lack of prescribed burning within restoration treatments in Management Area 5.1A; and 4) high occurrence of storm-damaged trees within dense sites of Ponderosa pine which increases fuels hazard and suppresses understory vegetation development.

The elements of this alternative which differ from Alternative 2 (Proposed Action) are: 1) increasing the basal area (see definition in Appendix G) of residual stands from 40BA to 60BA to reduce the potential for wind damage; 2) deferring vegetation treatment in site 031112-11 near State of South Dakota property to enhance big-game cover; closing roads near the same property to enhance big-game security; 3) increasing acres of prescribed (Rx) burning within restoration treatments in Management Area 5.1A to meet the restoration objective; and 4) increasing treatment acres of storm-damaged trees within dense sites of Ponderosa Pine to reduce fuels hazard and encourage understory vegetation development.

The South project purpose and need provides the focus and scope of the proposal as related to National and Forest-level policy and direction. Given the purpose and need, the Responsible Official (District Ranger) reviews the proposed action, the issues identified during scoping, and the environmental effects of implementing each of the alternatives. This review forms the basis for making the following determinations:

- Whether or not the information in this analysis is sufficient to make an informed decision.
- Whether or not vegetation and fuels treatments should be implemented and, if so, in what manner and in which locations.
- Whether or not changes to the road system should be implemented and, if so, in which locations

• Table of Contents

SUMMARY ..... **II**

CHAPTER 1. PURPOSE OF AND NEED FOR ACTION **7**

CHAPTER 2. ALTERNATIVES **21**

CHAPTER 3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES **31**

WATERSHED, GEOLOGY AND SOILS 32
MINERALS 68
SILVICULTURE 72
FIRE AND FUELS 93
WILDLIFE 102
RANGE, NOXIOUS WEEDS AND BOTANY 177
RECREATION 185
VISUAL QUALITY/SCENERY 189
HERITAGE RESOURCES 196
LANDS AND SPECIAL USES 199
TRANSPORTATION 200
ECONOMICS 204
SHORT-TERM USES AND LONG-TERM PRODUCTIVITY 205
UNAVOIDABLE ADVERSE EFFECTS 206
IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES 206
CUMULATIVE EFFECTS 207
OTHER REQUIRED DISCLOSURES 207

CHAPTER 4. INDEX **209**

CHAPTER 5. LITERATURE CITED **211**

CHAPTER 6. LIST OF PREPARERS **225**

CHAPTER 7. FINAL EIS DISTRIBUTION LIST **227**

APPENDICES ..... **A – I**

• TABLES

TABLE 1.1 WILDLIFE, FISH AND RANGE PROJECTS FOREST-WIDE PER YEAR 12
TABLE 1.2 STRUCTURAL STAGES OF PONDEROSA PINE IN MA 5.1 AND MA 5.4 16
TABLE 2.1 COMPARISON OF VEGETATION TREATMENTS (BY ACRES) 28
TABLE 2.2 EFFECTS TO ISSUES BY ALTERNATIVE 29
TABLE 3.1 HUC 6 WATERSHEDS IN THE SOUTH PROJECT AREA 32
TABLE 3.2 HUC 7 WATERSHEDS IN THE SOUTH PROJECT AREA 33
TABLE 3.3 GEOLOGY 33
TABLE 3.4 SOIL DESCRIPTIONS IN THE SOUTH PROJECT AREA 35
TABLE 3.5 SLOPE 36
TABLE 3.6 WATERSHED CONDITION IN THE SOUTH PROJECT AREA 37
TABLE 3.7 STREAMS WITHIN THE SOUTH PROJECT AREA 38
TABLE 3.8 FLOODPLAINS 40
TABLE 3.9 WETLANDS, PALUSTRINE 40
TABLE 3.10 WETLANDS, PALUSTRINE (CODES) 41
TABLE 3.11 WETLANDS 41
TABLE 3.12 BENEFICIAL USES, SOUTH DAKOTA 42
TABLE 3.13 PRIVATE LAND 43
TABLE 3.14 SOUTH COMMERCIAL TREATMENT WITHIN WIZ 48
TABLE 3.15 SOUTH PRESCRIBED FIRE WITHIN WIZ 48

TABLE 3.16 SOUTH MILES OF ROADS WITHIN WIZ 49
TABLE 3.17 EXISTING COVER TYPES IN THE PROJECT AREA. 72
TABLE 3.18 EXISTING STRUCTURAL STAGES ON FS LANDS BY COVER TYPE IN SOUTH 73
TABLE 3.19 COVER TYPES OF FS LAND IN MA 5.1 73
TABLE 3.20 COVER TYPES OF FS LAND IN MA 5.4 73
TABLE 3.21 COVER TYPES OF FS LAND IN MA 5.1A 73
TABLE 3.22 EXISTING SS WITHIN SOUTH: PONDEROSA PINE ONLY 75
TABLE 3.23 EXISTING PINE STRUCTURAL STAGES FOREST-WIDE IN MA 5.1 76
TABLE 3.24 EXISTING PINE STRUCTURAL STAGES FOREST-WIDE IN MA 5.4 76
TABLE 3.25: BY MA: EXISTING % SS4 PONDEROSA PINE WITH AVERAGE SIZE CLASS OF "VERY LARGE" .. 77
TABLE 3.26 RELATIONSHIP OF STRUCTURAL STAGE TO INSECT RISK RATING 77
TABLE 3.27 CURRENT MPB RATING FOR PONDEROSA PINE IN SOUTH 77
TABLE 3.28 ALTERNATIVE 2: PONDEROSA PINE STRUCTURAL STAGES IN MA 5.1 83
TABLE 3.29 ALTERNATIVE 2: PONDEROSA PINE STRUCTURAL STAGES IN MA 5.4 84
TABLE 3.30: "VERY LARGE" TREE DISTRIBUTION IN MA 5.1 (FOREST-WIDE) 85
TABLE 3.31: "VERY LARGE" TREE DISTRIBUTION IN MA 5.4 (FOREST-WIDE) 85
TABLE 3.32 EFFECT OF COMMERCIAL HARVEST ON MPB RISK 85
TABLE 3.33 MPB RISK RATING FOR ALTERNATIVE 2 86
TABLE 3.34 POST-HARVEST PONDEROSA PINE SS IN MA 5.1 88
TABLE 3.35 POST-HARVEST PONDEROSA PINE SS IN MA 5.4 89
TABLE 3.36: "VERY LARGE" TREE DISTRIBUTION IN MA 5.1 (FOREST-WIDE) 89
TABLE 3.37: "VERY LARGE" TREE DISTRIBUTION IN MA 5.4 (FOREST-WIDE) 89
TABLE 3.38 EFFECTS OF COMMERCIAL HARVEST ON MPB RISK. 90
TABLE 3.39 MPB RISK RATING FOR ALTERNATIVE 3 90
TABLE 3.40 FIRE SIZE AND OCCURRENCE FROM 1950 TO PRESENT 93
TABLE 3.41 PAST LARGE FIRES WITHIN SOUTH 94
TABLE 3.42 FIRE REGIME DEFINITIONS 94
TABLE 3.43 FIRE REGIME CONDITION CLASS (FRCC) DESCRIPTIONS 95
TABLE 3.44 CURRENT PINE STRUCTURAL STAGE AND FIRE HAZARD 97
TABLE 3.45 CURRENT FIRE HAZARD RATING 97
TABLE 3.46 FIRE HAZARD RATING COMPARISON FOR EACH ALTERNATIVE 101
TABLE 3.47 MIS LIST AND RATIONALE FOR SOUTH PROJECT-LEVEL ANALYSIS 110
TABLE 3.48 BIG-GAME SCREENING COVER BY ARTERIAL/COLLECTOR ROAD 112
TABLE 3.49 SOLC LIST AND RATIONALE FOR SOUTH PROJECT ANALYSIS. 124
TABLE 3.50 THREATENED, ENDANGERED AND R2 SENSITIVE SPECIES 152
TABLE 3.51 GOSHAWK NEST TERRITORY STATUS: SOUTH PROJECT AREA 158
TABLE 3.52 BIRD CONSERVATION REGION 17 SPECIES LIST 172
TABLE 3.53 EFFECTS OF PROPOSED PROJECTS: RANGE & BOTANY 181
TABLE 3.54 SOUTH ROADS: JURISDICTION AND EXISTING CONDITIONS 201
TABLE 3.55 ROAD MANAGEMENT- OPEN MOTORIZED 203
TABLE 3.56 ROAD MANAGEMENT – CLOSED MOTORIZED AND UNAUTHORIZED 203
TABLE 3.57 FINANCIAL ANALYSIS RESULTS BY ALTERNATIVE 205

This page intentionally left blank

CHAPTER 1. PURPOSE OF AND NEED FOR ACTION

Document Structure

The Hell Canyon Ranger District of the Black Hills National Forest prepared this Environmental Impact Statement in compliance with the National Environmental Policy Act (NEPA) and other relevant Federal and State laws and regulations. This EIS (Environmental Impact Statement) discloses the direct, indirect, and cumulative environmental impacts that would result from implementation of each alternative. The document is organized as follows:

- Chapter 1. Purpose of and Need for Action: This chapter includes information on the history of the project proposal, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also describes how the public was informed of the proposal, and issues derived from public input.
- Chapter 2. Alternatives: This chapter provides a description of alternative methods for achieving the stated purpose. Alternatives are developed based upon key issues raised during scoping. This chapter provides summary tables of proposed activities and effects on issues.
- Chapter 3. Affected Environment and Environmental Consequences: This chapter describes the environmental effects associated with implementing the proposed action or another alternative.
- Chapter 4. Index
- Chapter 5. Literature Cited
- Chapter 6. List of Preparers
- Chapter 7. FEIS Distribution List
- Appendices: The appendices provide additional information to support the analyses presented in the EIS.

Other supporting documents are stored in the project planning record (project file) located at the Hell Canyon Ranger District office in Custer, South Dakota.

Background

Photographs taken during General George A. Custer's 1874 expedition give a glimpse of the appearance of the Black Hills in pre-European-settlement times. The Black Hills represent a fire-adapted ecosystem, and past fires created a landscape quite different than what we see today. Far fewer trees meant that open spaces were more common. Alteration of natural fire cycles on the Black Hills, as a means of protecting people, timber resources, and private property, has created dramatic changes in the landscape of the Black Hills.

The development of continuous, dense forest with few open spaces has led to both recent large forest fires and increased Mountain Pine Beetle activity. These are issues familiar to many people living and working in the Black Hills, and to people that visit this unique region. The number of fires on lands managed by the Black Hills National Forest has remained fairly constant at 65-130 starts per year. The number of fires that have escaped suppression attempts has also remained constant. However, these escaped fires have become larger and more difficult to control, with an average large-fire-size increasing from under 1,000 acres per fire in the early 1900's to over 8,000 acres in recent years. Approximately 239,000 acres have burned in the Black Hills since 1980. Locally and nationally, the public is requesting that wildfire and insect threats be reduced, and the diversity of species be maintained.

The proposed management actions within the action alternatives are designed to reduce hazards related to large-scale wildfire and the risk of insect infestations, increase vegetation diversity, enhance wildlife habitat, provide a sustainable supply of commercial timber (consistent with Forest Plan direction), and provide a variety of access to land managers and the public.

Forest Plan Direction

The 1997 Revised Land and Resource Management Plan (Forest Plan), as amended, provides direction for management of the Forest. The Forest Plan contains goals and objectives and associated standards and guidelines, management area direction, and identification of desired future conditions for the Forest. Resource specialists reviewed the current condition of the project area, compared these conditions with the desired future conditions and goals and objectives, and identified opportunities for improvement.

The Decision for the Phase II Amendment to the Forest Plan was signed on October 31, 2005 and became effective on February 28, 2006. The Forest Plan, as amended, establishes 11 goals and associated objectives for multiple-use management of the Forest. Goals 1, 2, 4 and 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 provide basic direction for defining a purpose and need for a project and developing a proposed action. Forest Plan goals are discussed in Chapter 1 of the Phase II Amendment of the Forest Plan.

Forest-wide Goals and Objectives

Goals and Objectives identified below provide management emphasis and direction for the South project.

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

Objective 101: Maintain air quality standards in accordance with state implementation plans.

Although usually short in duration, smoke from prescribed fires has the potential to affect air quality. Two Class I air-sheds are located east of the South project area: Badlands National Park and Wind Cave National Park. The communities of Argyle (to the south), Pringle (east) and Custer (northeast) are adjacent to South. The project area is designated as a Class II air-shed which allows higher concentrations of pollutants than a Class I air-shed. Smoke generated by wildfire is often abundant and cannot be mitigated compared to smoke generated under controlled conditions. For instance, mitigation of smoke is accomplished by: limiting size of treatment area, specifying acceptable wind direction and speed, specifying acceptable minimum mixing heights, and staggering ignitions. Opportunities exist to implement these and other mitigation techniques to minimize the effects of smoke on visibility and human health.

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

Objective 104: Maintain or enhance watershed conditions to foster favorable soil relationships and water quality. Implement projects to improve watershed conditions on an average of at least 300 acres annually over the Plan period. Achieve and maintain stable streambeds and banks, diverse riparian vegetation, and effective ground cover that controls runoff and erosion.

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

Objective 107: Restore degraded wetlands except where exemptions are allowed by a Clean Water Act Section 404 permit.

There are approximately 186 miles of stream channel in the two watersheds (Upper and Lower Pleasant Valley creeks) within the project area. Ninety (90) percent are ephemeral, 7% are intermittent and 3% are perennial. Most perennial and intermittent stream miles (over 80%) are located on private lands and include Fourmile Creek, Hay Creek, Lightning Creek, Pleasant Valley Creek and Warren Gulch. All streams and water bodies within the South project area are currently meeting their beneficial uses as assigned by South Dakota DENR. Opportunities exist for augmenting stream flows through management of upland vegetation.

Objective 109. Allow public use of caves unless restrictions are necessary to protect values present in significant caves. Work cooperatively with agencies, research institutions, cave interest groups and the public for cave resource use, scientific study, significance evaluation, safety, protection and management.

Objective 110. Manage the majority of caves as "wild" caves, with no modifications or facilities to aid or impede use

Objective 111. Determine significance of all caves.

There are 23 known caves within the limestone areas of the South project area. All known caves within the Black Hills National Forest are currently managed as significant caves (standard 1401, Phase II Amendment, p II-10). Forest personnel work cooperatively with local cave interest groups, national-level groups such as Bat Conservation International, and with Universities to study various uses and functions of caves. Opportunities exist to manage vegetation to benefit these systems and to increase safety for users (wildlife and/or recreational cave users).

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

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

There are 107 acres of aspen cover-type within the project area. The majority of these acres were managed during past projects. Opportunities exist to "release" five acres of aspen cover-type and also to release very small aspen clones within pine sites during project implementation.

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

The project area includes 4,727 acres of meadow in three management areas. Meadows provide unique habitats not found within the forested ecosystem. Ponderosa pine is encroaching into meadows, therefore this habitat is decreasing. There is an opportunity to conserve existing meadows by removing encroaching pine on 3,070 acres.

Within Management Area 5.1A (Southern Hills Forest and Grassland Areas), there is an opportunity to increase Southern Hills grassland habitat on 426 acres.

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

Natural mortality (insects, lightning, etc.) has created snags in all diameter classes, the majority of which are Ponderosa pine and are well-distributed across the South project area. The Black Hills National Forest has a policy that prohibits the cutting of standing dead trees (snags) for firewood, except in designated areas. Opportunity exists to conserve snags by prohibiting cutting of standing dead trees, unless a safety hazard, during project implementation.

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 pre-commercial treatments. Provide this tonnage no later than the removal cut (overstory removal) and pre-commercial thinning of the established stand (thinning to be accomplished within 10 years of the removal cut).

Drought, Mountain Pine Beetles, fires (Ventling, Jasper, prescribed fires), storms and natural mortality have created copious amounts of down woody material within the project area. In April, 2000, high tree mortality occurred following a significant ice storm. Much of this woody debris is now on the forest floor, which increases the likelihood of over-heating of the soil during a wildfire. Opportunities exist to manage these sites to obtain a less hazardous level of woody material.

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

No federally-listed species have been observed within the South project area. Large prairie dog towns provide habitat for black-footed ferrets, which is listed as an endangered species in Custer County, SD. However, the 20-acre prairie dog town within South is not large enough to provide habitat for ferrets.

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

Eleven Region 2 Sensitive animal species have habitat within the project area. Habitat for 13 species of local concern is present. No sensitive plant species have been located within the project area, although probable habitat exists. There is an opportunity to conserve and enhance habitat for these animal and plant species through vegetation treatments, fuels treatments, and modifications to the road system.

Objective 222: Complete the following habitat projects each year during the Plan period as funding allows:

Table 1.1 Wildlife, Fish and Range projects Forest-wide per year

	NONSTRUCTURAL	STRUCTURAL
Wildlife/Plant	1,000 acres	100 structures
Fish	50 acres	1 mile
Range	600 acres	30 structures

Opportunities exist to enhance wildlife habitat and range condition within South. See Appendix H for a listing of proposed post-sale projects.

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 infestation.

Previous soil disturbances and current infestations put this area at high risk for continued invasion by noxious weeds. Consistent monitoring and treatment as needed can reduce infestations of noxious weeds by up to 20% per year. Opportunities exist to treat known noxious weed infestations (approximately 600 acres within South) with herbicides prior to disturbance related to proposed activities in order to reduce seed dispersal from existing plants. Weeds are also treated with herbicides and biological controls after logging operations and/or prescribed burning to reduce further infestations and allow native vegetation to gain a competitive advantage over non-native vegetation.

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.

No R2 sensitive plant species were located during surveys within the project area, and a review of existing data indicated that no R2 sensitive plant species have been found in the area in the past. However, suitable habitat may exist for two sensitive species in the meadows: Botrychium campestre (Iowa moonwort) and Botrychium lineare (narrowleaf grapefern). Neither species is known to occur in the project area. Because of the uncertainty related to the species habitat preferences, there may be possible habitat for the species within meadows. Opportunities exist to manage meadows, therefore maintaining probable habitat for the Botrychium species mentioned above.

Objective 238: The following are objectives for management of management indicator species (MIS). The 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.

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, 5.4-206).

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.; Objective 211, 11-03, 5.1-204, 5.4-206).

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 white-tailed deer, brown creepers, black-backed woodpeckers and grasshopper sparrows is present within South. No spruce habitat is present for the golden-crowned kinglet, and there is no adequate stream habitat for mountain suckers within the South project area. Opportunities exist to enhance certain habitat elements for white-tailed deer, brown creepers, black-backed woodpeckers and grasshopper sparrows within the project area.

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

Guideline 2402. After the first decade, until the plan is revised, do not offer more than 181 million cubic feet of sawtimber and 21 million cubic feet of POL (products other than logs) in the second decade. (p. II-22 Phase II Amendment)

There is an opportunity to contribute to this Forest-wide objective through timber harvest in the project area.

Objective 304: On lands not identified as suitable and available for timber harvest, timber volume may be offered as a by-product of other vegetation management objectives. This volume would be offered in addition to the ASQ.

Opportunities exist to harvest Ponderosa pine from Management Area 5.1A using both regular harvest methods and "restoration" thinning. This volume would be offered in addition to the ASQ.

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.

Objective 405: Manage all heritage sites listed in the National Register of Historic Places in consultation with the State Historical Preservation Officer (SHPO) and the President's Advisory Council on Historic Preservation (ACHP).

There are 47 heritage sites in the project area that are eligible for listing on the National register. Fifty-eight sites are currently unevaluated and will be treated as eligible sites. Opportunities exist to design activities to protect from disturbance both eligible and unevaluated sites.

Objective 415: Support permitted outfitters and guides operating in the National Forest.

Opportunities exist to continue to support the current permitted outfitters (horseback riding, caving tours) operating within the South project area.

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

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

Currently the fire hazard rating is moderate to very high in approximately 70% of the Ponderosa pine sites within the project area. There are over 300 structures (homes and other buildings) present within South. Opportunities exist to manage vegetation to achieve a low-to-moderate fire hazard, especially in proximity to structures.

Objective 10-02: The scenic integrity objectives within the wildland-urban interface will be moderate to low for 2 to 4 years after management activities have been completed.

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 (Phase II Amendment, p. II-44,45).

Fire regimes in the project area are moderately to significantly altered from their historical range. Over 40% of existing pine stands are in the High to Very High category for fire hazard. Opportunities exist to reduce fuels and improve fire regime condition class to reduce fire hazard and modify potential fire behavior.

Objective 10-07: Where outbreaks of Mountain Pine Beetle could present risks to management objectives for Ponderosa pine, reduce acreage of Ponderosa-pine stands that are in medium or high risk for infestation.

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

The Bugtown project area lies immediately adjacent to the north/northeast portion of the South project area. The focus of the Bugtown project was reducing the epidemic levels of Mountain Pine Beetles (MPB) affecting Ponderosa pine. Although not at epidemic levels, elevated numbers of beetles were detected in pine in the northern portions of the South project area during silvicultural surveys. Opportunities exist to lessen the likelihood of MPB infestation of Ponderosa pine through vegetation management.

Management Area Goals and Objectives

The Forest Plan assigns a management emphasis to each portion of the Forest to meet multiple-use objectives. For each designated management area (MA), Chapter 3 of the Forest Plan includes a description of desired future condition, goals, objectives, standards, and guidelines.

National Forest lands within the South project area include the following Management Areas (See Map 9, Appendix A):

Management Area 5.1 (42%): Resource Production Emphasis. These lands are to be managed primarily for wood products, water yield, and forage production while also providing other commercial products, visual quality, diversity of wildlife, and a variety of other goods and services.

Management Area 5.4 (53%): Big Game Winter Range. These areas are managed to provide high-quality winter and transitional habitat for deer and elk, high-quality turkey habitat, habitat for other species, and a variety of multiple uses.

Management Area 5.1A (5%): Southern Hills Forests and Grassland Areas. These areas are managed for sustainability of the physical, biological and visual values associated with areas of woody vegetation and open grassland. Habitat and vegetation are managed to achieve and maintain the desired conditions for wildlife, livestock and vegetation.

Management Area 5.1

Objective 5.1-101. Sustain or enhance water yield through timber management.

Goal 5.1-201. Manage tree stands to emphasize timber products, forage production, and water yield.

Objective 5.1-202. While meeting other objectives for this management area, provide variety in stand sizes, shape, crown closure, age structure and interspersion.

Objective 5.1-203. Maintain or enhance hardwood shrub communities where biologically feasible, and within management objectives.

Objective 5.1-204 (same language as 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.(See Table 1.2)

Management Area 5.4

Goal 5.4-201. Manage tree stands for wildlife habitat and vegetative diversity.

Goal 5.4-204. Improve forage on range areas.

Objective 5.4-206. See Objective 5.1-204 above and Table 1.2.

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

Table 1.2 Structural Stages of Ponderosa Pine in MA 5.1 and MA 5.4

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

*10 percent of the structural stage 4 Ponderosa pine acreage in the management area will have an average 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-succession characteristics.

Management Area 5.1A

Objective 5.1A-201. Achieve diversity by maintaining or enhancing hardwood trees, shrub inclusions and other beneficial plant communities and openings.

Objective 5.1A-202. Vary tree densities (0- to 140-basal area) within stands to create small-scale diversity (i.e., to enhance understory shrubs or herbage), if compatible with other habitat objectives.

Goal 5.1A-203. Improve forage on range areas.

Objective 5.1A-204. Provide thermal cover on at least 20 percent of the forested area, where biologically feasible.

Objective 5.1A-205. ***NEW**. Remove pine encroachment in grasslands and shrublands.

Purpose of and Need For Action

The purpose of and need for action in the South project area is to reduce the hazard of and effects from large-scale wildfires on the At-Risk Communities (ARC) of Custer, Pringle and Argyle, South Dakota while providing for wildlife habitat needs, reducing risks of Mountain Pine Beetle infestation, providing a sustainable supply of commercial timber, and providing for management and public access needs.

Proposed Action

Following is a brief summary of the proposed action developed by the ID Team. All alternatives are presented in more detail in Chapter 2.

The proposed action was developed to address the Purpose of and Need for Action. Specific actions include: various silvicultural treatments of pine sites to reduce fire hazard (especially adjacent to private lands), to improve wildlife habitat, and to lower susceptibility of pine to Mountain Pine Beetles; pine encroachment treatments to preserve meadows; hardwood release to preserve hardwood stands; management of roads to supply various levels of motorized and non-motorized access to the Forest. Proposed road system changes include administrative closures and either converting or closing unauthorized roads. Total mileage of roads and open road density would decrease; system road mileage would increase.

Decision Framework

Given the purpose and need, the deciding official (District Ranger) will review the proposed action, the issues identified during scoping, the other alternatives, the environmental consequences of implementing each alternative, and public comments received on the Draft EIS. After careful consideration of this information, the District Ranger will decide the following:

- Whether or not the information in this analysis is sufficient to make an informed decision.
- Whether or not vegetation and fuels treatments should be implemented and if so, in what manner and in which locations.

- Whether or not changes to the road system should be implemented and if so, in which locations

Public Involvement

A Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS) was published in the Federal Register on July 19, 2007. The NOI asked for public comment on the proposal within 30 days of publication of the notice.

As part of the public involvement process, a scoping letter was sent to approximately 650 individuals, groups, agencies (private and government) and tribal representatives in June, 2007. As a result of public involvement efforts, input was received from 39 individuals, groups, agencies and tribes. South Dakota Game, Fish and Parks personnel joined members of the Interdisciplinary Team on a field review of the project area in October, 2007. The interdisciplinary team reviewed the input received and developed a list of significant issues. These issues were used to develop an additional alternative.

Issues

The ID Team reviewed input submitted during the scoping period and separated the issues into significant [as directed by the Council on Environmental Quality (CEQ) regulations (40 CFR 1500.4(g) and 1501.7)] and non-significant issues. Significant issues are defined as those directly or indirectly caused by implementing the proposed action. Non-significant issues were identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. The Council on Environmental Quality (CEQ) NEPA regulations explain this delineation in Sec. 1501.7, "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…." A list of non-significant issues and rationale regarding their categorization as non-significant may be found in the project record.

The ID Team identified the following significant issues. Numbers do not represent priority or ranking. An alternative to the Proposed Action was developed as a result of considering these issues.

ISSUE 1
Susceptibility of residual timber stands to wind damage

Stands proposed for thinning to a 40 basal area (BA) may be more susceptible to wind-throw and/or breakage hazard. A significant wind event could result in damaged timber stands, reducing sustainability of the future timber supply. Key indicators for this issue are:

- Acres of timbered sites with a target prescription of 40BA

ISSUE 2
Big-game cover and security near State of South Dakota property

South Dakota Game, Fish and Parks (SDGFP) department owns 1,197 acres at the southern end of Pleasant Valley Road within the project area. The property is cultivated to provide forage for elk and other wildlife. SDGFP personnel submitted concerns about cover and security for elk and other big-game on Forest lands adjacent to their property. Key indicators for this issue are:

- Roads open to motorized vehicles surrounding SDGFP property that reduce big-game security

- Pine site 031112-11 providing cover for big-game

ISSUE 3
Lack of prescribed burning within restoration treatments in Management Area 5.1A

The Proposed Action did not fully address the intent of the Restoration prescription in MA 5.1A because it did not include follow-up controlled burning. The desired future condition is to use controlled burning to manage a portion of this management area. Commercial and non-commercial thinning of pine would increase the safety and success of using fire as a management tool. Key indicators for this issue are:

- Acres of prescribed burning within restoration thinning sites in MA 5.1A

ISSUE 4
High occurrence of storm-damaged trees within "dense" sites of Ponderosa pine increases fuels hazard and suppresses understory vegetation

Pine sites with extensive storm damage would remain within the project area under the proposed action (Alternative 2). Concerns were submitted about the proposed action's deferred pine sites that contain extensive tree damage from the April, 2000 ice storm. Unmanaged fuels would pose a hazard to public and private lands values and suppress the growth of existing vegetation. Key indicators for this issue are:

- Acres of Improvement Cutting

This page intentionally left blank

CHAPTER 2. ALTERNATIVES

Introduction

This chapter contains the alternatives considered in the South project. It includes a description of the Proposed Action (Alternative 2), one alternative to the Proposed Action (Alternative 3), as well as the No Action Alternative (Alternative 1). Another section compares the alternatives in order to provide a clear basis for choice between options for the decision maker and the public. There is also a brief overview of alternatives that the ID Team considered but eliminated from further development and analysis.

Alternatives Considered in Detail

The Forest Service developed three alternatives (No Action/Alternative 1; Proposed Action/Alternative 2; Alternative 3). The alternatives considered in detail by the IDT are discussed below. This section provides a summary of activities proposed to occur during implementation of any action alternative. The amount (acres, miles) of any particular activity in an alternative is approximate, based on inventory and survey estimates. Exact figures may vary slightly during preparation of a timber sale, prescribed burn, or other project based upon various factors such as topography, non-uniform site structure, fuels, refinement of the standard of road needed, etc.

Alternative 1: No Action

The National Environmental Policy Act (NEPA) requires the study of the No Action Alternative as a basis for comparing the effects of no action to effects from the action alternatives. The No Action Alternative assumes no implementation of any element of the action alternatives within the South project area. This alternative represents no attempt to actively respond to the purpose and need for action or the issues presented during scoping. No effort would be made to modify existing vegetation or related fuel conditions within the project area.

Alternative 2 : Proposed Action

Alternative 2 was developed to meet the Purpose and Need for Action. This alternative represents the ID team's recommendations prior to considering input gathered during public scoping.

In addition to the management activities described under "Features Common to All Alternatives" and "Post-Sale Projects," this alternative includes the following treatments. Approximately 12,063 acres are proposed for commercial thinning, therefore reducing stand density to improve the fire regime condition class. The target density, measured as basal area (BA) in square feet per acre (sq.ft/acre), varies from 40 to 60. The sites proposed for a BA of 40 (9,456 acres) are adjacent to private property and are the wildland/urban interface (WUI). Sites proposed for a BA of 60 (2,607 acres) are those which are not adjacent to private lands. Other commercial treatments include group shelterwood harvest on 8,703 acres, overstory removal on 3,456 acres, and products other than logs (POL thinning) on 3,121 acres.

This alternative proposes to commercially harvest approximately 65 mmbf of sawtimber and 55,000 ccf of POL (products other than logs) from approximately 32,118 acres.

Prescribed (controlled) burning is proposed 8,796 acres. The main intent of the prescribed burning proposed within the South project is to provide a "fuel break" to increase likelihood of controlling a wildland fire before it reaches the At-Risk Communities (ARCs) of Custer, Pringle and Argyle, SD. Other benefits include nutrient recycling and related understory vegetation enhancement. If fuels objectives are met with mechanical vegetation treatments, prescribed burning may not occur.

No new road construction is proposed in Alternative 2. However, the ID team identified approximately 22 miles of currently unauthorized roads for re-designation as Forest Service system roads. Approximately 73 miles of unauthorized roads were identified for closure to motorized vehicles.

See Table 2.1 for a comparison of alternatives.

Alternative 3

This alternative was developed to address issues identified during scoping. The elements of this alternative which differ from the Proposed Action (Alternative 2) are: 1) prescribing 60 BA rather than 40 BA to increase wind-firmness of pine; 2) deferring site treatments and closing roads for big-game cover and security; 3) restoration prescribed burning in MA 5.1A; 4) additional acres of Improvement Cutting, and 5) the proposed Layton Canyon mountain bike trail.

Alternative 2 and Alternative 3 differ in target density of commercially-thinned pine sites, which is measured as basal area (BA) in square feet per acre (sq.ft/acre). In Alternative 2, the target of commercially-thinned sites is 40BA near private lands and 60 BA elsewhere. In Alternative 3, the target is 60BA, to address the issue of wind-firmness of pine. The sites proposed for 40 BA (9,456 acres) in Alternative 2 would change to 60 BA in this alternative.

Vegetation treatment is deferred within pine site 031112-11 in Alternative 3 to provide big-game cover adjacent to SD Game, Fish & Parks (SDGFP) property. Vegetation treatment is proposed within this site in Alternative 2.

In Alternative 3, approximately 14 miles of non-system (unauthorized) roads were identified for conversion to system roads. Approximately 81 miles of unauthorized roads were identified for closure to motorized vehicles. Administrative closure of 3.08 miles of system road is proposed for big-game security near SDGFP property.

Prescribed (controlled) burning is proposed 10,929 acres. Alternative 3 proposes 2,133 additional acres of burning when compared to Alternative 2. The intent of the additional acres of prescribed burning is to meet the restoration prescriptions within MA 5.1A and respond to issue #3.

Improvement cutting is proposed on 3,317 acres. This is an increase of 2,354 acres of improvement cutting when compared to Alternative 2. This action responds to issue #4.

New trail construction is proposed in this alternative as follows: 1.7 miles of single-track non-motorized trail to create the Layton Canyon mountain bike route. See Map 16 in Appendix A.

In addition to the management activities described under "Features Common to All Alternatives" and "Post-Sale Projects," this alternative includes the following treatments: Approximately 11,986 acres are proposed for commercial thinning, reducing existing stand density and improving the fire regime condition class. This alternative proposes to commercially harvest approximately 54 mmbf of sawtimber and 54,000 ccf of POL (products other than logs) from approximately 31,527acres. Other commercial treatments include group shelterwood harvest on 8,071 acres, overstory removal on 3,441 acres, products other than logs (POL thinning) on 3,254 acres.

See Table 2.1 for a comparison of alternatives. See maps in Appendix A for vegetation treatments (Maps 3 & 6), prescribed burning treatments (Maps 17 & 18) and travel management proposals (Maps 2,4,5,7 & 8).

Features Common to All Action Alternatives

- Proposed vegetation treatments which are the same for all action alternatives include the following:
    - Hardwood release is proposed on a total of 5 acres of aspen. Treatment would be accomplished by removing all conifers within the site boundary.
    - Group selection is proposed on 904 acres. Small openings would be created to regenerate the stand in an uneven-aged configuration.
    - Seedcut is proposed on 370 acres.
    - Removal of pine encroaching into meadow sites is proposed on 3,070 acres.
    - Restoration thinning is proposed on 426 acres within Management Area 5.1A

- Implementation of prescribed burning, outside of MA 5.1A, would be similar for both action alternatives. If fuels objectives are met with mechanical treatment, the Fuels Specialist has to option to forego prescribed burning.

- The following fuels treatments are proposed for all action alternatives (refer to Maps 3 & 6 in Appendix A):

  - 300-foot fuel breaks adjacent to private land would occur on 412 acres

- Harvest units may contain inclusions of different cover condition or type. Each site has a single treatment prescription; however, inclusions within sites may be treated differently than the majority of the site.

Post-sale projects

The following projects are included in all Action Alternatives**.** Note that there are some acreage differences by Alternative. See Appendix H for a list of post-sale projects by location/site. More information on these projects is available in the project file.

- Pre-commercial TSI thinning and burning/rehabilitation of related slash piles is proposed on 3,556 acres in Alternative 2 and 3,541 acres in Alternative 3.
- Regeneration surveys are required on all sites treated with an overstory removal or a regeneration treatment (seedcut, group selection).
- POL (products other than logs) thinning and burning/rehabilitation of related slash piles is proposed as a secondary treatment following commercial thinning on 12,489 acres in Alternative 2 and 12,412 acres in Alternative 3.
- Hardwood release is the removal of conifers from hardwood stands and includes burning and rehabilitation of slash piles. In Alternatives 2 and 3, five acres of hardwood release is proposed.
- Pine encroachment control on 3,070 acres
- Mechanical site preparation is proposed on 125 acres in Alternatives 2 and 3. This treatment is designed to break up sod and prepare a seedbed for pine regeneration.
- Weed spraying would occur for five consecutive years on approximately 878 acres the first year and 702, 562, 450 and 360 acres in Years 2, 3, 4, and 5, respectively.
- Biological control of weeds would occur for five consecutive years on 30 acres where access is an issue. This would include monitoring and signing of the areas.

- Windmill Draw pipeline is proposed in the Limestone range allotment. Pipeline would supply water from Alkali Well to uplands.
- Warren Gulch Spring project is proposed in the French Creek range allotment and would include a spring box, tank, gravel, pipeline and interpretive sign.
- Ballwood Seep spring development project is proposed in the French Creek range allotment. This project would include a spring box, tank, gravel, pipeline and interpretive sign. Buck and rail fence would be erected around spring source (riparian).
- Fence project proposed in the French Creek range allotment would consist of building ½ mile of new fence from private property line to the 2-wire drift fence on the section line of Sections 6 and 31.
- Aspen seep project is proposed in the French Creek range allotment and would involve installing spring box, running pipeline to a tank on gravel pad, fencing hardwoods and the riparian area and erecting an interpretive sign.
- Freeport Well project is proposed in the French Creek range allotment and would involve placing a collection box to act as a well, running a pipeline to a tank on a gravel pad and erecting an interpretive sign.
- Martin Draw pit tank exclosure project is proposed in the Richardson range allotment and would involve installing new woven wire and barbed wire fence and erecting an interpretive sign.
- Fence and Pipeline project is proposed in the Richardson range allotment, which would involve erecting two miles of 3-wire fence to divide the Big Richardson pasture.
- Wood Well tank project is proposed in the Richardson range allotment which would involve installing a tank on gravel pad and erecting an interpretive sign.
- Layton Canyon Mountain Bike Trail (Alternative 3): designate path route on level 1 & 2 roads within the canyon; would involve constructing approximately 1.7 miles of bike path, two associated trail heads, and installing interpretive signs at trailheads.

Design Criteria

Design criteria are standard practices such as Forest Plan Standards and Guidelines, Best Management Practices, and others. They are to be implemented as a matter of standard operating procedures for the action alternatives. Design criteria are applied to protect resources and forest users. All activities proposed in this project, including any post-sale activities or monitoring, must implement these design criteria. A complete list of project-related design criteria is available in Appendix B.

Monitoring

The Hell Canyon Ranger District is responsible for ensuring that EIS and Record of Decision (ROD) direction, including design criteria, are applied and carried out appropriately.

Project and contract administrators perform much of the project monitoring during project implementation. Other resource specialists monitor specific progress including application of design criteria related to their resource of concern. See the project area monitoring plan in Appendix C.

Alternatives Considered but Eliminated from Detailed Study

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Public comments received in response to the Proposed Action provided suggestions for alternative methods for achieving the purpose and need. The following alternatives were considered, but dismissed from detailed consideration for reasons summarized below.

- An Alternative that would treat all pine sites in structural stages 4B and 4C. Rationale: Some 4B and 4C sites are deferred from treatment in order to contribute to the Forest-level structural stage distribution and/or to fulfill specific wildlife habitat needs.
- An Alternative which does not undertake any logging, thinning, or any other vegetation management and instead focuses on road decommissioning and closure. Rationale: This alternative would not fulfill the portions of the purpose and need which focus on: reducing the hazard of and effects from large-scale wildfires, reducing risks of Mountain Pine Beetle infestation, providing a sustainable supply of commercial timber, and providing for management and public access needs.
- An alternative that does not harvest or thin any stands of structural stage 4C and 4B. Rationale: This alternative would not fulfill the portions of the purpose and need which focus on: reducing the hazard of and effects from large-scale wildfires, reducing risks of Mountain Pine Beetle infestation, providing a sustainable supply of commercial timber. Alternative 1 would forego all vegetation harvest.
- An alternative that addresses fragmentation concerns on the BHNF. Rationale: Fragmentation relevance and effects vary by species and their respective habitat needs and mobility. Large tracts of unlogged, mature forest may represent less fragmented conditions for some species, while representing less diversity for others. Abundance and distribution of habitat is discussed for the individual wildlife species for which fragmentation is a concern in

Phase II FEIS Chapter 3, Section 3-3. Also refer to the 1997 FEIS for the Revised Forest Plan, pgs. III-247 through 275, for a discussion and evaluation of fragmentation.

- An alternative that proposes no overstory removal to retain large-diameter trees that are more fire resistant. Rationale: Alternative 1 would forego all vegetation harvest. Rationale for eliminating this as an action alternative: In the Shelterwood silvicultural system, this is one step in the process of regenerating the Ponderosa pine forest. Overstory removal is only proposed within sites where pine sites are ready for this silvicultural treatment. To forego this option would disallow long-term management of the Ponderosa pine sites using the Shelterwood silvicultural system.

- An alternative that does not allow harvesting of trees greater than 10" in diameter. This alternative will ensure that an adequate amount of larger diameter trees are retained for future snag creation and for the benefit of species dependent upon larger diameter trees. Rationale: Alternative 1 would forego all vegetation harvest. Also, this alternative would not fulfill the portions of the purpose and need which focus on reducing the hazard of and effects from large-scale wildfires and reducing risks of Mountain Pine Beetle infestation

- An alternative that proposes to designate all management area prescription ("MAP") 5.4 within the project area as MAP 4.1 (non-motorized emphasis). This alternative proposes a non-significant Forest Plan amendment and will enhance wildlife habitat. Rationale: The desired future condition of Management Area 5.4 (Big-game winter range) is to provide big-game winter range while maintaining healthy plant communities and recreational opportunities. All activities, including recreation, are managed so that deer and elk can effectively use the area during winter and other critical time periods. High quality winter habitat is in part maintained by reducing vehicle access to key areas. Vehicle traffic is limited to only a portion of the total road network. Hiding and thermal cover and late-succession areas are provided. Vegetation is managed to provide healthy plant communities with a variety of species for food and cover. (Phase II Amendement, p III-91). Motorized road and off-road closures may be implemented. (Phase II Amendment, p III-92). Approximately two-thirds of ("MAP") MA 5.4 within the project area is currently closed to motorized vehicles from December 15 through May 15. Management Area 4.1 (MA 4.1) has a different focus. Limited motorized use is allowed, and often the Forest Development ("System") roads are open most of the time. Over-the-snow vehicles may be authorized. (See pages III-47, 48 of Phase II Amendment). Structural stage objectives for Ponderosa pine are the same for both MA 4.1 and MA 5.4. The ID team discussed these differences of motorized-use-focus and vegetation management and decided that MA 5.4 remains the best designation within the South project area.

- An alternative that designates all stands of structural stage 4C as MAP 3.7. This alternative also proposes a nonsignificant Forest Plan amendment and will enhance wildlife habitat. Rationale: This alternative would create management complexity that would exceed the benefits of re-designating these scattered sites. Structural stage 4C is currently above the Forest Plan objective of 5%; structural stage 4C will persist within the project area in all alternatives.

- An alternative that focuses on the stated purpose of providing for wildlife habitat needs. Rationale: All alternatives provide for wildlife habitat needs. Further discussion is provided in the wildlife report within the project file.

Comparison of Alternatives

This section provides a summary of the Alternatives. Refer to maps in Appendix A for a visual display of where activities are proposed. See Appendix G for definitions of terms.

Table 2.1 Comparison of Vegetation Treatments (by acres)

Commercial Treatment	Alternative 1	Alternative 2	Alternative 3
Commercial Thinning 40sq.ft/acre BA(CT40)	0	9,456	0
Commercial Thinning 60sq.ft/acre BA (CT60)	0	2,607	11,986
Group Selection (GS)	0	904	904
Group Shelterwood (GSH)	0	8,703	8,071
OverstoryRemoval (OR)	0	3,456	3,441
Seedcut (SC)	0	370	370
Hardwood Release (HWR)	0	5	5
Pine Encroachment (PE)	0	3,070	3,070
POL Thinning (POL 18)	0	2,273	2,303
POL Thinning (POL 20)	0	0	951
POL Thinning (POL 24)	0	848	0
Restoration Thinning	0	426	426
Total Acres	0	32,118	31,527
Total Volume	0	65 mmbf	54 mmbf
Follow-up Treatments			
POL Thinning (POL 20)	0	2,607	11,986
POL Thinning (POL 24)	0	9,456	0
POL Thinning (POL-irr)	0	426	426
Non-commercial Treatments			
Pine Encroachment	0	3,070	3,070
Hardwood Release	0	5	5
Pre-commercial Thinning	0	3,556	3,541
Improvement Cut (IC)	0	963	3,317
300-foot fuel breaks	0	412	412
Prescribed Burning	0	8,796	10,929
Total Fuels Treatments	0	9,208	11,341

Table 2.2 Effects to Issues by Alternative

1: Timber windthrow/breakage susceptibility Management indicators:	**Alternative 1**	**Alternative 2**	**Alternative 3**
Acres of 40 BA treatment	0	9,456	0
2: Lack of big-game cover/security Management indicators:	**Alternative 1**	**Alternative 2**	**Alternative 3**
Pine site 031112-11 providing cover	Y	N	Y
Roads closed* Miles	0	0	3.08
3: Restoration Burning Management Indicators:	**Alternative 1**	**Alternative 2**	**Alternative 3**
Acres of prescribed burning in MA 5.1A	0	0	2,133
4: Storm-damaged pine increasing fuels hazard in "dense"sites Management indicators:	**Alternative 1**	**Alternative 2**	**Alternative 3**
Acres of improvement cut	0	963	3,317

*specifically for big-game security adjacent to SDGFP property

This page intentionally left blank

CHAPTER 3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter presents relevant resource descriptions of the existing condition and the environmental consequences of each alternative. The discussion of environmental consequences includes direct, indirect, and cumulative effects. Resource elements that are not affected, or upon which the action alternatives have a negligible effect, are not discussed. These include elements such as topography and climate**.** Full reports completed by resource specialists are available in the South project file.

Analysis of direct, indirect, and cumulative effects of the action alternatives on the biological, physical, and social environment was completed by the Interdisciplinary (ID) team and is presented in this chapter. Analysis was accomplished by field observations and surveys, past experience and professional recommendations, aerial photography, resource modeling, literature review, information obtained through monitoring, Forest Plan direction and associated analysis, and public participation. Direct and indirect effects were analyzed using a 10-year planning period.

Analysis of cumulative effects includes past, present, and reasonably foreseeable future activities that could affect the biological or social environments. See Appendix E for a listing of past, present and future activities considered in the South cumulative effects analysis. The cumulative effects analysis area is the project area for all resources except silviculture, specifically mountain pine beetle. The cumulative effects boundary for mountain pine beetle is the project area plus the Wabash Timber Sale area immediately adjacent to the northeast boundary of the project area. This boundary was selected because beetle populations are known to be at epidemic levels in the Wabash area and could potentially affect Ponderosa pine within one mile of this sale area. Beetles generally move less than one-tenth of a mile per year but might travel up to several miles on rare occasions.

Past activities can have long-lasting and far-reaching effects regardless of whether they are active or passive in nature. Past activities that were considered in the cumulative effects analysis are summarized in Appendix E. Some of these activities/events have been occurring in the project area for over 100 years, while other activities are recent.

Present activities are those currently occurring in the project area. These include activities such as livestock grazing, dispersed recreation including hunting and off-highway vehicle use, developed recreation (Comanche campground), timber harvest, fuel-wood gathering, wildfire suppression, and noxious weed treatment. Refer to Appendix E for a summary listing.

Reasonably foreseeable future actions include those management activities that are on-going or are scheduled to occur within the next five years. These activities may occur regardless of the alternative selected for implementation under this analysis.

WATERSHED, GEOLOGY AND SOILS

Affected Environment

A watershed is defined as "The catchment area or drainage basin from which the waters of a stream or stream system are drawn" (Gove, 1966). "The term watershed describes an area of land that drains down slope to the lowest point. The water moves through a network of drainage pathways, both underground and on the surface. Generally, these pathways converge into streams and rivers, which become progressively larger as the water moves on downstream, eventually reaching an estuary and the ocean" (Watershed Definition, 2003).

Watersheds are comprised of different components and each component applies its signature to the watershed, making each watershed unique. These components include watershed boundaries, precipitation and climate, water quality and quantity, geology/ soils, slope, watershed condition, connected disturbed areas (CDAs), streams, lakes, wetlands, floodplains, beneficial uses, roads and private land. This report discusses each component as it relates to the South project area. See the Watershed Specialist Report in the project file for more detailed information.

Watershed Boundary

The South project area boundary was developed from the HUC (Hydrological Unit Code) 6 watershed boundaries. HUC 6 watersheds are generally 10,000 to 50,000 acres in size, and there are two HUC 6 watersheds within the project area. Table 3.1 displays the acreage and percent of each watershed.

Table 3.1 HUC 6 Watersheds in the South Project Area

HUC 6 Watersheds			
HUC 6 Number	Watershed Name	Acres	% Within South project area
101201060401	Upper Pleasant Valley Creek	31,263	100%
101201060402	Lower Pleasant Valley Creek	22,580	92%
Total		53,843	

(Black Hills National Forest, 2001)

The project area is within parts of six HUC 7 watersheds, which are the next-smaller watersheds. HUC 7 watersheds are generally 5,000 to 10,000 acres in size. See Table 3.2 and Map 13 in Appendix A.

Table 3.2 HUC 7 Watersheds in the South Project Area

HUC 7 Watersheds			
HUC 7 Number	Watershed Name	Acres	% Within South project area
10120106040101	Lightning Creek	7,451	100%
10120106040102	Fourmile Creek	8,568	100%
10120106040103	Layton Canyon	8,254	100%
10120106040104	Lower Fourmile Creek	6,989	100%
10120106040201	Upper Pleasant Valley Creek	7,253	100%
10120106040202	Middle Pleasant Valley Creek	6,428	100%
10120106040203	Lower Pleasant Valley Creek	8,899	79%
Total		53,842	

(Black Hills National Forest, 2001)

Precipitation and Climate

The South project area elevation ranges from 4,535 feet where Pleasant Valley Creek leaves the project area, to the highest point at 6,620 feet on an unnamed ridge at the northern-most point of the project area. The South project area has a semi-arid climate with low humidity throughout the year. Temperatures range from near 100° F during the summer months to well below 0° F in winter. Average annual precipitation estimates from an Isohyetal Map for the area range from 18 to 19 inches (Driscoll, Carter, Williamson and Putnam, 2002), based on 1961 to 1990 data. The largest precipitation amounts typically occur during May and June, and the smallest amounts typically occur during November through February (Driscoll, Carter, Williamson and Putnam, 2002). Approximately 51% of the annual precipitation occurs May, June and July and approximately 71% of the annual precipitation occurs April through August. Localized, intense thunder cells associated with the monsoons can produce much greater rain than surrounding areas within one storm event (Fact Sheet Team, 2001).

Geology

The geology underlying the South project area has eleven different hydrogeologic units. These are illustrated in Table 3.3.

Table 3.3 Geology

Geology		
Description	Geology Symbol	% of Planning Area
Alluvium	Qa	5%
Deadwood Formation	OCd	4%
Gravel Deposits	Qg	<1%
Harney Peak Granite	Xh	<1%
Madison Limestone	MDme	30%
Metamorphosed Graywacke	XWgw	24%
Minnelusa Formation	PPm	36%
Undifferentiated Igneous Rock	XWui	<1%
Undifferentiated Metamorphosed Sedimentary Deposits	XWus	<1%
Water	H2O	<1%
White River Group	Tw	1%

(Strobel, Jarrel, Sawyer, Schleicher and Fahrenbach, 1999)

The above units are grouped into broader categories. Alluvium, Gravel Deposits and White River Group are in the unconsolidated unit; Deadwood Formation, Madison Limestone, Minnelusa Formation are aquifers; and Harney Peak Granite, Metamorphosed Graywacke, Undifferentiated Igneous Rock, and Undifferentiated Metamorphosed Sedimentary Deposits are in the Precambrian Igneous and Metamorphic Unit.

Soils

There are 37 different soil map units within the South project area. The vast majority of the soil map units have small areas within South. Eight soil map units, BsB, BuE, BvC, CxC, PbD, SrE, VcE and VoG, comprise 83% of the project area and the other 29 soil map units occupy 2% or less. Eighteen of the 29 occupies less than 1%.

Soil map units HtG, RgG, RkG, RlG, RnG, TuG and VoG have a very high erosion hazard rating (EHR). These units occupy 10% of the South project area. The EHR is high because of steep slopes.

Three soil map units that have high mass movement potential are HtG, RgG and RnG. All these units occupy less than 1% of the South project area.

Soil map units that are subject to compaction when they are wet include, BvC, CkC, PaE, SybC, SycE, VcE and VkE. These units cover 12% of the South project area.

Soil map units HtG, NfE, RkG, SpE, SybC, VkE and ZnD have low topsoil organic matter. These units cover 3% of the South project area.

Soils within meadows are often unique and differ from soils that support timber stands. Soil map units BdA, BrB, BsB, CoA, CvB, CwB, CxC, HeE, HfC, HgB, HgD, NfE, PbD, WtB and ZnD occupy 21% of the South project area, generally support native grasses, and represent the meadows within the South project area.

Current conditions of the soils were observed when five soil map units were visited in the field. They were units BuE, BvC, PbD, SrE and VoG. These units represent 72% of the South project area. The goal was to find previously logged areas to see if there were any residual effects from past activities. Eight sites were observed. The findings were that all sites that were visited had Properly Functioning Soil Health Ratings. At some of the sites there were minor residual effects, usually on skid trails. These were small, isolated areas and were well under 15% of the area. All areas had excellent ground cover, infiltration was excellent and no erosion was occurring.

Photos taken during field review are available in the project file.

Five soils/units are estimated to occur over 72% of the area. They are: Vanocker, 22%; Sawdust, 21%; Paunsaugunt, 13%; Buska, 10%; and Rock Outcrop, 6%. See Table 3.4.

Table 3.4 Soil Descriptions in the South Project Area

Soil Descriptions		
Soil/Unit	**Percent of area**	**Description**
Vanocker	22%	This soil is formed in material weathered from limestone and calcareous sandstone. It is deep, well drained, strongly sloping to steep soils at the lower elevation on the Limestone Plateau. The Vanocker soil is generally on the side slopes of the landscape that have a north aspect. Typically there is one inch of forest litter on the surface and the soil is a channery loam to a calcareous very channery loam. Depth to bedrock is 60 inches while some areas can be 20 to 40 inches. The available water capacity is moderate, permeability is moderate, shrink-swell potential is moderate and runoff is medium. Erosion can be controlled by reseeding disturbed areas and by installing water bars and culverts.
Sawdust	21%	This soil is formed in material weathered from limestone and calcareous sandstone. It is deep, well drained and strongly sloping to steep soils at the lower elevation on the Limestone Plateau. The Sawdust soil is generally on side slopes that have a south aspect. The soil is a calcareous channery loam to a calcareous extremely channery loam. Depth to bedrock is 60 inches while some areas can be 20 to 40 inches. The available water capacity is moderate, permeability is moderate, shrink-swell potential is low and runoff is medium. Erosion can be controlled by reseeding disturbed areas and by installing water bars and culverts.
Paunsaugunt	13%	This soil is formed in material weathered from limestone and calcareous sandstone. It is shallow, well drained and strongly sloping to steep soils at the lower elevation on the Limestone Plateau. The Paunsaugunt soil is generally on upper side slopes and on ridges. The soil is a calcareous gravelly loam to a calcareous very gravelly loam. Depth to bedrock is 11 inches while some areas can be 20 to 40 inches or less than 10 inches. The available water capacity is very low, permeability is moderate, shrink-swell potential is low and runoff is medium. Erosion can be controlled by reseeding disturbed areas and by installing water bars and culverts.
Buska	10%	This soil is formed in loamy material weathered from micaceous schist. It is deep, well drained, strongly sloping to steep on the Central Crystalline Area. The Buska soil is generally on mountain side slopes. Typically there is one inch of forest litter on the surface and the soil is a very dark gray loam to a very channery loam. Depth to bedrock is 41 inches while some areas can be 20 to 40 inches. The available water capacity is low, permeability is moderate, shrink-swell potential is low and runoff is medium. Erosion can be controlled by reseeding disturbed areas and by installing water bars and culverts. Mass movement may occur if the steep areas are disturbed.
Rock Outcrop	6%	Rock Outcrop is on mountains side slopes of the Central Crystalline Core. It occurs as low-relief, fractured schist and dikes or plugs of quartzite or granite. Most of the schist outcrops have steeply tilted bedding plains. It also occurs on the sides of mountains and canyons at the lower elevations on the Limestone Plateau. It is hard, fractured limestone and hard sandstone. In some areas the weathering has caused rock slides below the rock outcrop.

Slope

Ninety-one percent (91%) of the South project area has slopes of 30% or less and 97% of the South project area has slopes of 40% or less. Table 3.5 indicates the percentage of the South project area in each slope class.

Table 3.5 Slope

Slope			
Slope Class	% of Planning Area	% Shallower in Planning Area	% Steeper in Planning Area
0-10%	33%	33%	100%
10-20%	40%	73%	67%
20-30%	18%	91%	27%
30-40%	6%	97%	9%
40-50%	2%	99%	3%
50-60%	1%	100%	1%
>60%	<1%	100%	<1%

(Black Hills National Forest, 2002b)

As indicated in Table 3.5, the South project area has a variety of slopes and as a whole the South project area generally has gentle slopes. Nine percent (9%) of the area has slopes greater than 30%.

Connected Disturbed Areas (CDA)

CDAs are areas that contribute sediment to streams or wetlands causing degradation of physical function, degraded water quality and increased peak flows that may alter physical channel processes. When a disturbed area flows into a waterbody without sufficient delay from vegetated filter strips or sediment detention structures, it is connected to the waterbody. CDAs may include bare soil patterns, compacted soils, roads, severely burned areas, mine spoils, etc.

Disturbed areas near ephemeral drainages are generally not CDAs. This is because there is vegetation in the drainages that would filter out any sediment generated. This sediment does not contribute to the degradation of the physical function of the stream or degrade water quality.

During the field inventory of the South project area, no CDAs were identified on National Forest system land. There may be CDAs within the South project area on private land. Private land was not visited because of trespass issues. Since most of the intermittent and perennial streams are on private land, there is potential that there are CDAs within the South project area.

Watershed Condition

Watershed Condition Assessments (WCAs) were completed for each sixth level watershed in the process of developing the 1997 Land and Resource Management Plan (Forest Plan). The WCAs were based on the watershed sensitivity, known impacts, and available monitoring data. Since the Forest Plan was completed, a new watershed layer was completed and the WCAs that were done do not match up with the new watershed layer. One old, 6th-level watershed was split into three watersheds for the new watershed layer. As part of the existing conditions report, new Natural Watershed Sensitivity Index (NWSI) and Impact Indexes were recalculated on the 6th-level watershed.

The NWSI is used to assess watershed sensitivity to see how watersheds compare to each other. Sensitive areas in each watershed were identified on three criteria: (1) riparian areas/streamside management zones, (2) severely erodible soils, and (3) slopes greater than 60 percent. The sum of all areas (in acres) meeting any of the NWSI criteria divided by the total watershed acreage produces the NWSI. Three qualitative categories were established for the index values:

- Low Sensitivity 0-29%
- Moderate Sensitivity 30-65%
- High Sensitivity 66-100%

Impact Indexes account for those impacts that are most likely to affect stream health. CDAs are those disturbed sites that drain directly into streams, and disturbed areas in close proximity to streams are most likely to be hydrologically connected. CDAs allow sediment and associated pollutants to reach streams, causing decreased physical habitat, decreased water quality, and increased risk of flood damage. Index values are determined by dividing the number of acres of disturbed land adjacent to streams by the total stream buffer area in a watershed. Impact Index values less than 11 percent are considered minor.

Table 3.6 indicates the Sensitivity and Impact Index for each of the HUC 6 watersheds.

Table 3.6 Watershed Condition in the South Project Area

Watershed Condition			
HUC 6 Number	Watershed Name	Sensitivity Index %	Impact Index %
101201060401	Upper Pleasant Valley Creek	16%	1%
101201060402	Lower Pleasant Valley Creek	5%	0%
Average		11%	1%

Sensitivity Index – Both watersheds fall into the Low Sensitivity category. Average of both watersheds is 11%. Limited perennial and intermittent streams are a major reason why the sensitivity index is low, along with minimal severely erodible soil. There are not very many slopes greater than 60% within the watersheds, which also keeps the index low.

Impact Index – The watersheds have indexes that fall into the category that is considered minor and are generally low numbers, because of the lack of perennial and intermittent streams.

Streams and Lakes

There are no lakes within the South project area. There are estimated 186 miles of streams within the South project area. Three percent (3%) are perennial, 7% are intermittent and 90% are ephemeral.

Streams within the South project area are described below. Fieldwork, USGS Quad maps and knowledge of the area were used to identify whether the streams were Ephemeral, Intermittent or Perennial within the planning area. Perennial and intermittent streams have a water influence zone (WIZ), which is a distance of 100 feet from each bank for a total of a least 200 feet.

Table 3.7 Streams within the South Project Area

Streams within South project area							
		Stream Miles					
		Ephemeral		Intermittent		Perennial	
HUC 6 Number	Watershed Name	Total	Private	Total	Private	Total	Private
101201060401	Upper Pleasant Valley Creek	85.09	29.98	11.72	10.52	6.05	4.82
101201060402	Lower Pleasant Valley Creek	83.47	20.09	0.00	0.00	0.10	0.00
Total		168.56	50.07	11.72	10.52	6.15	4.82
Percent Private			*30%*		*90%*		*78%*
Percent Private (all streams)							*35%*
Grand Total *(ephemeral+intermittent+perennial)*						186.43	65.41

Stream health, defined as " The condition of a stream versus reference conditions for the stream type and geology, using metrics such as channel geometry, large woody debris, substrate, bank stability, flow regime, water chemistry and aquatic biota" (USDA Forest Service, 2006b), is an indicator of water quality. Streams and stream health within the South project area are discussed below.

There are limited perennial and intermittent streams within the South project area. They are concentrated in the northeast corner of the project area. The reason why they are there versus other parts of the planning area is because of the geology. Here it is in the Precambrian Core and the rest of the area is primarily limestone. Eighty-six percent (86%) of the perennial and intermittent streams are on private land.

Streams and stream health within the project area are discussed below:

Fourmile Creek – An estimated 99% of this 6.4 mile creek flows through private land in the South project area. It is estimated that there is less than 250 feet of this creek on National Forest at two different areas. Since there is so little of this creek on National Forest, a stream health rating has not been assigned to this stream.

Hay Creek – An estimated 97% of this 2.9 mile creek flows through private land in the South project area. It is estimated that there is less than 500 feet of this creek on

National Forest at two different areas. Since there is so little of this creek on National Forest, a stream health rating has not been assigned to this stream.

Layton Canyon – There is a 0.7 mile section of Layton Canyon that was originally classified as intermittent. This section is all on National Forest. This portion is in a narrow canyon where water is concentrated when it does flow. However, water does not flow on a regular basis. A rocky channel is present, and there are ephemeral channels above and below this section. The stream health rating would be "robust" on this section because all of the rock creates a stable stream channel.

This stream was originally classified as intermittent based on the defined channel and evidence of scour and deposition. Another part of the definition of an intermittent stream discusses groundwater connectivity. Intermittent channels are connected to the local groundwater table, which provides flow, sometimes for an extended period. This is not the case in Layton Canyon as there is no connection to the local groundwater table. Layton Canyon does not have flows for extended periods of time. Using this updated information, Layton Canyon would be classified as an ephemeral channel.

Lightning Creek – An estimated 78% of this 4.2 mile creek flows through private land in the South project area. On the National Forest portion, there are no stream crossings on the stream, but there is a road that parallels the stream. The stream is well vegetated and is in good shape and the stream health rating would be robust.

Pleasant Valley Creek – An estimated 90% of this 1.5 mile creek flows through private land in the South project area. This creek is a lot longer but only this portion is perennial/intermittent after Fourmile and Lightning Creek come together. The rest of the stream below is ephemeral. The 900 feet that is on National Forest is in three pieces. On the National Forest portion there are no stream crossings on the stream, and the road that parallels the stream is far away in the wide valley bottom. The stream is well vegetated and is in good shape and the stream health rating would be robust.

Warren Gulch – An estimated 59% of this 0.9 mile creek flows through private land in the South project area. This length is the perennial/intermittent portion of the drainage. The 1,900 feet that is on National Forest is in three pieces. There is one road/stream crossing that is a low water crossing with rock. A road parallels the stream but it does not cause any problem with the stream. The stream is in good shape with good vegetation and even with the one stream crossing the stream health rating would be robust.

Floodplains

There are 1,495 acres of mapped 100-year floodplains within the South project area, of which 1,108 acres (74%) are located on private land. The floodplains are mapped by FEMA. A floodplain is any area susceptible to inundation by floodwaters. A 100-

year flood is a flood having a one percent chance of being equaled or exceeded in magnitude in any given year. It is not a flood occurring once every 100 years.

The 100-year floodplain acres within the South project area are listed in Table 3.8 by HUC 6 watersheds.

Table 3.8 Floodplains

Floodplains			
HUC 6 Number	Watershed Name	Floodplain Acres in South project area	Floodplain Acres in South project area on Private
101201060401	Upper Pleasant Valley Creek	807	572
101201060402	Lower Pleasant Valley Creek	688	536
Total		1,495	1,108
Percent Private			74%

(FEMA Flood Plain Coverage GIS Layer, 1996)

The mapped FEMA floodplains within the South project area are along Fourmile Creek, Hay Creek, Layton Canyon, Lightning Creek, Long Draw and Pleasant Valley Creek.

Wetlands

There are 33 miles of mapped linear wetlands and 61 acres of mapped wetland polygons within the South project area. All mapped wetlands in the South project area are classified as Palustrine Systems. "Palustrine" comes from the Latin word "palus" or marsh. Wetlands within this category include inland marshes and swamps as well as bogs, fens, tundra and floodplains. Palustrine systems include any inland wetland, which lacks flowing water and contains ocean-derived salts in concentrations of less than .05%. Table 3.9 lists the kinds of mapped Palustrine wetlands in the South project area and Table 3.10 describes the codes.

Table 3.9 Wetlands, Palustrine

Wetlands - Palustrine					
PABF	PABFh	PEMA	PEMAh	PEMB	PEMC
PEMCh	PEMCx	PEMFh	PFOA	PSSA	PSSB
PUBFx	PUSAh	PUSCh			

Table 3.10 Wetlands, Palustrine (Codes)

Wetlands, Palustrine, Codes							
System		**Class**		**Water Regime**		**Special Modifier**	
P	Palustrine	AB	Aquatic Bed	A	Temporarily Flooded	h	Diked/Impounded
		EM	Emergent	B	Saturated	x	Excavated
		FO	Forested	C	Seasonally Flooded		
		SS	Scrub Shrub	F	Semipermanently Flooded		
		UB	Unconsolidated Bottom				
		US	Unconsolidated Shore				

The miles of mapped linear wetlands and acres of mapped wetlands within the South project area are listed in Table 3.11 by watershed.

Table 3.11 Wetlands

Wetlands					
		Wetlands			
		Miles		Acres	
HUC 6 Number	Watershed Name	Total	Private	Total	Private
101201060401	Upper Pleasant Valley Creek	20.17	17.36	58.18	55.63
101201060402	Lower Pleasant Valley Creek	13.13	10.80	2.90	2.37
Total		33.30	28.16	61.08	58.00
Percent Private			85%		95%

(USDI Fish and Wildlife Service, 1995)

Not all mapped wetlands are true wetlands and some may be missed during the mapping process. The Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory, 1987) states, “Caution: Since not all delineated areas on NWI maps are wetlands under Department of Army jurisdiction, NWI maps should not be used as the sole basis for determining whether wetland vegetation is present.” It goes on to say, “Wetlands classified as having a temporarily flooded or intermittently flooded water regime should be viewed with particular caution since this designation is indicative of plant communities that are transitional between wetland and non-wetland.”

A determination has not been made as to whether or not the mapped areas within the South project area are true wetlands. Comparing the miles of perennial stream with the miles of linear wetlands, it appears that within the South project area there are many ephemeral channels that have been labeled wetlands. Pleasant Valley Creek is labeled as a linear wetland and from field observations this should not be labeled as such. A large portion of the mapped wetlands are located in the northeast corner of the South project area along Lightning and Fourmile Creeks and their tributaries. Most are on private land.

Beneficial Uses

The South Dakota (SD) Department of Environment and Natural Resources (DENR) assigns water quality standards based on the beneficial uses of each water body. All streams in SD are assigned the beneficial uses of irrigation, wildlife propagation and stock watering. The streams in Table 3.12 have additional designated beneficial uses.

Table 3.12 Beneficial Uses, South Dakota

Beneficial Uses, South Dakota			
	SD Beneficial Uses		
Water Body	Coldwater Marginal Fish Life Propagation	Warmwater Semi-Permanent Fish Life Propagation	Limited Contact Recreation
Pleasant Valley Creek		X	X
Four Mile Creek	X		X
Lightning Creek	X		X

(SD DENR, 1999)

Water Quality and Quantity

There are no streams within the South project area that are currently on the SD 303(d) Waterbody List (SD DENR, 2006). This is a list of water bodies that need the development of TMDLs (total maximum daily load) because they do not meet water quality standards for the assigned beneficial uses. TMDLs are a tool for the management of water quality.

All streams and water bodies within the South project area are currently meeting their assigned beneficial uses. The following statements were taken from the 'The 2008 SD Integrated Report for Surface Water Quality Assessment' and is talking about the Black Hills as a whole but it does apply to the streams within the South project area. "The Black Hills region traditionally has some of the best surface water quality in the state. This is due in a large part to a cooler climate and higher rainfall than the surrounding plains as a result of greater elevation and forest cover. Also contributing to the water quality in this region is the nature of local bedrock formations which are much less erodible than the highly erosive and leachable marine shale and badlands of the surrounding plains. However, the Black Hills streams are vulnerable to losses of flow exacerbated by periodic droughts. Grazing of streamside vegetation, which increases stream bank erosion, water temperature and nutrient loading, also continues to be a problem in some streams in this area" (SD DENR, 2006).

Streamflows throughout the Black Hills have been reduced over the last century. There are several factors contributing to this, but the main one is fire suppression, which has led to an increase of woody biomass (trees). Higher leaf areas from increased woody biomass increase evapotranspiration and interception, resulting in lower streamflows and the drying of springs (USDA Forest Service, 2003).

Peak streamflows within the South project area are extremely variable because of the lack of perennial water; streams flow only in response to storms. One gaging station was maintained on Red Canyon below the project area for 10 years in the 1970s, and peak streamflows varying from 1 to 30 cubic feet per second (cfs) were recorded in 8 of those years. No flow was recorded in the stream during the other two years

Private Land

Land ownership patterns are part of the watersheds and could potentially affect conditions. Table 3.13 shows the distribution of National Forest and private land in the HUC 6 watersheds. There are 1,845 acres of private land within the Lower Pleasant Valley Creek watershed outside of the South project area.

Table 3.13 Private Land

Private Land							
HUC 6 Number	Watershed Name	National Forest Acres in HUC 6	% of HUC 6 National Forest	Private Land Acres in South project area in HUC 6	% of HUC 6 Private Land in South project area	Private Land Acres out of South project area in HUC 6	% of HUC 6 Private Land out of South project area
101201060401	Upper Pleasant Valley Creek	24,958	80%	6,306	20%	0	0%
101201060402	Lower Pleasant Valley Creek	18,013	80%	2,722*	12%	1,845	8%
Total		42,971	80%	9,028	17%	1,845	3%

(Black Hills National Forest, 2002a); *1,197 acres is State-owned land

The scattered private land within South is old homestead claims and mining claims. The mining claims are concentrated primarily in the northeastern corner of the South project area, where the Pre-Cambrian core is located. The private lands average 20% of the area within the watersheds. There are homes throughout the private land, but more are concentrated near the town of Custer. They are a mixture of year-round residences and summer homes.

Roads

Roads tend to concentrate water and put it where it is not designed to go. This is not the case for the South project area. Five hundred nine (509) of the 517 road segments within the South project area, as identified during the Road Analysis Process (RAP), have a Composite Watershed Rating ("composite score) of moderate or less. The composite score is obtained by adding scores from Severe Erosion and Mass Wasting Soils plus Roads within the buffer of a stream, plus Stream Crossings. Only five segments (5) had a high rating and three (3) had an extreme rating.

Roads that have a rating of high or extreme have a potential for creating issues with the soils and streams. This means that most (98%) of the roads within the South

project area have a low potential to erode and cause sedimentation. Increased sediment can have a negative impact on water quality and aquatic life. See the hydrology report in the South project record for the watershed composite score and rating for roads, and the procedure on how the watershed score and composite watershed rating were obtained.

Environmental Consequences

The proposed project may affect the following watershed components: aquatic ecosystems, soil productivity, geologic hazards, and special areas. Aquatic ecosystems include physical conditions (sediment, bed/bank stability and flow regimes), chemical conditions (temperature/oxygen and water purity), and biological conditions (aquatic life). Soil productivity may be affected by soil erosion, soil compaction, nutrient removal, soil heating, and regeneration hazard. Geologic hazards include landslides, soil failure, and earthquakes. Special areas include riparian ecosystems, wetlands, and floodplains. Maps of Alternatives 2 and 3 can be found in Appendix A. The cumulative effects analysis considered past, present, and future activities summarized in Appendix E.

Aquatic Ecosystems (Physical)

An Aquatic Ecosystem is any watery environment, such as rivers, lakes, wetlands, and estuaries, in which plants and animals interact with the physical and chemical features of the environment (Sherbinin, 1996). For the South project area it consists of the perennial streams and wetlands that are adjacent to the streams.

Sediment

“Most sediment delivered to streams comes from a source zone along streams whose width depends on topography, soils, and ground cover. Connected disturbed areas like roads and other disturbed soil near streams can deliver sediment during runoff events. Sediment deposits in stream beds harm insect populations and fish reproduction” (USDA Forest Service, 1996). Sediment deposits in streambeds results in a shift toward burrowing invertebrate taxa that are unavailable as prey (Suttle et al. 2004). Increased sedimentation alters the suitability of fish spawning and rearing reproduction.

The source zone along the streams is often referred to as the Watershed Influence Zone (WIZ). The Watershed Conservation Practices (WCP) Handbook (USDA Forest Service, 2006b) defines the WIZ as 100 feet minimum from each bank. Best Management Practices (BMP) (South Dakota State University, 2003) defines it as a strip of at least 50 feet wide on each side of the stream. The width of the WIZ for the South project area is 100 feet either side of the stream. Based on field observation and experience, this is an adequate distance for this project area. If any sediment is

produced from the WIZ, it is generally produced in the first 25 feet from the stream. There is usually adequate vegetation to filter out the sediment.

Some activities are not of concern relating to sediment. Non-commercial timber activities and fuel treatments are activities that are proposed for the South project area that are not of concern for producing sediment. Non-commercial timber activities generally are done with limited mechanized equipment and results in no or minimal ground disturbance. For the South project area, some mechanized equipment may be used to address the fuels issue created from the thinned material. This still is of little concern as the material being removed is small in size and major skid trails would not be developed. Disturbance from these activities would be minimal and organic matter on the ground would still be in place to protect the soil and absorb surface precipitation, thus limiting the likelihood of sediment being produced.

Fuel treatments are not a concern for producing sediment. The reason is that minimal ground disturbance is expected, leaving the organic matter layer in place to absorb the rainfall which results in minimal runoff, again reducing the likelihood of sediment being produced. Most of the activities are upslope treatments. Limited fuel treatment activities would occur in the WIZ and many times these areas are meadows with adequate vegetative buffers. Therefore, negligible sediment is expected to be produced from fuel treatments.

One post-sale project that has potential to generate sediment is mechanical site preparation. This treatment is designed to break up sod and prepare a seedbed for regeneration. This usually exposes bare mineral soil. This is not a concern related to sediment being delivered to a stream because the design criteria “No mechanical site preparation would be allowed within the WIZ” would be applied across the project area. This would provide a large distance between disturbed areas from mechanical site preparation and intermittent and perennial streams, and any erosion coming off of these areas would not reach an intermittent or perennial stream.

Range projects are not a concern in relation to sediment. They include weed control, water developments and fencing. Some of the water developments are to develop or redevelop springs. In most cases fences are included to keep livestock out of the wet areas, therefore reducing the sediment in these areas.

One mountain bike trail is proposed as part of this project. Seventy-five percent of this trail is on existing roads. Putting the trail on the road would not increase sediment. There is a slight potential for sediment on the new construction, but it would be localized and will not travel far. Sediment being delivered to a stream is not a concern with the mountain bike trail as Layton Canyon is an ephemeral drainage.

Sediment is not a major concern within the South project area because of the minimal perennial and intermittent streams. There are only 19 miles of perennial and intermittent stream, of which 16 miles or 86% are on private land. These are mainly located in the northeastern quarter of the South project area.

Bed and Bank Stability

"Bed and bank stability can be damaged from trampling by animals or humans, vehicle impact, degraded bank vegetation, or excessive flow augmentations. Streams can be made wider and shallower, pools and overhanging banks can be destroyed, and much sediment can be added to streams" (USDA Forest Service, 1996)

Flow Regimes

"Flow regimes can be altered by major changes in cover type or ground cover, dense road networks, or water projects. Water temperature and chemistry, sediment transport, aquatic habitats, and aquatic life cycles can be degraded" (USDA Forest Service, 1996).

The biggest impact on flow regimes in the Black Hills and this project area is past fire suppression policies. These policies have resulted in the increase of tree biomass in the Black Hills. This increase in biomass uses more water through evapotranspiration, thus making less water available for streamflow and groundwater recharge.

An impact to flow regimes on the forest can come from tree mortality from Mountain Pine Beetle activity. Mountain Pine Beetle activity on the Black Hills is cyclic. When the biomass increases and the stands have a high density of timber, Mountain Pine Beetle activity increases, which in turn reduces the live biomass. This has a positive benefit on flow regime by making more water available for streamflow and ground water recharge. This can reverse the effect of increased biomass as a result of fire suppression, depending on the amount of tree mortality from Mountain Pine Beetle activity.

Wildfire can also impact flow regimes very dramatically. If a wildfire were to occur within dense biomass on the landscape, landscape changes can take place by killing live trees over large areas. This would make more water available for stream flow and groundwater recharge. "Reducing the likelihood of crown-fires requires decreasing the amount, density, and continuity of surface fuels, and removing ladder fuels" (Graham, 2004). Less intense wildfires would not kill as many trees and less water would be available for stream flow and groundwater recharge.

Flow regimes do not appear to be adversely affected by dense road networks in the Black Hills. The roads have contributed positively to the flow regimes because roads are occupying areas where trees or biomass would be. This creates openings and reduces the evapotranspiration rates on these areas making more water available for ground water recharge or stream flow. Normally, roads tend to change flow regimes by delivering water more quickly to the channels and streams making the peak flows higher. This does not appear to be a problem in the Black Hills, based on field reviews.

The South project area has not seen major changes in the flow regime in recent time. Five percent (5%) of the project area has been affected by wildfire in the past ~40 years. Biomass increases have been somewhat offset by timber harvest that has occurred over 44% of the planning area in the last 28 years. For these reasons, changes in flow regime have been gradual and relatively negligible.

ALTERNATIVE 1

Direct and Indirect Effects

Sediment

In this alternative, no new activities would occur within the project area; existing approved projects would be completed. There would be no overall change in sediment being delivered to the streams unless a wildfire occurred, which could deliver a large amount of sediment to the channels. The potential for a large wildfire would be the greatest under this alternative. If a wildfire were to occur, the sediment delivered to the streams would increase. Large amounts of sediment would occur the first year after the fire and would decrease over the next three to five years as the vegetation/ground cover recovered.

Bed and Bank Stability

This alternative would not have any new activities occur within the project area so the bed and bank stability would generally not be affected and would remain unchanged from its current state.

Flow Regime

This alternative would not have any new activities within the project area. The effect of no activities would be that the biomass may continue to increase which would generally reduce the amount of water available for streamflow and ground water recharge. However, in the South project area the Mountain Pine Beetle has the potential to increase and reduce the live biomass on the landscape. This would have a positive effect on the flow regime by making more water available for streamflow or ground water recharge that has been lost in the past due to fire suppression.

Wildfire could also play a role with flow regimes. With the increase of tree mortality, the risk of large-scale, high intensity wildfire increases. If a wildfire were to occur, flow regimes would be positively affected by the reduction of trees, making more water available for stream flow and ground water recharge.

ALTERNATIVES 2 & 3

Direct and Indirect Effects

Sediment

Commercial timber harvest proposes to treat up to 32,118 acres with Alternative 2 and up to 31,527 acres for Alternative 3. Of these acres, only 59 acres are located in the WIZ for both alternatives (Table 3.14). The prescriptions for these commercial harvest acres within the WIZ include commercial thin (24 acres), fuel break (1 acre), group selection (<1 acre), group shelterwood (9 acres), overstory removal (1 acre), pine encroachment (19 acres), products other than logs (POL) (1 acre) and seedcut (4 acres). The potential to generate sediment is very low, especially with the small amount of acres being treated within the WIZ. Minimal sediment may be generated from the commercial activities, but implementing the Forest Plan Standards and Guidelines (FPS&G), which include WCPs and BMPs such as minimizing skid trails in the WIZ, would lead to generation of very little sediment and would have limited impact on aquatic resources.

Table 3.14 South Commercial Treatment within WIZ

South Commercial Treatment within WIZ			
	Acres of Commercial Treatment in WIZ		
	Alternative 1	Alternative 2	Alternative 3
Total	0	59	59

Prescribed fire is proposed to treat up to 8,796 acres with Alternative 2 and up to 10,929 in Alternative 3. Of these acres, only 22 acres for Alternative 2 and 23 acres for Alternative 3 are located in the WIZ. See Table 3.15. Minimal sediment may be generated from prescribed fire, but implementing the FPS&G, which include WCPs and BMPs, would lead to generation of very little sediment, therefore limiting impact on aquatic resources.

Table 3.15 South Prescribed Fire within WIZ

South Prescribed Fire within WIZ			
	Acres of Prescribed Fire in WIZ		
	Alternative 1	Alternative 2	Alternative 3
Total	0	22	23

The risk of large, high-intensity wildfire would be reduced with both alternatives as compared to Alternative 1. Alternative 2 would treat an additional 550 acres and the risk of a large, high-intensity wildfire would be slightly less with Alternative 2 as compared to Alternative 3. A wildfire could still occur, but with the reduced basal area and prescribed fire, the severity and size of wildfires would be reduced. This in turn would mean less sediment introduced to the streams than Alternative 1 and fewer impacts to the aquatic resources if a large wildfire were to occur.

Maintenance and temporary use of roads within the WIZ and at stream crossings have the potential to increase sediment. See Table 3.16 for the miles of roads within the

WIZ for these alternatives. With activities at stream crossings and roads in the WIZ there would be some sediment produced. With the implementation of the FPS&Gs, which include WCPs and BMPs, the amount would be minimal for Alternatives 2 & 3, a slight decrease over Alternative 1, because of a road closure. There were no road-related CDAs identified during field inventory.

Table 3.16 South Miles of Roads within WIZ

South Miles of Roads within WIZ			
	Miles of Roads within WIZ		
Category	Alternative 1	Alternative 2	Alternative 3
Forest Service	3.8	3.6	3.6
Private	1.8	1.8	1.8
Total	5.6	5.4	5.4

Timber harvest and roads would have limited effect as compared to Alternative 1. If a large wildfire were to occur after implementation of either of these alternatives, sediment produced from a wildfire would be less than Alternative 1. A fire coming after implementation of Alternative 2 would produce less than Alternative 3 because 550 more acres would be treated which could mean a smaller, less intense fire that would lead to production of less sediment. In reality, sediment levels produced under Alternative 2 would not be much different than Alternative 3 if a wildfire were to occur after implementation of either alternative.

Overall, the impacts from sediment with both alternatives would remain about the same over existing conditions if no wildfires occur. There would be a slight potential increase in sediment in the short term (<5 years) in some categories (harvesting and road use) and in the long term (>5 years) it would remain about the same with these alternatives as compared to existing conditions.

Bed and Bank Stability

The action alternatives include commercial and non-commercial vegetation management, fuel treatments, prescribed fire, range projects and recreation projects. The proposed activities of these alternatives would not have an impact on bed and bank stability within the South project area as all projects would be away from the bed and banks of streams.

Flow Regime

These alternatives include commercial and non-commercial vegetation management, fuel treatments, prescribed fire, range projects and recreation projects. Commercial and non-commercial timber activities would have the greatest effect on the flow regime. Commercial timber harvest proposes to treat up to 32,118 acres with Alternative 2 and up to 31,527 for Alternative 3. Either of these alternatives would have a positive effect on flow regime due to removing live vegetation from the landscape, a significant improvement over Alternative 1. If a large wildfire were to occur under Alternative 1, this would have the most effect on flow regime.

Biomass removal under alternatives 2 or 3 would reduce current evapotranspiration losses. This would also reduce the risk of a large wildfire. This would in turn, move the flow regime back towards where it was prior to the era of fire suppression. The non-commercial timber activities would have a short-term positive effect, removing biomass by another 4,550 acres for Alternative 2 and 6,904 acres for Alternative 3, but it would be short-term because the adjoining remaining trees would soon grow to take up the space that was occupied by the removed trees. The action alternatives do the best to restore flow regimes unless a wildfire were to occur under Alternative 1.

Aquatic Ecosystems (Chemical: Temperature/Oxygen)

"Summer water temperature is increased, and winter water temperature is decreased, by removing shade, reducing low flows, or damaging banks so streams are wider and shallower. Dissolved oxygen is usually reduced when summer water temperature is increased. Such impacts impair or destroy the suitability of water bodies for aquatic biota," (USDA Forest Service, 1996). Within the South project area there are not a lot of streams so this watershed component is not a very big concern. Most of the water available for stream flow or ground water recharge goes into ground water recharge.

Chemical: Water Purity

"Water purity can be degraded by placing concentrated pollutant sources near water bodies, applying harmful chemicals in or near water bodies, or intercepting hazardous rock strata by roads. Degrading water purity can impair or destroy use of the water by aquatic biota and humans," (USDA Forest Service, 1996).

ALTERNATIVE 1

Direct and Indirect Effects

Temperature/Oxygen

This alternative would not have any new activities within South project area. If the biomass continues to increase, this could affect stream temperature/oxygen, by making less water available for streamflow because of increased evapotranspiration. Less water in the stream could mean increased water temperature and decreased oxygen. However, things could change within the South project area because of the MPB. If there is less live biomass within the watershed due to the MPB eliminating live trees from the landscape, there would be less evapotranspiration and more water available for stream flow or ground water recharge to help maintain the current water temperature and oxygen regime. The results or changes related to this alternative are very variable, but generally would occur at a slow rate.

Water Purity

This alternative would not have any new activities within the project area, so water purity would remain unchanged from its present state.

ALTERNATIVES 2 & 3

Direct and Indirect Effects

Temperature/Oxygen

These alternatives include commercial and non-commercial vegetation management, fuel treatments, prescribed fire, range projects and recreation projects. Reducing the stand density on 70% of the project area for Alternative 2 and 74% for Alternative 3 of the project area with commercial and non-commercial timber activities would have a positive effect on stream temperature and oxygen. Biomass would be reduced, resulting in more water being available for streamflow. More water would help maintain stream temperatures. These alternatives would have a greater positive effect on water temperature and oxygen over Alternative 1 because more water would be available for streamflow.

Water Purity

These alternatives include commercial and non-commercial vegetation management, fuel treatments, prescribed fire, range projects and recreation projects. None of these activities, including weed treatments, involves placing concentrated pollutant sources near water bodies or applying harmful chemicals near water bodies. The weed treatments include using harmful chemicals, but precautions are taken to maintain and protect water purity.

Aquatic Ecosystems (Biological)

“Aquatic life can be degraded by migration barriers, changed flow regimes, riparian damage, or big sediment loads or chemical loads,” (USDA Forest Service, 1996).

Flow regimes are discussed under the flow regime section, sediment loads are discussed under the sediment section and chemical loads are discussed under water purity section of this report. The items discussed in this section include migration barriers and riparian damage.

ALTERNATIVE 1

Direct and Indirect Effects

This alternative would not have any new activities within the project area, so aquatic life, related to migration barriers and riparian damage, would not be affected and would generally remain unchanged from where it is now.

ALTERNATIVES 2 & 3

Direct and Indirect Effects

These alternatives include commercial and non-commercial vegetation management, fuel treatments, prescribed fire, range projects and recreation projects. Potential indirect impacts to aquatic life relates to the amount of activity within the WIZ. There are 59 acres of possible activity in the WIZ for these alternatives.

These alternatives would not increase or decrease any migration barriers and no riparian damage would occur. The range projects would improve riparian areas by improving the stream/riparian habitat by providing alternative watering areas for livestock and fencing some riparian/spring areas. No effects would occur to aquatic life.

Soil Productivity

The long-term maintenance of site productivity is a goal of the 1997 Black Hills National Forest Land and Resource Management Plan (Forest Plan) and a part of the mission of the Forest Service. Soil erosion, soil compaction, nutrient removal, soil heating and regeneration hazards can limit the long-term productivity of forested sites. All analysis is based on Natural Resource Conservation Service (NRCS) soil surveys (USDA Soil Conservation Service, 1990) and the Black Hills National Forest Soil Map Unit Descriptions and Interpretations Notebook (Black Hills National Forest, 1995). Field survey reports and photos are available in the project file.

Soil Erosion

"Severe erosion can impair long-term soil productivity if soils are heavily disturbed on shallow or highly erodible soils. Evidence of severe erosion is rills or pedestals," (USDA Forest Service, 1996).

Soil Compaction

"Soil compaction is caused by excess weight of vehicles and animals. It impairs infiltration, root growth, and soil biota," (USDA Forest Service, 1996).

Activities on soils subject to compaction when wet can change the characteristics of these soils, causing more runoff or resulting in poor plant growth. Implementing

FPS&G restrictions on these soils would prevent these problems. These would include allowing activities only when the soils are dry or frozen, operating with low impact equipment or operating equipment on slash. When soil is not dry, frozen or covered by compacted snow, skidders would remain on approved skid trails. Track-mounted felling equipment would be allowed to work off the approved skid trails. Trees would be bunched to allow skidders to reach them from the approved skid trails. Mechanical site preparation would only occur when soils are dry. This would minimize the overall impacts as a result of the activities.

Nutrient Removal

"Soil fertility depends on organic matter and nutrients. Soil productivity can be degraded if humus and topsoil, or even excess leaves and limbs, are taken off site," (USDA Forest Service, 1996).

Soil Heating

"Soil heating is caused by severe fires that occur when humus and large fuels are dry and large fuels are consumed near the ground. Soil heating sterilizes the soil, alters soil physics, consumes organic matter, and removes much of the site's nutrients," (USDA Forest Service, 1996).

Regeneration Hazards

"Forests must be restocked within five (5) years after regeneration harvest. Regeneration may be impeded on marginal sites due to seedling mortality, plant competition, and other factors," (USDA Forest Service, 1996).

Regeneration hazard is being considered in this report in relation to soils. Soil texture, rock content, drainage class and rooting depth are factors considered. Topography in relation to elevation, slope and aspect along with microclimate changes are also considered along with plant competition and available water capacity.

Forest Plan Consistency for Soils

All alternatives would be conducted consistent with Forest Plan standards 1101, 1102, 1103, 1105, 1106, 1109, 1110, 1112, 1113, 1114, and 1116. Forest plan standards and guidelines, including all applicable BMPs and WCPs would be included in any action alternative. The effects of the alternatives are discussed below and additional information on how the project would be consistent with these standards is available in the project file.

ALTERNATIVE 1

Direct and Indirect Effects

Soil Erosion

This alternative would not have any new activities within the project area so soil erosion would generally remain unchanged. Problems where erosion is currently occurring would continue to occur. Erosion problems are generally road related and there are approximately 2.6 miles of system roads (0.9 miles are closed) and 2.4 miles of unauthorized roads on soils with very high erosion hazard ratings (VHEHR) with slopes greater than 20%. These roads on high-erosion-rating soils are not known to cause any problems currently, but the potential for soil erosion is present.

Soil Compaction

This alternative would not have any new activities occur within the project area so likelihood of soil compaction would remain unchanged.

Nutrient Removal

This alternative would not have any new activities within the project area so nutrient removal would not be a concern and would remain unchanged.

Soil Heating

This alternative would not have any new activities within the project area, and that lack of action could affect soil heating in the project area. The biomass and fuels would not be treated and would continue to accumulate. If a wildfire were to occur, the soils could be adversely affected. A wildfire, with an effect to the soil from soil heating, has the greatest chance of occurring with this alternative because no activities would occur to reduce the fuels.

Regeneration Hazards

This alternative would not have any new activities within the project area; regeneration potential would not be affected with this alternative.

ALTERNATIVE 2

Direct and Indirect Effects

Soil Erosion

This alternative includes commercial and non-commercial vegetation management, fuel treatments, prescribed fire, range projects and recreation projects. Commercial timber harvest proposes to treat up to 32,118 acres in this alternative. Of these acres, an estimated 3,022 acres or nine percent (9%) of the treated acres are located on soils with a VHEHR (Very High Erosion Hazard Rating) with slopes greater than 20%. Eight hundred fifty-four (854) of these acres are on slopes greater than 40%. These commercial units have a variety of treatments. Mechanical site preparation on slopes greater than 20% may occur on eight (8) acres. No acres are on slopes greater than 40%.

Minimal soil erosion may occur from commercial activities and mechanical site preparation through implementing the following FPS&G, WCPs, BMPs, and design criteria: “On soils with VHEHR and slopes between 20 and 40%, machinery operations must be restricted to dry or frozen soil conditions”, “Mechanical site preparation must be restricted to dry soil conditions,” and “On soils with VHEHR and slopes steeper than 40%, ground skidding and mechanical site preparation must be avoided.” Erosion problems related to roads would be corrected through maintenance in conjunction with the timber harvest. There would be approximately 2.6 miles of system roads on soils with VHEHR greater than 20%. Of these 2.6 miles of roads, 1.6 miles are open and 1.0 miles are closed. No unauthorized roads would remain open with this alternative. These roads on high erosion rating soils are not known to cause any problems currently.

Alternative 2 has the greatest potential for soil erosion due to the amount of acres of activity on soils with a VHEHR. Implementing the FPS&G would prevent or minimize erosion from occurring on these soils, reducing erosion to a negligible amount.

Soil Compaction

This alternative includes commercial and non-commercial vegetation management, fuel treatments, prescribed fire, range projects and recreation projects. Commercial timber harvest proposes to treat up to 32,118 acres in this alternative. Of these acres, approximately 3,640 acres or 11% of the treated acres are located on soils subject to compaction. Mechanical site preparation is not scheduled for any acres that are identified to be subject to compaction when wet. Minimal soil compaction may occur from the commercial activities, but by implementing the FPS&G, which include WCPs and BMPs, and the design criteria of operating on dry or frozen ground, there would be very little soil compaction occurring for a possible short-term impact and if it does occur it would be reduced over time, as shown in Forest Plan Monitoring (USDA Forest Service, 2007). This alternative has the greatest potential to impact soils by compaction because it has the most acres of soils subject to compaction being treated, but implementing the FPS&G would prevent or minimize soil compaction from occurring on these soils and long-term soil compaction would not be expected.

Nutrient Removal

This alternative includes commercial and non-commercial vegetation management, fuel treatments, prescribed fire, range projects and recreation projects. Commercial timber harvest proposes to treat up to 32,118 acres. It is estimated that two percent (2%) of the treated acres are located on soils that could potentially have low organic matter. Treatment prescriptions in these stands are commercial thin, group shelterwood, over-story removal, pine encroachment, POL, seed cut or restoration thinning. Generally, these prescriptions leave residual material (slash) in the stand.

However, for shelterwood and group-selection treatments, the design criteria "On soils with low organic matter in the topsoil, retain 50% or more of the slash (less than three (3) inches in diameter) in the stand after each shelterwood and group-selection harvest" would be applied in order to maintain organic material on site. Negligible effects on soil nutrients are expected with this alternative.

Soil Heating

These alternatives include commercial and non-commercial vegetation management, fuel treatments, prescribed fire, range projects and recreation projects. Broadcast burning is proposed as part of the fuel treatments on 8,796 acres with Alternative 2 and 10,929 acres with Alternative 3. There is potential that soil heating would occur from the action alternatives; however, implementing the design criteria, "conduct prescribed fires to minimize the residence time on the soil while meeting the burn objectives, this is usually done when the soil and duff are moist" would minimize the effects to the soil from soil heating. Indirect effects include reducing the potential for a large, high-intensity wildfire within the project area by reducing the fuel loading.

Regeneration Hazards

All action alternatives treat a variety of acres. Ponderosa Pine tends to reproduce well in the Black Hills (Orr, 1975). "Natural regeneration of pine can be quite successful" (Shepperd and Battaglia, 2002). These alternatives would not have an effect on regeneration potential as there are no soils with regeneration hazards.

ALTERNATIVE 3

Direct and Indirect Effects

Soil Erosion

This alternative includes commercial and non-commercial vegetation management, fuel treatments, prescribed fire, range projects and recreation projects. Commercial timber harvest proposes to treat up to 31,527 acres in this alternative. Of these acres, an estimated 2,870 acres or nine percent (9%) of the treated acres are located on soils with a VHEHR with slopes greater than 20%. Eight hundred thirty-nine (839) of

these acres are on slopes greater than 40%. These commercial units have a variety of treatments. Mechanical site preparation on slopes greater than 20% may occur on eight (8) acres. No acres are on slopes greater than 40%. Minimal soil erosion may occur from commercial activities and mechanical site preparation through implementing the following FPS&G, WCPs, BMPs, and design criteria: "On soils with VHEHR and slopes between 20 and 40%, machinery operations must be restricted to dry or frozen soil conditions", "Mechanical site preparation must be restricted to dry soil conditions," and "On soils with VHEHR and slopes steeper than 40%, ground skidding and mechanical site preparation must be avoided." The potential for erosion would be slightly less but similar to Alternative 2. Erosion problems related to roads would be corrected through maintenance in conjunction with the timber harvest. There would be approximately 2.6 miles of road on soils with VHEHR greater than 20%. Of these 2.6 miles of roads, 0.5 miles are open, 1.1 miles are seasonally closed and 1.0 miles are closed. No unauthorized roads would remain open with this alternative. These roads on high erosion rating soils are not known to cause any problems currently.

Of all the alternatives, this alternative has the second greatest potential for soil erosion, slightly behind Alternative 2, because of the amount of acres of activity on soils with a VHEHR. Implementing the FPS&G and the design criteria would prevent or minimize erosion from occurring on these soils. Negligible erosion would be expected.

Soil Compaction

This alternative includes commercial and non-commercial vegetation management, fuel treatments, prescribed fire, range projects and recreation projects. Commercial timber harvest proposes to treat up to 31,527 acres in this alternative. Of these acres, approximately 3,692 acres or 12% of the treated acres are located on soils subject to compaction. Mechanical site preparation is not scheduled for any acres that are identified to be subject to compaction when wet. Minimal soil compaction may occur from the commercial activities, but by implementing the FPS&G, which include WCPs and BMPs, and the design criteria of operating on dry or frozen ground, there would be very little soil compaction occurring for a possible short-term impact and if it does it would be reduced over time meaning no long-term effects as shown in Forest Plan Monitoring (USDA Forest Service, 2007). This alternative has less potential to impact soils by compaction because it has fewer acres proposed for treatment on soils subject to compaction. Effects of this alternative are similar to Alternative 2 because the acres are similar and with the implementation of FPS&G there would be minimal impacts related to Soil Compaction.

Nutrient Removal

This alternative includes commercial and non-commercial vegetation management, fuel treatments, prescribed fire, range projects and recreation projects. Commercial timber harvest proposes to treat up to 31,527. Of these acres, it is estimated that two percent (2%) of the treated acres in each alternative are located on soils that could

potentially have low organic matter. Treatment prescriptions in these stands are commercial thin, group shelterwood, over-story removal, pine encroachment, POL, seed cut or restoration thinning. Generally, these prescriptions leave residual material (slash) in the stand.

However, for shelterwood and group-selection treatments, the design criteria "On soils with low organic matter in the topsoil, retain 50% or more of the slash (less than three (3) inches in diameter) in the stand after each shelterwood and group-selection harvest" would be applied in order to maintain organic material on site. Negligible effects on soil nutrients are expected with any of the action alternatives.

Soil Heating and Regeneration Hazards

The potential effects would be the same as described under Alternative 2.

Geologic Hazards

"Soil creep, slumps, earth-flows and debris avalanches can occur on unstable slopes if roads overload or undercut them, vegetation is removed from them, or runoff is emptied onto them. Hazard depends on type of disturbance, nature of earth material, and water content," (USDA Forest Service, 1996).

"Soil failures include land subsidence, shrinking and swelling soils, and collapsing soils. Removal of subsurface fluids or materials, or changed hydrology on certain soil types can induce soil failures," (USDA Forest Service, 1996).

ALTERNATIVE 1

Landslides

This alternative would not have any new activities within the project area, so landslide potential would not be affected and the present risk would remain unchanged.

Soil Failures

Soil failures are not a concern within the South project area. None of the proposed activities or lack of activities would have an affect on soil failures.

ALTERNATIVE 2

Landslides

This alternative includes commercial and non-commercial vegetation management, fuel treatments, prescribed fire, range projects and recreation projects. Commercial timber harvest proposes to treat up to 32,118 acres in this alternative. Of these acres, approximately 41 acres are on slopes greater than 20% on soils with high mass movement potential (HMMP). There are no proposed treatments on slopes greater than 40%. Design criteria of the project would restrict activities to dry or frozen condition on slopes 20 to 40%. Activities on these soils would follow FPS&G and design criteria to reduce the risk of landslides.

Of all the alternatives, this alternative has the greatest potential to induce landslides because it treats the most acres on soils with risk for landslides. The risk remains low because of the low number of acres proposed to be treated. Implementing the design criteria would minimize or eliminate the risk of landslides.

Soil Failures

Soil failures are not a concern within the South project area. None of the proposed activities or lack of activities would have an effect on soil failures.

ALTERNATIVE 3

Landslides

This alternative includes commercial and non-commercial vegetation management, fuel treatments, prescribed fire, range projects and recreation projects. Commercial timber harvest proposes to treat up to 31,527 acres in this alternative. Of these acres, approximately 32 acres are on slopes greater than 20% on soils with HMMP and there would be no proposed treatments on slopes greater than 40%. Design criteria of the project would restrict activities to dry or frozen condition on slopes 20 to 40%. Activities on these soils would follow the design criteria to reduce the risk of landslides and would meet the FPS&G.

This alternative has the second greatest potential to cause landslides but is very similar to Alternative 2 because it treats a similar number of acres on soils with risk for landslides. Risk remains low because of the low number of acres that could be treated. Implementing the design criteria would minimize or eliminate the risk of landslides.

Soil Failures

Soil failures are not a concern within the South project area. None of the proposed activities or lack of activities would have an affect on soil failures.

Special Areas

Riparian Ecosystems

"Riparian ecosystems provide shade, bank stability, fish cover, and woody debris to aquatic ecosystems. They also provide key wildlife habitat, migration corridors, sediment storage and release, and surface/ground water interactions. Composition and structure of riparian vegetation can be changed by actions that remove certain species age classes," (USDA Forest Service, 1996). Riparian areas contain unique soils and vegetation and they occur along streams and wetlands. A water influence zone (WIZ) is a distance measured perpendicular to the banks of a stream or wetland and differs from a riparian area in that the entire WIZ does not necessarily contain unique riparian soils or plants.

Wetlands

"Wetlands control runoff, water quality, and recharge of ground water, and provide special habitats. Actions that may alter their ground cover, soil structure, water budgets, drainage patterns, and long-term plant composition can impair these values," (USDA Forest Service, 1996).

Floodplains

"Floodplains are natural escape areas for floods that temper flood stages and velocities," (USDA Forest Service, 1996).

ALTERNATIVE 1

Riparian Areas

This alternative would not have any new activities within the project area so there would be no new impacts or effects on riparian ecosystems.

Wetlands

This alternative would not have any new activities within the project area so there would be no new impacts or effects on wetlands.

Floodplains

This alternative would not have any new activities within the project area so there would be no impacts or effects on floodplains.

ALTERNATIVES 2 & 3

These alternatives are presented together here because the expected effects to these watershed elements would be the same.

Riparian Areas

These alternatives include commercial and non-commercial vegetation management, fuel treatments, prescribed fire, range projects and recreation projects. There would not be any commercial activities within any riparian areas so there would not be any new impacts as a result of the proposed projects.

The proposed range water development projects would protect riparian habitat by erecting fencing to control livestock utilization.

Wetlands

These alternatives include commercial and non-commercial vegetation management, fuel treatments, prescribed fire, range projects and recreation projects. Roads related to timber activities have the potential to affect wetlands; however, no new road construction is proposed.

The proposed range water development projects would protect wetlands by erecting fencing to control livestock utilization.

Floodplains

These alternatives include commercial and non-commercial vegetation management, fuel treatments, prescribed fire, range projects and recreation projects. Roads are the main concern with floodplains because road fills are usually placed in floodplains to facilitate road crossings of streams. This interrupts flood flows and can change the elevation of flood waters. Timber harvest activity would not affect floodplains because floodplains would not be altered. No new roads are proposed as part of this project, so there would be no impacts to floodplains

Cumulative Effects to Watershed, Geology and Soils

The South project area is located within two (2) HUC 6 watersheds. They are; Upper Pleasant Valley Creek and Lower Pleasant Valley Creek. As outlined in the Soil & Watershed Specialist Final Report, respectively 100% and 92% of the watersheds are located within the South project area. Both watersheds have sizeable areas located inside of the South project area. The cumulative effect analysis applies to both of these HUC 6 watersheds.

The cumulative effects boundary for this report is the individual HUC 6 watersheds within the South project boundary. Time frame for the effects on the watersheds varies and depends on the activity. For example roads will be on the landscape indefinitely with some having more impacts, depending on use and whether or not there is vegetation on the road prism. Timber harvest activity effects depend on various parameters. For sediment or soil erosion, the effects are very short term, usually less than three (3) years based on personal observation and 30 years of experience (L.Gonyer, personal observation). Flow regimes can be affected over a period of time up to 10 years or more. There are a number of factors, such as annual precipitation, species being treated, site characteristics, intensity of treatments, size of area receiving treatments, re-growth rate and length of time between treatments that affect how long it will persist (Schumann, 2005). Although lengths of effects vary, ten years will be used in this analysis.

Past, present and future land uses and events within these watersheds include; commercial timber harvest, pre-commercial thinning, site preparation, fuel-breaks, pine encroachment reduction treatments, wildfire, prescribed fire, grazing, weed spraying, gravel quarries, mining, abandoned mines, mine reclamation, developed recreation, dispersed recreation, private land development and roads. All of these activities or events individually have an impact and result in cumulative impacts on the watershed.

All alternatives would be conducted consistent with Forest Plan standards 1101, 1102, 1103, 1105, 1106, 1109, 1110, 1112, 1113, 1114, and 1116. Forest plan standards and guidelines, including all applicable BMPs and WCPs would be included in any action alternative. Additional information on consistency with these Forest Plan standards is available in the project file.

Soil Erosion

Cumulative impacts to the soils from soil erosion would not be a concern within the South project area, with the implementation of WCPs and BMPs. BMP monitoring results (Thomas, 2008) for sales near South on the Hell Canyon Ranger District show that in general, there is no or very little erosion occurring in past timber harvest units. In most units, it is difficult to tell that timber harvest has occurred except for the skid trails and landings that are present but well-vegetated. Past timber activity areas do not show any residual effect and the proposed actions would not be expected to add impacts with implementation of design criteria.

There would be no cumulative impacts from soil erosion in the project area from the proposed activities because minimal erosion would be expected with the implementation of the FPS&G and project design criteria.

Soil Compaction

There have been past activities in the project area that may have caused soil compaction problems. These are generally activities that involve using heavy equipment at inappropriate times. Eight (8) areas were visited and none revealed problems with compaction. According to Wortmann (2003), soil compaction is not permanent and when it occurs, "nature has built-in processes that reduce soil compaction, including cycles of wetting and drying, freezing and thawing, as well as plant growth and microbial activity."

Cumulative impacts to the soil from compaction are not expected in the action alternatives with the implementation of the FPS&G.

None of the alternatives would add to significant cumulative effects on the soil resource. With application of FPS&Gs and design criteria, any change would be within acceptable limits.

No adverse cumulative effects to watershed, geology, or to the soils resource of any watershed analyzed are expected as related to the alternatives. Additional information on the analysis is available in the project file.

ALTERNATIVE 1

This alternative would have no effect on the following watershed elements: bed and bank stability, water purity, aquatic life, soil compaction, nutrient removal, regeneration hazard, geologic hazard/landslides, soil failures, riparian areas, floodplains, and wetlands. Therefore, no adverse cumulative effects would occur to these elements.

Sediment

There would be minimal cumulative impacts from sediment in the project area with this alternative. If a large wildfire were to occur, sediment would increase and the cumulative impacts from sediment exist, primarily in the northeast quarter of the South project area.

Flow Regime

High levels of MPB activity or large-scale wildfire could augment the flow regime.

Temperature/Oxygen

Cumulative impacts from this alternative could go could two ways: (1) there would be an adverse cumulative impact over time if the biomass continued to increase. Lower streamflows would increase stream temperatures, and oxygen would decrease due to increased evapotranspiration; or (2): there would be no cumulative impacts if

biomass were removed by Mountain Pine Beetle, making more water available for streamflow. This would maintain stream temperature and oxygen at current levels.

Water Purity

There are no known concentrated pollutant sources from past actions, or expected in the future. There are no known harmful chemical applications near water bodies from past activities, or expected in the future. There would be no cumulative impacts to water purity within the project area with this alternative.

Soil Productivity

There would be no long-term, adverse effects on soil productivity as a result of this alternative. The elements of soil productivity are discussed below.

- *Soil Erosion*
    - There have been past activities or events in the project area that have caused minor soil erosion. The past activities are generally road related, where water has been concentrated. There are no known areas of severe erosion. There would be no cumulative impacts on soil erosion in the project area with this alternative because no new activities would occur.
- *Soil Heating*
    - Past events that affected soil heating include large wildfires. Large wildfires generally occur when conditions are dry and result in soil heating. There have been two (2) wildfires within the South project area in the past. The 83,000 acre Jasper Fire of 2000 burned 1,758 acres within South on the northwest side of the project area. The 1,000 acre Ventling Draw Fire of 1966 burned 801 acres within the South project area on the central/eastern side of the planning area.
    - There would be no adverse cumulative impacts from soil heating in the project area with this alternative related to project activities because no activities are planned.

ALTERNATIVES 2 AND 3

The results of the cumulative effects analysis for each of these alternatives are similar. Therefore, they are presented together here. There would be no direct or indirect effect to bed and bank stability, aquatic life, regeneration hazard,

earthquakes, or soil failures and therefore, there would be no adverse cumulative effect to these resource elements.

Sediment

There would not be adverse cumulative impact from sediment from these alternatives because the implementation of BMPs and WCPs would reduce or eliminate any sediment potential.

Flow Regime

There would be no adverse cumulative impact by the reduction of water available for streamflow or ground water recharge. The proposed action would help restore the flow regimes by removing biomass that uses water.

Temperature/Oxygen

There would be no adverse cumulative impact to temperature/oxygen within the project area with this alternative because of the reduced stand density across the project area. This reduction in biomass means less water consumption by trees, making more water available for streamflow. This would maintain or improve stream temperature and oxygen.

Water Purity

Activities in these alternatives would not result in adverse cumulative impacts to water purity within the project area with this alternative because there would not be any concentrated pollutant sources placed near water bodies, harmful chemicals applied in or near water bodies, or hazardous rock strata intercepted by roads.

Soil Productivity

There would be no long-term, adverse effects on soil productivity from the implementation of these alternatives. The elements of soil productivity are discussed below.

- *Soil Erosion*
  - There would be no adverse cumulative impacts from soil erosion in the project area from the proposed harvest units because minimal erosion is expected with the implementation of the FPS&G and the design criteria.

- *Compaction*
  - Alternative 3 has the second greatest potential to impact soils by compaction because it has the second highest number of acres of soils subject to compaction being treated, but implementing the FPS&G

would prevent or minimize soil compaction from occurring on these soils and long-term soil compaction is not expected.

- *Nutrient Removal*
  - There would be no adverse cumulative impacts to soil nutrients from these alternatives within the project area because sufficient residual material would be left after project implementation.

- *Soil Heating*
  - There would be no adverse cumulative impacts from soil heating in the project area with these alternatives because implementation of the project would minimize the residence time of a wildfire, and prescribed fire causes minimal impacts to the soil.

Geologic Hazard/Landslides

Commercial timber harvest proposes to treat up to 32,118 acres in Alternative 2. Of these acres, approximately 41 acres are on slopes greater than 20% on soils with HMMP and there would be no proposed treatments on slopes greater than 40%. Design criteria of the project would restrict activities to dry or frozen condition on slopes 20 to 40%. Activities on these soils would follow the design criteria to reduce the risk of landslides and would meet the FPS&G.

Commercial timber harvest proposes to treat up to 31,527 acres in Alternative 3. Of these acres, approximately 32 acres are on slopes greater than 20% on soils with HMMP and there would be no proposed treatments on slopes greater than 40%. Design criteria of the project would restrict activities to dry or frozen condition on slopes 20 to 40%. Activities on these soils would follow design criteria to reduce the risk of landslides and would meet the FPS&G.

Alternative 2 has the greatest potential to cause landslides because it treats the most acres on soils with risk for landslides, but remains low because of the low number of acres that could be treated. Implementing design criteria would minimize or eliminate the risk of landslides.

Alternative 3 has the second greatest potential to cause landslides but is very similar to Alternative 2, because it treats a similar number of acres on soils with risk for landslides, but remains low because of the low number of acres that could be treated. Implementing the design criteria would minimize or eliminate the risk of landslides.

Riparian Areas

There would not be any commercial activities within any riparian areas so there would not be any new impacts as a result of the proposed projects. The proposed range water developments and fencing associated with springs would improve conditions by drawing livestock away from riparian areas. There would be no cumulative impacts to riparian ecosystems within the project area with these alternatives in relation to the vegetative treatment. There would be improvements in the riparian area with implementation of the range projects.

Wetlands

The projects that have the potential to affect the wetlands are roads related to timber activities. No new road construction is proposed. No wetlands would be affected by this activity. The range projects would improve the wetlands with their proposed projects of riparian habitat improvement and fencing of wetlands in association with water developments. There would be no cumulative impacts to wetlands within the project area with these alternatives in relation to the vegetation treatments. There would be improvements in the wetlands with implementation of the range projects.

Floodplains

The action alternatives propose commercial and non-commercial vegetation management, fuels treatments, prescribed fire, range projects and recreation projects. Roads are the main concern with floodplains because road fills are usually placed in floodplains to facilitate road crossings of streams. This interrupts flood flows and can change the elevation of flood waters. Timber harvest activities would not affect floodplains because floodplains would not be altered. There would be no new roads built as part of this project, so there would be no impacts to floodplains. There would be no cumulative impacts to floodplains within the project area with these alternatives.

BMP (Best Management Practice) Effectiveness

BMPs by definition are “Common-sense actions required, by law, to keep soil and other pollutants out of streams and lakes. BMPs are designed to protect water quality and to prevent new pollution” (IFPC, 2003). BMPs are implemented to control or limit non-point source pollution. The general thought is that if BMPs are implemented, then the project meets the requirement of the Clean Water Act (CWA) to protect water quality.

“BMPs are developed by the State of SD…to ensure compliance with federal and state water-quality standards,” (USDA Forest Service, 2006). They provide good guidance but are fairly general. Watershed Conservation Practices (WCPs), developed by USDA Forest Service Region 2, are practices to protect soil, aquatic,

and riparian systems. They are more specific than BMPs; "If used properly, they meet or exceed State BMPs," (USDA Forest Service, 2006b). BMPs and WCPs are incorporated into the FPS&G and provide more specific direction. By meeting the FPS&Gs when implementing a project, both the WCPs and BMPs are met.

The question has been brought up, "How do we know the BMPs are effective or work?" The Black Hills National Forest completed a Forest Plan BMP Evaluation (USDA Forest Service, 2003b). Chapter four (4) cites two (2) studies done on the Black Hills National Forest by the Black Hills Forest Resource Association (2001) and Wyoming Timber Industry Association (2001). The conclusion was "These results highlight the consistent application and effectiveness of BMPs in the Black Hills and other National Forests" (USDA Forest Service, 2003b). The evaluation goes on to review other studies or reports and comes to the conclusion that "These studies highlight the effectiveness of BMPs in forests throughout the United States" (USDA Forest Service, 2003b). This evaluation shows that BMPs are effective. Since this evaluation has been completed, a field audit was completed in 2004 in SD (Black Hills Forest Resource Association, 2004). Results showed application of BMPs were 92% in 2004 compared to 82% in 2001 and effectiveness of the BMPs was 95% in 2004 compared to 84% in 2001. This additional information shows the continued application and effectiveness of BMPs in South Dakota.

Additional BMP/WCP monitoring was completed on the Hell Canyon Ranger District, for 2002, 2003, 2004, 2005, 2006 and 2007. The summary report show that the BMP/WCP are being implemented and are effective and states, "Logging practices on the Hell Canyon Ranger District have not had negative impacts on the watershed and streams and they do comply with the requirements of the CWA" (Thomas, 2008).

The South project area would have FPS&Gs, WCPs and BMPs prescribed and implemented. This would protect the water quality of the streams and creeks in the South project area and the activities that are planned for in the South project area would meet the requirements of the CWA.

MINERALS

Affected Environment

The mineral potential of the Black Hills National Forest was evaluated by the US Geological Survey (Dewitt et al., 1985) and the US Bureau of Mines (Gersic, et al., 1990). Dewitt et al. (1985) identified significant mineral potential for a number of locatable and saleable mineral commodities within the South project area. Locatable commodities include pegmatite minerals, gold, and high-calcium limestone. Leasable commodities include oil, gas and coal. Saleable commodities include sand, gravel, and crushed stone.

Locatable Minerals

Pegmatite minerals have been mined in the Black Hills almost continuously since 1879. Currently, mineral production from Black Hills pegmatite deposits is primarily restricted to feldspar. A number of other minerals are present in the pegmatite deposits including several strategic and critical mineral commodities including beryllium, columbium, sheet mica, tantalum, tin, and lithium. Domestic supplies of these commodities are currently imported from countries such as China, Malaysia, India, Thailand, Canada, France and Brazil (Gersic, et al., 1990).

Dewitt et al. (1985) identified a zone with high potential for pegmatite deposits including the northeast portion of the South project area. Economic feldspar production in the Black Hills is largely dependent on the existence of the Pacer Corporation mill in Custer. If the mill were to shut down, feldspar production in the Black Hills may no longer be economically feasible. An increase in pegmatite mining could be facilitated by investment in additional mineral processing technologies, such as flotation, to economically recover feldspar from finer-grained pegmatite deposits (Gersic, 1990) or by development of additional markets for pegmatite minerals.

The pegmatite mines host several different mineral commodities and are currently being exploited primarily for feldspar and landscape rocks such as rose quartz. Mining operations at these sites are small-scale operations utilizing selective blasting and limited heavy equipment such as bulldozers, loaders, and dump trucks. Disturbance associated with these operations is generally less than one acre per site. The feldspar market is very specialized and requires strict specifications on potassium content and other factors. Intermittent mining at a number of mines allows the feldspar producers to optimize production as their specific markets require.

There are two pegmatite mines in the South project area that have a current plan of operations with the Forest Service. The Tip Top Mine is an old feldspar mine where the current operator is looking for rare minerals associated with a pegmatite deposit. The Velvet Mine has a plan of operations for mining of feldspar, but the project has been placed on hold because of opposition from local landowners.

Gold mines have operated in the South project area on a small scale. Wade's Gold Mine at T4S R3E Section 26 is currently active. Creek Gold Corporation operated a gold mine adjacent to Wade's Gold Mine from 1994 to 2001. Both of these are placer mines. It is possible that additional gold mines might be discovered and developed.

High-calcium limestone is currently used in the Rapid City area for the production of lime and cement. High calcium limestone is combined with sand, gypsum, iron ore and other additives to produce portland cement. In the production of lime and cement, high calcium limestone ($CaCO_3$) is heated to drive off carbon dioxide and produce quick lime (CaO). Due to high transportation costs, a close proximity to a

processing plant is an important aspect of the economics of high-calcium limestone production.

Dewitt et al. (1985) denoted the Pahasapa Limestone with a moderate potential to produce high-calcium limestone. However, the Pahasapa Limestone is primarily a dolomite with only local zones of high-calcium limestone. With the abundance of high calcium limestone in the Minnekahta, from which Rapid City gets its limestone, it is unlikely that the Pahasapa will be exploited for high calcium limestone.

Leaseable Minerals

Dewitt et al. (1985) identified a low potential for discovery of oil and gas deposits within the South project area. This potential is based on the presence of favorable rock units, source rocks and geologic structure. Oil, gas and coal are leasable commodities based on the Mineral Leasing Act of 1920. Exploration, development, and production of these commodities are regulated by prospecting permits and leases.

Saleable Minerals

Common variety rock such as landscape rock, crushed stone, sand and gravel are saleable commodities. The Forest Service has the discretion to sell these commodities from Forest Service land. There are numerous resources for pegmatite, landscape rock, sand, gravel and crushed rock within the South project area. Saleable minerals were contracted for the Tip Top and Red Spar mines during the past three years, but the contracts have since lapsed. Custer County has a permit to remove gravel from the Stapp Quarry at Section 4, T4S, R3E.

Mineral Recreational Opportunities

Numerous decorative and collectable minerals occur within the pegmatite mines. There are currently two free-use permits issued for mineral collecting in the South project area from the Rainbow #4 Mine located in T4S R4E Section 6 and one mineral materials sale permit for rip rap removal from the Tip Top Mine waste dump located in T4S R4E Section 8. It is possible that additional mineral collecting activities are on-going, but have not been permitted through a free-use permit.

Abandoned Mines

There are many abandoned mines within the South project area. The abandoned pegmatite mines are generally small open pits or small underground workings. The primary hazards associated with these mines are physical hazards related to open shafts, collapsing and subsiding underground workings, and steep and unstable highwalls. The Hell Canyon Ranger District currently has an active abandoned mine reclamation program. Approximately six abandoned mines within the district are reclaimed each year.

Caves

The Pahasapa Limestone is host to the majority of the caves in the Black Hills including Jewel Cave and Wind Cave, the third and sixth longest caves in the world respectively (Gulden, 2003). A large number of caves have been reported along the trend of Pahasapa Limestone extending southeast from Jewel Cave through the South project area. It is also very possible that additional unidentified caves are present within this zone.

The boundary of the Jewel Cave National Monument is approximately two miles west of the South project area. Cave exploration and mapping is continuously increasing the known extent of Jewel Cave. Several mineral withdrawals have been established to protect Jewel Cave. An EIS for an additional mineral withdrawal was produced by the Hell Canyon Ranger District and is currently under evaluation. This mineral withdrawal addition will overlap the South project area. Another mineral withdrawal along U.S. Highway 16 crosses the South project area.

Paleontological Resources

The extent of paleontological (fossil) resources within the project area is currently unknown. The Pahasapa Limestone and the Englewood Formation have the potential to contain Paleozoic invertebrate fossils. Caves within the project area have the potential to contain more recent vertebrate fossils from animals that lived in the caves or fell into vertical shafts at cave entrances.

Environmental Consequences

Direct/Indirect/Cumulative Effects – All Alternatives

Minerals

The No Action alternative would not cause either beneficial or adverse effects to mineral resources in the project area. Existing roads provide adequate access to the active mines as well as to many of the abandoned mines and mineral claims.

Alternatives 2 and 3 include some road closures, which will not affect access to the Tip Top Mine or Wade's Gold Mine, which are currently active. Closure of FSR 685.1B, as proposed in Alternative 2, would affect access to the Velvet Mine, which has a plan of operations that has not yet been approved. Mine reclamation at the Melrose, Pink Glaze, and Rainbow Mines would not be affected by either Alternative 2 or 3. Access to mines and mineral claims would still be available and the potential to respond to future access needs would be maintained. No negative direct, indirect, or cumulative effects to the mineral resources or to mining claimants are expected from any of the alternatives.

Caves

The South project area is notable for having a large number of caves and for its proximity to Jewel Cave. It is likely that some of the caves in the project area are connected with Jewel Cave. The Forest Plan mandates a study of the significance of caves, a process which has not yet been accomplished. Caves which are determined to be significant, or which have not been evaluated for significance, must be managed to protect their biological, cultural, ecological, hydrological, and physical characteristics.

Mitigation measures that are already in place should protect cave resources. Standard 1504 of the Forest Plan calls for special precautions for mine operating plans in karst (cave) areas such as in the Minnelusa Formation and the Pahasapa Limestone. Standard 1401 includes specific management practices for significant caves or caves that have not been evaluated for significance. The practices include maintaining a 500 foot buffer around the caves and taking measures to prevent changing the cave ecosystem (water, sediment, nutrient, chemical, airflow, or temperature regimes). With these mitigation measures in place, there should by no negative direct, indirect, or cumulative effects to caves from any of the alternatives.

SILVICULTURE

Affected Environment

The overall goal of silviculture is to manage the forest environment to achieve desired management goals and objectives. This section displays an overview of the analysis and effects to timber resources within the South Project Area.

The vegetation in the South area is dominated by Ponderosa pine (*Pinus Ponderosa*) (89%) along the ridges and slopes. Most of the pine sites are single-storied and even-aged although groups of various age and size classes may be found horizontally across sites. Meadows (11%) are found in flatter bottomlands, particularly in the southern end of the analysis area. Aspen (*Populus tremuloides*) sites (<1%) are found in proximity to meadows or as inclusions within pine sites. Less than one percent of sites are shrubland, consisting mainly of snowberry. Slope ranges from level ground to approximately 70% within the project area.

Table 3.17 Existing Cover Types in the Project Area.

Cover Type	Acres/Percentage
Ponderosa Pine	38,136 / 89%
Meadow	4,727 / 11%
Aspen	107 / <1%
Shrubs - snowberry	23 / <1%
Non-Forest (rock, etc)	51 / <1%

Table 3.18 Existing Structural Stages on FS Lands by Cover Type in South

Structural Stage	Ponderosa Pine	Aspen	Total Acres
SS1	1,474		1,474
SS2	461	100	561
SS3A	4,370	2	4,372
SS3B	6,884	5	6,889
SS3C	2,518		2,518
SS4A	10,500		10,500
SS4B	9,454		9,454
SS4C	2,342		2,342
SS5*	133		133
TOTAL	38,136	107	38,243

* Structural stage 5 is the only structural stage that is not computed from stand data. The criteria for pine sites to become structural stage 5 is: the site must be at least 160 years old and have an average tree size class of "V" which is trees 16-inches in DBH or greater. Sites were identified as meeting these criteria after field review.

There are 3 Management areas within the South project. Management area 5.1, Resource Production Emphasis comprises 17,863 acres (42%), Management area 5.4, Big Game Winter Range comprises 23,018 acres (53%), and Management area 5.1A comprises 2,162 acres (5%).

Table 3.19 Cover Types of FS Land in MA 5.1

Cover Type	Acres/Percentage
Ponderosa Pine	15,559 / 87%
Meadow	2,250 / 13%
Aspen	10 / <1%
Shrub-snowberry	17 / <1%
Non-Forest (rock, etc)	28 / <1%

Table 3.20 Cover Types of FS Land in MA 5.4

Cover Type	Acres/Percentage
Ponderosa Pine	21,064 / 92%
Meadow	1,829 / 8%
Aspen	97 / <1%
Non-Forest (rock, etc)	28 / <1%

Table 3.21 Cover Types of FS Land in MA 5.1A

Cover Type	Acres/Percentage
Ponderosa Pine	1,515 / 70%
Meadow	647 / 30%
Aspen	0
Shrub-snowberry	0
Non-Forest (rock, etc)	0

Meadows

There are 4,727 acres (11%) of meadow within the project area. Large meadows at the southern end dominate the wide drainage bottoms with stringer meadows running up the draws, dividing the conifer sites. The large meadows are several hundred acres

in size. At the northern end, meadows are smaller and are found in the narrow bottomlands surrounded by pine sites.

Encroachment of pine into meadows is widespread within the project area. Approximately 65% (3,070 acres) of the existing meadows are currently experiencing pine encroachment. Pine encroachment does not occur as frequently in the northern locations as it does in the southern locations. In the southern locations, some pine encroachment removal has been accomplished in the post-sale activities of past timber sales. No meadows have been identified which have completely converted to pine sites within the project area.

Hardwoods

Aspen (*Populus tremuloides*) sites are found in proximity to meadows or as inclusions within pine sites. There are only 107 acres (<1%) of designated aspen sites in the South project area. The majority of these aspen sites (102 acres) are not currently experiencing competition from Ponderosa Pine because conifers have been removed in the past or have not become established within the aspen sites. An estimated 60-80 acres of aspen are found as scattered individuals and small clones within pine sites at the northern end of the project area. These scattered occurrences of aspen are being out-competed by conifers for light and nutrients. Forest-wide, acres of aspen are at approximately 50% (45,560 acres) of the objective of 92,000 acres (USDA Forest Service, 2007).

Understory Vegetation

Shrubs, forbs, and grasses occur in the forest understory. Common juniper (*Juniperus communis*) is the most widespread shrub except in the most southern locations where it occurs less frequently. There are a variety of forbs and grasses in the analysis area. Refer to the Botany section presented later in this chapter for more information on forbs and grasses. There are four western snowberry shrub sites which total approximately 23 acres.

Ponderosa Pine

Ponderosa pine dominates the South project area occurring on 38,136 acres. In some areas, little understory vegetation is present except for some grasses and Common juniper shrubs (*Juniperus communis)* due to dense pine overstory. Many sites are mature to overmature in age. Many acres of pine sites (14,447 acres) are currently at high risk for mountain pine beetle (MPB).

There are a variety of site sizes, crown closure, age structure, and interspersion within the analysis area. Site sizes vary from 5 acres to over 300 acres with crown closures varying from very open stands to very dense stands. There are young stands of seedlings, saplings and pole-size trees and old stands with trees well over 100 years

of age. The northern end of the area is dominated by Ponderosa pine sites, with larger and more frequent meadows interspersed toward the southern end.

In April, 2000 a storm with heavy, wet snow and ice damaged an estimated 4,300 acres of trees in the area. Large trees were broken or wind-thrown and sapling/pole-sized trees were bent over and damaged. Approximately 1,000 acres of damaged trees, mostly along roads, were cut, piled, and burned to reduce fuel loadings. Therefore, approximately 3,300 acres of damaged sites have not been treated.

The South area has been managed in past decades for timber products, forage production, and water yield through previous timber sales and other timber-related activities.

Structural Stages and Very-Large-Tree-Sized Stands

The South project area contains a variety of ponderosa pine structural stages, as displayed in Table 3.22.

Table 3.22 Existing SS within South: Ponderosa Pine Only

Structural Stage	Ponderosa Pine
SS1	1,474
SS2	461
SS3A	4,370
SS3B	6,884
SS3C	2,518
SS4A	10,500
SS4B	9,454
SS4C	2,342
SS5*	133
TOTAL acres	38,136

* Structural stage 5 is the only structural stage that is not computed from stand data. The criteria for pine sites to become structural stage 5 is: the site must be at least 160 years old and have an average tree size class of "V" which is trees 16-inches in DBH or greater. Sites were identified as meeting these criteria after field review.

The Phase II Amendment of the Forest Plan includes objectives for distribution of ponderosa pine site's structure and tree size. These objectives are applied on a management area basis, not on a project-level scale. The objectives are identical for both the 5.1 and 5.4 management areas.

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

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

*10 percent of the structural stage 4 ponderosa pine acreage in the management area will have an average 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.

The South project area contributes to the Forest-wide objectives for pine structural stages in Management Areas 5.1 and 5.4. Tables 3.23 and 3.24 display the objective as well as existing acres and percentages of each structural stage in these management areas Forest-wide. These values are from the 2006 Forest Monitoring Report (USDA, Forest Service, 2007).

Table 3.23 Existing Pine Structural Stages Forest-wide in MA 5.1

Structural Stage	Forest Plan Objective	Existing Acres	Existing Percentages
1	5%	38,308	8%
2	5%	15,453	3%
3A	10%	18,371	4%
3B	15%	22,827	5%
3C	5%	11,675	2%
4A	25%	177,660	37%
4B	25%	144,167	30%
4C	5%	4,7617	10%
5*	5%	307	0.1%
Total		476,385	100%

* Structural stage 5 is the only structural stage that is not computed from stand data. The criteria for pine sites to become structural stage 5 is: the site must be at least 160 years old and have an average tree size class of "V" which is trees 16-inches in DBH or greater. Sites were identified as meeting these criteria after field review.

Table 3.24 Existing Pine Structural Stages Forest-wide in MA 5.4

Structural Stage	Forest Plan Objective	Existing Acres	Existing Percentages
1	5%	51,861	15%
2	5%	8,469	2%
3A	10%	18,045	5%
3B	15%	28,974	8%
3C	5%	19,926	6%
4A	25%	77,761	23%
4B	25%	93,782	27%
4C	5%	44,154	13%
5*	5%	1,137	0.3%
Total		341,109	100%

* Structural stage 5 is the only structural stage that is not computed from stand data. The criteria for pine sites to become structural stage 5 is: the site must be at least 160 years old and have an average tree size class of "V" which is trees 16-inches in DBH or greater. Sites were identified as meeting these criteria after field review.

The South project area also contributes to the Forest-wide percentage of ponderosa pine stands in the "very large" size class. The project area contains approximately 81 and 347 acres of structural stage 4 pine in management areas 5.1 and 5.4, respectively, which are currently in the "very large" size class. The objectives (5.1-204 and 5.4-206) call for 10% of the structural stage 4 ponderosa pine acreage in a management area to be in the "very large" size class. Currently, Management areas 5.1 and 5.4 have 12% and 8%, respectively, of ponderosa pine sites in structural stage 4 with an average size of 'very large'. These percentages are based on the 2006 Forest Monitoring Report (USDA, Forest Service, 2007). See Table 3.25 for a display of existing Forest-wide percentages, by management area.

Table 3.25: By MA: Existing % SS4 Ponderosa pine with average size class of "Very Large"

Objective	MA 5.1 - Existing		MA 5.4 - Existing	
% of SS4	acres	% of SS4	acres	% of SS4
10%	42,966	12%	17,342	8%

Mountain Pine Beetle (MPB)

Mortality of Ponderosa pine from MPB continues to be the most evident of any insect or disease issue in the analysis area. Currently, Mountain Pine Beetle activity is at endemic levels but is increasing.

The susceptibility of a pine site to Mountain Pine Beetle infestation can be estimated based on the diameter and density of trees within a site. The Final Environmental Impact Statement for the Phase II Amendment to the Black Hills National Forest Plan provides guidance on estimating risk based on structural stage condition. Table 3.25 displays the relationship between structural stage and insect rating.

Table 3.26 Relationship of Structural Stage to Insect Risk Rating

Ponderosa Pine	
Structural Stage	Insect Risk Rating
1	Low
2	Low
3A	Low
3B	Medium
3C	High
4A	Medium
4B	High
4C	High
5	High

Currently, there are approximately 14,447 acres of Ponderosa pine at high risk for Mountain Pine Beetle infestation. This is about 38% of the pine sites in the analysis area. High-risk pine sites have a greater potential for increased MPB activity. Generally, sites are considered to be most susceptible to infestation when 75% of the site is in the 7-13 inch diameter range and the site density is over 120 ft^2/ac of basal area (Allen, 2006). Even though a 4A structural stage is in the lowest tree density, the tree size of 4 (>9 inch DBH) is largely in the 7-13 inch diameter range and therefore 4A stands remains at medium risk. Table 3.27 displays risk ratings for the pine sites in the project area.

Table 3.27 Current MPB Rating for Ponderosa Pine In South

Insect Rating	Acres	Percentage
Low	6,305	16
Medium	17,384	46
High	14,447	38
Totals	38,136	100

Environmental Consequences

ALTERNATIVE 1

Direct and Indirect Effects

Meadows

Meadows would continue to be encroached upon by pine, decreasing grass and forage production. Meadows without conifer encroachment at present would eventually become encroached upon by conifers.

Hardwoods

The five-acre aspen site identified as having pine competition, scattered individuals, and small aspen clones occurring within pine sites would decline in numbers as the pine out-competes the shade-intolerant aspen for light and nutrients. The pine would eventually overtop the aspen, leading to a type conversion. Hardwoods do not out-compete conifers, and therefore require some type of disturbance to release them from conifer encroachment. Under this alternative, natural disturbances such as insect-related mortality, wildfire or blowdown would be events supporting aspen release.

Understory Vegetation

Within conifer sites, forbs, shrubs, and grasses would be shaded out, reducing benefits to other resources such as wildlife and range. In areas with MPB infestation and related tree mortality, there would be an increase in forbs, shrubs, and grasses due to increased sunlight, moisture, and nutrients becoming available to the understory vegetation, creating more forage for wildlife and livestock.

Ponderosa Pine

The effects of deferring treatment in the pine sites would be a slower increase in yield, a reduction of diameter growth, an increased risk to Mountain Pine Beetle infestation, and an increased risk of large-scale, high-intensity wildfire. Diameter growth would be reduced due to mature age and overstocking within sites, thereby reducing potential future yield. Storm-damaged trees would continue to occupy growing space and cause high fuel loadings. The number of Ponderosa pine acres would generally remain the same.

Mountain Pine Beetle Risk

Mountain pine beetle risk would remain the same with this alternative. The analysis area would continue to have 38% of pine sites in high risk and 46% in medium risk for susceptibility to MPB infestation. Mountain pine beetle-caused mortality would

be expected to increase. Over time, the infestation could become epidemic, as seen in the Wabash timber sale area. Under epidemic conditions, the medium-risk sites would become highly susceptible to infestation.

Age class distribution could change where mortality occurs due to the MPB. The mortality caused by MPB would open up pine sites, creating large openings reduced to structural stage 1 (grass stage). Pine sites not affected by Mountain Pine Beetle would have an increase in mortality in the long-term due to competition between pine trees, and an increase in merchantable defect due to disease.

Structural Stages and Very-Large-Tree-Sized Stands

The Forest-wide structural stage percentages would not change with this alternative in the short term (approximately <10 years) unless the MPB infestation or other disturbance changed site structure. In Management Area 5.1, structural stages 1, 4A, 4B, and 4C would continue to be over target percentages while 2, 3A, 3B, 3C, and 5 would be under the target percentages for the management area. Within Management Area 5.4, structural stages 1, 3C, 4B, and 4C would continue to be over target percentages while 2, 3A, 3B, 4A, and 5 would be under the target percentages for the management area (see Tables 3.23 and 3.24).

In the long term, structural stages would be expected to change as trees grow and regenerate, wildfires or wind events take place, or insects and disease-related mortality occurred. These changes could take decades, or could happen quickly. Barring a disturbance event, structural stage 1 (grass stage) would grow into structural stage 2 as the site regenerated naturally or was planted with seedlings. Trees would grow in height and diameter, with structural stage 2 (seedling/sapling) growing into structural stage 3 (poles), and structural stage 3 growing into structural stage 4 (sawtimber).

The density of a site (A, B, or C) would also change as the trees grew. Sites would become denser as trees matured and competed for growing space. Eventually, the majority of structural stages would grow into 4B or 4C in the absence of disturbances to the site.

The acreage and percentage of pine sites in the very large size category would not change. Because of overcrowded conditions, few trees would reach the very large size class. This would not move Ponderosa pine towards the forest objective for structural stages for both management areas. These changes to structural stages would occur as long as there are no natural or man-made disturbances within the site.

Adding natural disturbances such as wildfire, wind events, or insects and disease could alter the structural stage of a site. Natural occurrences could change structural stages or have no impact on the site structure depending on the size of disturbance. Small (less than 10 acres) natural disturbances usually have no effect on existing site structure but large (greater than 10 acres) disturbances could open up a site, reducing

site density or changing stand size. A wind event could knock over trees, reducing site density whereas a wildfire could reduce the site structural stage from a 4C (dense sawtimber) to 1 (grass) by burning up the entire site.

This alternative would not move the site conditions towards the forest objectives.

Mountain Pine Beetle Risk

Mountain pine beetle risk would remain the same with this alternative. The analysis area would continue to have 38% of pine sites in high risk and 46% in medium risk for susceptibility to MPB infestation. Mountain pine beetle-caused mortality would be expected to increase. Over time, the infestation could become epidemic, as seen in the Wabash timber sale area. Under epidemic conditions the medium risk sites would become highly susceptible to infestation.

Age class distribution may change where mortality occurs due to the MPB. The mortality caused by MPB would open up pine sites, creating large openings reduced to structural stage 1 (grass stage). Pine sites not affected by Mountain Pine Beetle would have an increase in mortality in the long-term due to competition between pine trees and an increase in merchantable defect due to disease.

ALTERNATIVE 2

Direct and Indirect Effects

In this Alternative 32,118 acres would be commercially harvested with an estimated volume of approximately 65 MMBF (million board feet) and approximately 55,000 CCF (hundred cubic feet) of POL (products other than logs). This alternative would prescribe some commercial thinnings at 40ft²/ac of basal area for fuels treatments that would put some sites at a stocking level slightly below the timber management zone for long-term timber yields as described in Appendix H in the Black Hills Land and Resource Management plan. This alternative harvests the most volume from the greatest amount of acres.

Meadows

Approximately 3,070 acres of meadow would be maintained by removal of encroaching pine. As a result, increased grass and forage production would occur within these meadow sites.

Hardwoods

This alternative would remove encroaching pine from the five acres of aspen which were identified as experiencing pine competition. In addition, individual aspen trees and scattered clones occurring within pine sites would be released from competition by removing all conifers within 1 chain (66 feet) around the perimeter of these

individuals or clones because the shade-intolerant hardwoods do not compete with the more shade-tolerant conifers. Removing conifers from a hardwood site ensures that hardwoods would not become shaded out, with the site eventually being taken over by conifers. Design criteria is included in Appendix B to whole-tree harvest within the aspen site to prevent slash from impacting aspen regeneration.

Understory Vegetation

This alternative would open up the canopy on 29,048 acres. This would allow an increase in light, nutrients, and moisture to become available to the understory vegetation of forbs, shrubs, and grasses. The result would be an increase in forage for wildlife and livestock.

Ponderosa Pine

The majority of proposed treatments would occur in Ponderosa pine sites. Commercial thinning is proposed on approximately 12,063 acres. Two different basal areas are proposed in the commercial thinning areas depending upon specific site conditions and objectives. A basal area of 40ft²/ac of basal area would be used on 9,456 acres adjacent to private land where crown-fire-hazard reduction would be the primary objective, and a 60ft²/ac target basal area would be utilized in remaining areas proposed for commercial thinning. In the 40 BA prescription, a follow-up POL thinning of trees under 9 inches diameter breast height (DBH) to a 24’ by 24’ spacing would also be done where the commercial sawtimber harvest (selected trees over 9 inches DBH) did not remove enough trees to reach the 40ft²/ac objective. Areas on some ridge tops and shallow soil areas could be vulnerable to windthrow and breakage after thinning. Design criteria to increase the leave-basal-area to 60ft²/ac on shallow soils are included (see Appendix B) to reduce potential for wind damage.

A 60ft²/ac basal area would be used on 2,607 acres where timber production and general forest health would be the objective. A follow-up POL thinning of trees under 9 inches diameter breast height (DBH) to a 20’ by 20’ spacing would also be done where the commercial sawtimber harvest (selected trees over 9 inches DBH) did not remove enough trees to reach the 60ft²/ac objective.

There would be 3,456 acres of overstory removal to release established seedlings. There would also be 8,703 acres of Group Shelterwood, which is a combination of commercial thinning, shelterwood seed cut, and overstory removal arranged spatially according to conditions encountered throughout the site. Each treatment group in the site is generally, although not necessarily, more than 2 acres in size.

Also included would be approximately 904 acres of group selection to retain existing uneven-aged site diversity in perpetuity in groups less than 2 acres in size. Shelterwood seed cut is proposed on 370 acres to regenerate mature pine sites. Restoration thinning is proposed on 426 acres on timber-unsuitable sites within management area 5.1A. This treatment is designed to create site conditions which will allow for maintenance of the site with prescribed fire. The concept is to mimic

conditions present prior to fire suppression. The acres treated with restoration thinning would also be treated with a follow-up irregular POL thinning. The purpose of an irregular POL thinning is to mimic conditions in the 5-8.9" diameter classes which may be created by natural disturbances. Therefore, tree spacing would not be regular as with other POL thinnings.

All sites proposed for overstory removal would also have a pre-commercial thinning completed. In addition, several pine sites (100 acres) which are not proposed for commercial treatment would have pre-commercial thinning. Pre-commercial thinning would improve the residual stand of trees by increasing the quality of the timber through the removal of damaged, diseased, and poorly-formed trees up to 5 inches in diameter. An increase of individual tree growth would also occur by releasing the remaining trees from competition.

Improvement Cuts would be done on 963 acres. These cuts would address trees damaged in the April 2000 storm, while maintaining the current structural stage for wildlife habitat. Snow-bent, broken and down tree material would be cut and piled. This would create some openings where storm damage is concentrated. Excessively dense areas would be thinned based on canopy overlap rather than a spacing distance. Only trees 1" to 6" DBH would be cut in the improvement cut. The result would be an irregularly-spaced stand of fairly high density, but with a reduced susceptibility to wildfire and insect damage. Some development of a new seedling layer would be expected.

Two pine sites (031007-17 and 031403-04, 125 acres total) that were previously seed cut contain sod which is hindering seedling establishment. The portions of these sites containing sufficient pine regeneration would be harvested to release the understory and would not require mechanical site preparation. Those portions without sufficient pine regeneration would not be harvested. These un-harvested areas may receive enough scarification from skidding activity to expose mineral soil and allow sufficient new seedling germination and establishment. If post-harvest regeneration surveys reveal that pine regeneration is not sufficient, then mechanical site preparation may be used to break up the sod layer to expose bare mineral soil for seedling establishment. This practice has been shown to be effective and far less costly than tree planting.

POL-only thinning is proposed on 3,121 acres in this alternative. Removal of sawtimber-size trees from these sites would result in a residual stand of trees with only the smaller, suppressed trees left. Consequently, only trees less than 9-inches diameter DBH (non-sawtimber trees) would be removed to leave a spacing of 24'x24' in the fuels-emphasis areas (848 acres) and to 18'x18' in all other areas (2,273 acres). POL thinning improves the residual stand of trees by increasing the quality of the timber through the removal of damaged, diseased, and poorly-formed trees. An increase of individual tree growth also occurs by releasing the remaining trees from competition.

This alternative would prescribe some commercial thinning at 40ft²/ac to accomplish fuels hazard reduction objectives. This would put some sites at a stocking level slightly below the timber management zone for long-term timber yields as described in appendix H in the Black Hills Land and Resource Management plan. Long-term timber production would be reduced because these thinnings would leave the sites at less than full occupancy. There would be a decreased risk of large, high-intensity wildfire because of a more open canopy. Refer to the Fire and Fuels section of this Chapter for further information on Fire Risk and Hazard.

Structural Stages and Very-Large-Tree-Sized Stands

Alternative 2 would have a relatively minor impact on the range of structural stages in Ponderosa pine in management area 5.1 (see table 3.28). In the short term (<10 years), the percentages for all structural stages after harvest would remain the same except 3B and 4A. Structural stage 4A would increase by 1% to 38%, which moves away from the objective of 25%. Structural stage 3B would decrease by 1% to 4%, which moves away from the objective of 15%. No Harvesting would occur in sites with a SS5, late-succession, condition.

Table 3.28 Alternative 2: Ponderosa pine structural stages in MA 5.1

MA 5.1	Objective	Alt 1 (Existing *)		Alt. 2	
SS	%	Acres	%	Acres	%
1	5%	38,308	8%	38,308	8%
2	5%	15,453	3%	16,113	3%
3A	10%	18,371	4%	18,862	4%
3B	15%	22,827	5%	19,952	4%
3C	5%	11,675	2%	11,079	2%
4A	25%	177,660	37%	183,382	38%
4B	25%	144,167	30%	141,080	30%
4C	5%	47,617	10%	47,302	10%
5	5%	307	<1%	307	<1%
Total	100%	476,385	100%	476,385	100%

* Existing Forest-wide acreages are those presented in the 2006 Black Hills National Forest monitoring Report, (USDA Forest Service, 2007)

Alternative 2 would have a somewhat greater impact on the range of structural stages in ponderosa pine in management area 5.4 and all of these changes move the structural stage distribution in management area 5.4 toward objectives. The percentages for structural stages 1, 3B, 4C and 5 would not change. Other structural stages would shift 1-2% toward objectives (see Table 3.29).

Table 3.29 Alternative 2: Ponderosa pine structural stages in MA 5.4

MA 5.4	Objective	Alt 1 (Existing *)		Alt. 2	
SS	%	Acres	%	Acres	%
1	5%	51,861	15%	51,861	15%
2	5%	8,469	2%	9,839	3%
3A	10%	18,045	5%	19,352	6%
3B	15%	28,974	8%	25,921	8%
3C	5%	19,926	6%	18,574	5%
4A	25%	77,761	23%	85,068	25%
4B	25%	93,782	27%	88,985	26%
4C	5%	44,154	13%	43,372	13%
5	5%	1,137	<1%	1,137	<1%
Total	100%	344,109	100%	344,109	100%

* Existing Forest-wide acreages are those presented in the 2006 Black Hills National Forest monitoring Report, (USDA Forest Service, 2007). The percentages listed are the Existing Condition and will change with time.

These percentages reflect expected conditions directly following implementation. The Forest objective for structural stages applies to an entire management area. The type of harvest prescribed and the number of acres treated will determine how soon the Forest Plan Objective percentages are reached. Taking Forest growth rates and funding of post-harvest treatments into consideration, it may take two or more decades to achieve the Forest Plan structural stage objectives (USDA Forest Service, 2005).

Commercial and non-commercial harvest would be utilized to move the management areas toward target structural stage percentages. Timber harvesting would change site densities and/or tree size depending on the treatment prescribed. Several entries over two or more decades may be necessary to reach the structural stage objectives as listed in Tables 3.23 and 3.24.

Shelterwood seed cuts, and parts of group shelterwoods that are seed cuts, in the short term would cause more acres to move into structural stage 4A by maintaining the tree size class but reducing stand density. Initially, more 4A needs to be created in order to move to the other structural stages. Shelterwood seed cuts are regeneration cuts, and, following harvest, the area would regenerate naturally. This regeneration cut would enable the site to move towards the early structural stages of 2 and 3. Once a shelterwood seed cut has regenerated and the seedlings are tall enough, an overstory removal could occur (approximately 15-20 years). An overstory removal changes tree size from sawtimber (structural stage 4) to seedlings/saplings (structural stage 2). This would increase the number of acres of structural stage 2, which in turn would grow into structural stage 3.

Commercial thinning is an intermediate treatment performed on immature stands that are not ready for a regeneration cut. The next entry after a commercial thinning would be a regeneration cut that would lead to structural stages 2 and 3.

In the project area, acres of structural stage 4 ponderosa pine sites with an average size of "very large" would increase with implementation of Alternative 2. In management area 5.1, the acres would increase by 362 acres to equal 443 acres total. In management area 5.4, the acres of pine trees in a very large size class would increase by 6 acres to equal 353 acres total. This increase is due to a change in average site diameters when thinning treatments remove the smaller diameter trees within a site. Areas thinned to 40ft²/ac basal area would reach the very large size class faster as more diameter growth would occur than in the 60ft²/ac basal area treatments. While this alternative would increase total acres of pine sites with an average tree size of very large, the Forest-wide percentage of very-large-size Ponderosa pine sites would remain the same in management areas 5.1 and 5.4. Tables 3.30 and 3.31 display the existing and alternative acres and percentages in both management areas.

Table 3.30: "Very Large" Tree Distribution in MA 5.1 (Forest-wide)

Objective	Alternative 1 (Existing)		Alternative 2	
% SS 4	Acres	% SS 4	Acres	% SS 4
10%	42,966	12%	43,328	12%

Table 3.31: "Very Large" Tree Distribution in MA 5.4 (Forest-wide)

Objective	Alternative 1 (Existing)		Alternative 2	
% SS 4	Acres	% SS 4	Acres	% SS 4
10%	17,342	8%	17,348	8%

Mountain Pine Beetle

This alternative would reduce the acres of pine in the high-risk category for MPB infestation and would increase acres of pine in the low and medium risk condition. All commercial harvest treatments which occur within high risk sites would reduce the risk to either medium or low categories post-harvest. The areas adjacent to the Wabash Timber Sale and the Bugtown project area, and along the west side of the project area west of Pass Creek Road would further benefit from the thinnings to 40 ft²/ac basal area. This basal area was recommended and used in the Bugtown area where the MPB was at an epidemic level of activity prior to harvest. Overstory removals move sites to the low risk rating as the majority of the residual stand would be seedlings/saplings, which is not a size class targeted by these insects.

Table 3.32 Effect of Commercial Harvest on MPB Risk

Harvest Treatment	MPB Risk Before Harvest	Acres Affected	MPB Risk After Harvest
Commercial Thin 40BA	High	9,456	Medium

Commercial Thin 60BA	High	2,607	Medium
Overstory Removal	Medium	3,456	Low
Shelterwood Seed cut	Medium or High	370	Medium
Group Shelterwood	Medium or High	8,703	Medium
Group Selection	Medium or High	904	Medium
Restoration Thinning	Medium or High	426	Medium
POL thin	High	3,121	Medium or Low

Acres in the high-risk rating would decrease from 14,447 acres to 3,201 acres of Ponderosa pine. Pine stands at the medium risk rating would increase from 17,384 acres to 24,344 acres and the low risk rating would increase from 6,305 acres to 10,593 acres.

Table 3.33 MPB Risk Rating for Alternative 2

MPB Risk Rating	Existing Condition Acres	Existing Condition Percentage	Acres Post-Harvest	Percent Post-Harvest	Change From Existing Condition
Low	6,305	16%	10,591	28%	Increase 12%
Medium	17,384	46%	24,344	64%	Increase 18%
High	14,447	38%	3,201	8%	Decrease 30%
Totals	38,136	100%	38,136	100%	

Fuel Treatments

The proposed fuels treatments use combinations of mechanical treatments and prescribed burning. Mechanical treatments include POL thinning to a spacing of 24'x24' and skidding slash to a landing, or pre-commercially thinning smaller trees and piling the slash. Trees to be thinned would be a minimum of 18-inches in height, up to less than 9-inches DBH. Slash treatments would reduce the amount of slash covering the ground, making more area available for regeneration to become established. Pre-commercial thinning would increase the quality of trees as stated previously. Storm-damaged trees would be removed. Burning would involve the burning of slash piles and/or broadcast burning. Pile burning would reduce the amount of slash in piles and broadcast burning would reduce the amount of slash and litter on the ground, providing more area for seedling establishment. Burning would also release nutrients back into the soil.

The Black Hills has been in drought conditions for several years, which has caused drought stress in the trees. Before broadcast burning, the area to be burned would need to be evaluated as to the drought condition of the timber to avoid unexpected mortality in larger trees.

ALTERNATIVE 3

Direct and Indirect Effects

In this Alternative 31,527 acres would be commercially harvested with an estimated volume of approximately 54 MMBF and approximately 54,000 CCF of POL. This alternative would prescribe treatments that keep all sites at a stocking level in the timber management zone for long-term timber yields as described in appendix H in the Black Hills Land and Resource Management plan. Commercial thinnings would all be at 60ft²/ac basal area which would reduce the chance of wind-throw and breakage of residual trees after harvest.

Meadows and Hardwoods

Direct and indirect effects to meadows and hardwoods would be the same as those described under Alternative 2.

Understory Vegetation

This alternative would commercially harvest approximately 546 fewer acres than Alternative 2, which would slightly reduce the potential for increases in understory vegetation. Pre-commercial improvement cutting would increase from 963 acres in Alternative 2 to 3,317 acres in Alternative 3 which would encourage multi-layered canopy development and shrub/forb enhancement.

Ponderosa Pine

The majority of proposed treatments would occur in Ponderosa pine sites. Commercial thinning is proposed on approximately 11,986 acres which is 77 acres less than Alternative 2. In addition, all commercial thinning would be to a 60ft²/ac basal area. As with Alternative 2, a follow up POL thinning of trees under 9 inches diameter breast height (DBH) to a 20’ by 20’ spacing would also be done where the commercial sawtimber harvest (selected trees over 9 inches DBH) does not remove enough trees to reach the 60ft²/ac objective.

Other differences in proposed treatments as compared to Alternative 2 include: A 15 acre reduction in overstory removal to release established seedlings, totaling 3,441 acres; a reduction of 632 acres of Group Shelterwood treatment, totaling 8,071 acres; an increase of 555 acres of POL-only thinning, totaling 3,254 acres; increase of 2,354 acres of Improvement Cutting, totaling 3,317 acres; and an increase of 2,133 acres of prescribed burning, totaling 10,929 acres.

Other treatments proposed in Alternative 2 remain the same in Alternative 3, including group selection, seedcut, hardwood release, restoration thinning, pine encroachment, pre-commercial thinning and mechanical site preparation.

This alternative would prescribe treatments that keep all sites at a stocking level in the timber management zone for long-term timber yields as described in appendix H in the Black Hills Land and Resource Management plan. There would be a decreased risk of large, high-intensity wildfire because of a more open canopy.

Structural Stages and Very-Large-Tree-Sized Stands

Alternative 3 would modify the Forest-wide structural stage distribution in management area 5.1 in the same manner as Alternative 2. Acres treated differs between the alternatives, but these differences do not equate to a percentage change when viewed on a Forest-wide scale. Table 3.34 displays acres and percentages for all alternatives in management area 5.1.

Table 3.34 Post-Harvest Ponderosa pine SS in MA 5.1

MA 5.1	Objective	Alt 1 (Existing *)		Alt. 2		Alt. 3	
SS	%	Acres	%	Acres	%	Acres	%
1	5%	38,308	8%	38,308	8%	38,308	8%
2	5%	15,453	3%	16,113	3%	16,113	3%
3A	10%	18,371	4%	18,862	4%	18,849	4%
3B	15%	22,827	5%	19,952	4%	20,020	4%
3C	5%	11,675	2%	11,079	2%	11,130	2%
4A	25%	177,660	37%	183,382	38%	183,015	38%
4B	25%	144,167	30%	141,080	30%	141,310	30%
4C	5%	47,617	10%	47,302	10%	47,333	10%
5	5%	307	<1%	307	<1%	307	<1%
Total	100%	476,385	100%	476,385	100%	476,385	100%

*Existing Forest-wide numbers are from the 2006 Black Hills Monitoring report (USDA, Forest Service, 2007).

As with Alternative 2, Alternative 3 would have a somewhat greater impact on the range of structural stages in Ponderosa pine in management area 5.4. There are differences in structural stage acres between Alternatives 2 and 3, however the distribution of Forest-wide structural stage percentages remains the same as Alternative 2, except for structural stage 4A. In Alternative 3, structural stage 4A is increased by 1% over the existing condition, which moves toward the objective. Refer to Table 3.35 to view acres and percentages of structural stages in management area 5.4 which would result from the alternatives.

Table 3.35 Post-Harvest Ponderosa pine SS in MA 5.4

MA 5.4	Objective	Alt 1 (Existing *)		Alt. 2		Alt. 3	
SS	%	Acres	%	Acres	%	Acres	%
1	5%	51,861	15%	51,861	15%	51,861	15%
2	5%	8,469	2%	9,839	3%	9,839	3%
3A	10%	18,045	5%	19,352	6%	19,321	6%
3B	15%	28,974	8%	25,921	8%	26,046	8%
3C	5%	19,926	6%	18,574	5%	18,691	5%
4A	25%	77,761	23%	85,068	25%	84,009	24%
4B	25%	93,782	27%	88,985	26%	89,886	26%
4C	5%	44,154	13%	43,372	13%	43,319	13%
5	5%	1,137	<1%	1,137	<1%	1,137	<1%
Total	100%	344,109	100%	344,109	100%	344,109	100%

*Existing Forest-wide numbers are from the 2006 Black Hills Monitoring report (USDA, Forest Service, 2007)

The percentages listed in Tables 3.34 and 3.35 reflect expected conditions directly following implementation.

In the project area, acres of structural stage 4 ponderosa pine sites with an average size of "very large" would increase in management area 5.1 and decrease in management area 5.4 with implementation of Alternative 3. In management area 5.1, the acres would increase by 199 acres to equal 280 acres total. In management area 5.4, the acres of pine trees in a very large size class would decrease by 107 acres to equal 240 acres total.

While this alternative would result in acreage changes of pine stands with an average tree size of very large, the forest-wide percentage of very large size Ponderosa pine stands would remain the same in both management areas. Tables 3.36 and 3.37 display the existing and alternative acres and percentages of "very large size" pine sites in both management areas.

Table 3.36: "Very Large" Tree Distribution in MA 5.1 (Forest-wide)

Objective	Alternative 1		Alternative 2		Alternative 3	
% of SS4	Acres	% of SS4	Acres	% of SS4	Acres	% of SS4
10%	42,966	12%	43,328	12%	43,165	12%

Table 3.37: "Very Large" Tree Distribution in MA 5.4 (Forest-wide)

Objective	Alternative 1		Alternative 2		Alternative 3	
% of SS4	Acres	% of SS4	Acres	% of SS4	Acres	% of SS4
10%	17,342	8%	17,348	8%	17,235	8%

Mountain Pine Beetle

This Alternative would reduce the acres of pine in the high-risk category for MPB infestation and would increase acres of pine in the low and medium risk condition. All commercial harvest treatments would reduce the number of acres in the high-risk category to either medium or low risk categories post-harvest. Overstory removals move sites to the low risk rating as the majority of the residual stands of trees would be seedlings/saplings.

Table 3.38 Effects of Commercial Harvest on MPB Risk.

Harvest Treatment	MPB Risk Before Harvest	Acres Affected	MPB Risk After Harvest
Commercial Thin 60BA	High	11,986	Medium
Overstory Removal	Medium	3,441	Low
Shelterwood Seed cut	Medium or High	370	Medium
Group Shelterwood	Medium or High	8,071	Medium
Group Selection	Medium or High	904	Medium
Restoration Thinning	Medium or High	426	Medium
POL thin	High	3,254	Medium or Low

The effects of harvesting pine sites in this alternative would result in 3% more high-risk sites and 3% less medium-risk sites when compared to Alternative 2. Vast improvements in reducing MPB risk would occur over existing conditions, as with Alternative 2. Acres in the high-risk rating would decrease from an existing 14,447 acres to 4,479 acres of Ponderosa pine. Pine sites at the medium-risk rating would increase from 17,384 acres to 23,110 acres and acres in the low-risk rating would increase from 6,305 acres to 10,548 acres.

Table 3.39 MPB Risk Rating for Alternative 3

MPB Risk Rating	Existing Condition Acres	Existing Condition Percentage	Acres Post-Harvest	Percent Post-Harvest	Change From Existing Condition
Low	6,305	16%	10,547	28%	Increase 12%
Medium	17,384	46%	23,110	61%	Increase 15%
High	14,447	38%	4,479	11%	Decrease 27%
Totals	38,136	100%	38,136	100%	

Fuel Treatments

Alternative 2 and 3 differ in the amount of acres proposed for prescribed burning. Alternative 3 proposes prescribed burning on 10,929 acres, which is 2,133 acres more than Alternative 2.

The Black Hills has been in drought conditions for several years, which has caused drought stress in the trees. Before broadcast burning, the area to be burned would need to be evaluated as to the drought condition of the timber to avoid unexpected mortality in larger trees.

The Silviculturist would be involved with design of all burn plans related to this project.

Cumulative Effects

The South analysis area has been commercially harvested many times in the past with recorded activities going back to the 1980s. Post-sale activities followed harvest, with natural disturbances such as wildfires, insects and diseases occurring throughout the years. All past, present, and future activities from the project area were compiled and considered for this analysis (see Appendix E).

Time Boundary (1980 to 2019): Harvesting and noncommercial treatments in the 1980s are the earliest known activities that still significantly affect the landscape today. The timber sales which may result from this analysis would likely sell in 2009 and 2010. Allowing 3-4 years for the sales to be harvested, and five years for post-sale activities to be accomplished, all activities should be completed by approximately 2019.

Space Boundary: The analysis area boundary is the cumulative effects analysis boundary for all resource elements discussed in this section except for mountain pine beetle. The direct and indirect effects for most elements are contained within the project area boundary. The cumulative effects boundary for mountain pine beetle is the project area and the Wabash Timber Sale area immediately adjacent to the northeast boundary of the project area. This boundary was selected because beetle populations are known to be at high levels in the Wabash area and could affect Ponderosa pine within one mile of this sale area. Beetles generally move less than one-tenth of a mile per year but might travel up to several miles on rare occasions.

Meadows

The cumulative effect under the No Action alternative would be that pine would remain in meadows and would further encroach into the meadows. Grass and forage production would likely decrease.

The Action Alternatives would remove up to 3,070 acres of encroaching pine from existing meadows. As a result, these alternatives would have a positive cumulative effect on maintaining meadow habitat.

Hardwoods

Under the No Action alternative, aspen clones and scattered aspen within pine sites would continue to be taken over by pine. Without a disturbance (fire, insects, etc), aspen would continue to decline in the project area.

The treatments proposed in the Action Alternatives, coupled with past aspen (hardwood) release treatments and natural disturbances, would have a positive cumulative effect on aspen.

Understory Vegetation

Under the No Action alternative, and with no disturbance (fire, insects), pine canopy density would continue to increase and understory vegetation would be suppressed. However, with increased canopy density, there is elevated potential for high-intensity wildfire and/or insect infestation. These disturbances would allow sunlight, moisture and nutrients to become available for growth of understory vegetation.

Past disturbances such as fire and past and current disturbances such as MPB infestation have encouraged growth of understory vegetation. The treatments proposed within the action alternatives would have a positive cumulative effect on the growth of understory vegetation due to the increase of sunlight, moisture and nutrients to the forest floor.

Ponderosa Pine

Much of the South project area has been harvested with approximately 28 timber sales occurring since 1980. The effect of past treatments has been an increase of merchantable volume growth and improvement in the quality of timber. There has also been an improvement in the quality of timber through removal of damaged, diseased, and poorly-formed trees. Pre-commercial thinning and weed & release treatments improved site health by removing damaged, diseased, and poor-quality trees.

Future treatments for the area may include further thinning or regeneration cuts. Any treatments for growth and yield purposes would not occur until stands became overstocked, regeneration cuts were prescribed at culmination of mean annual increment, or when uneven-aged treatments were desired. No future treatments are currently planned beyond those described in the alternatives.

The Black Hills, including the South analysis area, has been in an on-going drought condition the last 8-9 years. While MPB does not depend solely on drought conditions to continuously increase their population, the drought has aided the MPB by increasing stress in healthy trees, thus making the trees more vulnerable to a successful insect infestation.

Thousands of acres of Ponderosa pine sites in the analysis area were harvested or pre-commercially thinned to a density that has left them vulnerable to MPB infestation. These sites now encompass a large area of even-aged trees of similar size and age with high-risk densities. Pine sites with an average tree size over 7-inches DBH and basal areas over 80 ft^2/ac leave the sites susceptible to MPB infestation. Overall, 38 percent of the analysis area is in the high-risk rating for MPB.

Mountain pine beetle populations have been at epidemic levels in the Bugtown project area in the past and currently in the Wabash timber sale area adjacent to the

South project. Sites harvested using sanitation and prevention treatments in Bugtown appear to have reduced the epidemic in that area. However, areas that remain untreated in the Wabash Timber Sale area are hosting high beetle populations and are threatening to spread into the project area.

With the No Action alternative, lack of vegetation treatment within pine sites would increase the potential for beetle populations to increase within the project area. Pine sites near the epidemic center of the Wabash area would provide preferred habitat for the beetles and would be expected to become infested first. Sites further from these epidemic centers have the potential to become infested over time. The No Action alternative would therefore have an adverse cumulative effect on Ponderosa pine as related to drought stress and Mountain Pine Beetle infestation.

There would be positive effects to MPB risk under the action alternatives. Past and present activities combined with the proposed activities would result in positive cumulative effects on MPB risk.

There would be no adverse cumulative effect to SS5 (late-succession) sites in the project area because there would be no direct or indirect effects to SS5 habitat.

FIRE and FUELS

Affected Environment

The present condition of vegetation is characterized by moderately-stocked to well-stocked stands of Ponderosa pine and a reduction in open grassy meadows, riparian areas and open vistas thru pine. Increasing insect activity (mountain pine beetle) is present in scattered locations.

Fire History

Fire history occurrence of both large and point fires were analyzed using the project perimeter. The fire history data includes fires occurring from 1950 to present.

Table 3.40 Fire Size And Occurrence From 1950 To Present

Fire Size Class	Fire Size (acres)	Number of Fires
A	0 – ¼	105
B	¼ to 9	55
C	10-99	6
D	100 – 299	1
E	300-999	0
F	1000-4999	0
G	5000 +	0
U	Unknown	3

Table 3.41 Past Large Fires Within South

Fire Name	Fire Year	Total Acres	Acres Within Project Area	Percent of Project Area
Jasper	2000	83,511	1,758	3.5%
Ventling	1966	974	801	1.5%

The number of fires on Black Hills National Forest system lands has remained fairly constant at 65-130 starts per year. The number of fires that have escaped initial attack has also remained constant. However, these escaped fires have become larger and more difficult to control with an average large fire size increasing from under 1000 acres per fire in the early 1900's to over 8000 acres in recent years, having burned approximately 239,000 acres since 1980.

Fire Regime Condition Class (FRCC)

Currently, there are three general types of fire regimes in the Black Hills. Fire regimes characterize the role fire plays in an ecosystem. The Condition Class rating can be used to describe the degree of departure from the historic fire regime (Hann et al., 2003). Table 3.42 describes Fire Regimes and Table 3.43 describes each Condition Class.

Table 3.42 Fire Regime Definitions

	General Characteristics	Major Controlling Variables	Distribution
Frequent, Low-Severity Fire Regimes	Fires recur within any stand at relatively short intervals (10 - 50 years), burning at low severity in the canopy and soil, and variable severity in the understory	***Weather*** (fires occur during dry periods), ***Climate*** (extensive fires tend to occur in dry years that follow 1- 3 wet years), and ***Fuels*** (fuels gradually accumulate during the intervals between successive fires)	Evidence of surface fire in ponderosa pine forests throughout the Black Hills, most frequent at the Prairie-Forest ecotone and less frequent in interior forests at mid to high elevations (Fisher et al. 1987, Brown and Sieg 1996, Brown and Sieg 1999, Brown et al. 2000, Wienk 2001, Brown 2003, Wienk et al. 2004).
Infrequent, High- Severity Fire Regimes	Fires recur within any stand at long intervals (100 – 500+ years), burning at high severity in the canopy and understory, and at variable severity to the soil	***Weather*** and ***Climate*** are the primary controllers (most ignitions extinguish by themselves because of wet conditions; extensive fires occur only in very dry summers; variability in fuels usually has little influence on fire frequency, extent, or severity)	Large areas of even-aged and dense forest and of closed canopy, mature or old-growth forest at the time of settlement are evidence of stand-replacing disturbance (Graves 1899, Shinneman and Baker 1997).
Mixed Severity Fire Regimes	These fire regimes are intermediate between the Frequent, Low- Severity and the Infrequent, High- Severity Fire Regimes. Fires occur at variable intervals (10 - >100 years), and burn at variable severity (patches of high severity intermingled with patches of low or intermediate severity)	***Weather***, ***Climate***, and ***Fuels*** all influence fire frequency, extent, and severity, in complex ways that are not well understood, with enormous variability over time and space	Proposed as the dominant model for fire regimes in ponderosa pine forests of the Black Hills. Under this model, surface fire forms the background process creating forest structure and landscape pattern. However, fires sometimes burn with mixed severity, with both a surface fire and a stand-replacing fire component, and may sometimes create large areas of high severity burns. Forest patches are variable in size and within patch structure (Lentile et al. in press)

Table 3.43 Fire Regime Condition Class (FRCC) Descriptions

Fire Regime Condition Class	Description
FRCC1 Low Departure from the *central tendency of the historic fire regime.	• Fire regimes are within the historical range. • Risk of losing key ecosystem components is low. • Vegetative attributes are intact and functioning within the historical range.
FRCC2 Moderate Departure from the *central tendency of the historic fire regime.	• Fire regimes are moderately altered from their historical range. • Risk of losing key ecosystem components is moderate. • Vegetation attributes have been moderately altered from their historical range. • Fire frequencies have departed from natural frequencies by one or more return intervals, resulting in changes to fire size, intensity, severity, and landscape patterns.
FRCC3 High Departure from the *central tendency of the historic fire regime.	• Fire regimes are significantly altered from their historical range. • The risk of losing key ecosystem components is high. • Vegetation attributes have been significantly altered from their historical range. • Fire frequencies have departed from historical frequencies by multiple return intervals, resulting in dramatic changes to fire size, intensity, severity, and landscape patterns.

Central tendency refers to a composite estimate of vegetation characteristics including: species composition, structural stages, stand age, canopy closure, and mosaic pattern; fuel composition; fire frequency, severity, and pattern; and other associated natural disturbances.

From historic conditions, much more of the landscape is now forested and we are losing our open meadows and hardwood stands which serve as natural fuel breaks. Estimates show that 40 percent of the Forest was either non-stocked pine sites or meadow sites in 1875 compared to less than 6 percent in 2000 (USDA Forest Service, 2005). As a result of this increased fuel loading, more of the Black Hills is available for and affected by large, intense forest fires.

The coarse-scale national data characterizes the Black Hills as primarily Fire Regime Condition Class (FRCC) 3, which has a high relative risk of significantly altering or losing key components of the Ponderosa pine forest system (USDA, Forest Service 2005). These conditions significantly increase the probability of a surface fire transitioning to a crown-fire with increased burn severity and tree mortality. Evidence of past fires shows the potential for large, high intensity surface fires and, given the right conditions, stand-replacing fires. Recent examples around the Black Hills include the Jasper, Elk Mountain II, Battle Creek, Ricco and Alabaugh fires.

Air Quality

Maintaining and improving air quality in the Black Hills and western South Dakota is desired. Although usually short in duration, smoke from wildfires and prescribed fires has the potential to affect air quality. The EPA addresses smoke from wildland fire under their natural events policy at http://www.epa.gov/ttn/caaa/t1/memoranda/nepol.pdf. (USDA Forest Service, 2005).

The South project area is in the vicinity of two Class 1 airsheds (Badlands National Park and Wind Cave National Park), and three communities (Custer, Pringle and Argyle). Smoke generated by wildfire is usually abundant and cannot be mitigated. Smoke generated under controlled conditions can be mitigated using the following means:

- Limiting treatment area size
- Specifying wind directions and speed
- Specifying minimum mixing heights
- Staggering ignitions

These mitigation techniques, in addition to other control methods for smoke management, would minimize the impacts of smoke to visibility and human health.

Risk and Value

A Fire Protection Assessment (FPA) was completed by the Black Hills National Forest in 1996 to address Risk, Hazard and Values on the Forest, and is integrated into the Forest Plan. The purpose of the document was to identify and prioritize fire management activities to foster an effective wildfire prevention program. The assessment rated the potential that: 1) a lightning or person-caused ignition would occur (Risk); 2) once ignited, the flammability of a fuel, based on fuel type and condition, topography, and weather, influences the creation of dangerous fire-line intensities (Hazard); and 3) the possible change in tangible and intangible assets from fire (Value). Risk and Value are rated using a three-tier assessment: Low, Moderate and High. Hazard is rated using a 4-tier assessment: Low, Moderate, High and Very High.

In assessing Risk, 93% of the project area falls within the High risk rating. This rating is based on the potential of an ignition occurring as determined from historical fire record data.

Values in the South Project area, which could be threatened by wildfire include:

- Private land and structures: More than 350 structures occur within the project area and approximately another 1500 structures occur within 3 miles outside of the project boundary

- Wildlife habitat, including snags, forage, riparian areas, security cover, and mid-to-late seral Ponderosa pine stands
- Sensitive animals
- Commercial timber stands
- Power lines
- Range improvements, such as fences and spring developments
- Investments in timber stand improvement and reforestation
- Visual quality
- Heritage sites
- Water quality
- Recreation sites

Fire Hazard

A detailed examination of the Hazard rating is best accomplished by reviewing known data regarding the arrangement of the vegetation, which is referred to as the structural stage. The structural stage gives an indication of the current fire hazard and is a site-level rating of crown-fire susceptibility. Table 3.44 gives an approximate area of each structural stage and indicates the current fire hazard.

Table 3.44 Current Pine Structural Stage and Fire Hazard

Structural Stage	Approximate Acres	Fire Hazard
Meadow, Shrub and Rock	4,801	Low
1 – Grass/Forb	1,474	Low
2 – Shrubs/Seedlings	461	Moderate
3A – Sapling/Pole (<40%)	4,370	Moderate
3B – Sapling/Pole (40-70%)	6,884	High
3C – Sapling/Pole (>70%)	2,518	Very High
4A – Mature >9" (<40%)	2,476	Moderate
4A – Mature <9" (<40%)	8,024	Very High
4B – Mature >9" (10-70%)	2,345	High
4B – Mature <9" (10-70%)	7,109	Very High
4C – Mature <9" (>70%)	2,342	Very High
5 – Late-succession	133	Very High

Table 3.45 Current Fire Hazard Rating

Approximate Total Acres	Fire Hazard	Approximate Percentage of Project Area
6275	Low	~ 15%
7409	Moderate	~ 17%
9234	High	~ 21%
20126	Very High	~ 47%

In assessing Hazard, an overall Hazard Rating of high to very high exists in approximately 68% of the project area. It is suspected that much of the private forested land also follows this trend resulting in a higher percentage of high to very high Hazard Rating, however to what extent is unknown. The high to very high fire hazard rating is determined on the availability of fuels that could sustain a fire. The high fire hazard that exists in the South Project Area is a result of the disruption of the

historic fire regime, creating a landscape dominated by contiguous stands of dense Ponderosa pine with a high loading of surface and ladder fuels. In addition, recent pockets of tree mortality caused by insects and disease and the ice storm of April 2000 increased fuel concentrations on the ground, resulting in an overall increase of fire hazard. In an area such as South, where high risk coincides with high hazard, the probability of wildfire with undesirable characteristics is more likely and could be detrimental to many of the values existing in and around this project area.

At-Risk Communities (ARC) and Existing Structures

Three At-Risk Communities (ARC) are located within or adjacent to the South Project Area. Buffer zones were created at distances of half, one, two, and three miles around the communities to further assess the level of wildfire risk for each community.

Based on Custer County Planning Office data, there are more than 350 structures contained within the project area, and approximately 1500 other structures within three miles outside of the project boundary. The area continues to grow at a remarkable rate showing an increase of 68 structures in two recent years (a 24% increase) within the project boundary.

Environmental Consequences

ALTERNATIVE 1

Direct and Indirect Effects

The only changes on the landscape would be those that occur as a result of natural disturbances, wildfire suppression or from past project decisions.

The No Action alternative would continue the trend of increasing fire risks and the FRCC of 3. In the absence of vegetation treatments, tree densities would continue to increase, as would crown cover and ladder fuels. As a result, there would be higher resistance to control and increased likelihood of wildfire with increased risk of losses. This trend would continue until interrupted by a natural disturbance such as a large, high-intensity fire. Recent fires in the Black Hills provide examples of what type of fire behavior can be expected and its effects on the landscape.

Although air quality would not be impacted under the No Action alternative, there would not be any control over the timing or amount of emissions released into adjacent airsheds in the event of a wildfire. A large wildfire has the potential to make a much greater impact on adjacent communities and Type 1 airsheds, possibly exceeding National Air Quality Standards.

Under the No Action alternative, the South Project would not contribute to Forest Plan targets for fuels treatments or meet the intent of the National Fire Plan, as well as many other national, regional, and local direction/policies.

ALTERNATIVE 2

Direct and Indirect Effects

Alternative 2 focuses on limiting fire hazard potential. An aggressive approach was taken on Forest lands bordering private lands to provide increased private property protection and tactical opportunities to fight fires more safely.

This alternative would treat 4,550 acres non-commercially, 32,118 acres commercially and up to 8,796 acres could be treated with prescribed fire on a landscape scale (see Map 17 in Appendix A). As part of the 32,118 acres of commercial treatments, 9,456 acres would be thinned to a 40 Basal Area. This Basal Area allows for the recommended minimum crown spacing of 10 feet between crown canopies at full maturity to reduce the potential for crown-fire spread and create defensible space (Hunter et. al, 2007).

Commercial and non-commercial fuel breaks are proposed on lands adjacent to private lands. Many follow-up treatments or consecutive treatments are planned, resulting in more than one treatment in some sites. Considerable reduction in crown-fire hazard would result from the creation of a mosaic pattern breaking vegetative continuity both vertically and horizontally across the landscape.

Treatments outlined in Alternative 2 would decrease the risk for large, high-intensity fires, allowing for characteristic low-to-mixed-severity fires to occur. The treatments proposed in Alternative 2 would also have a considerable effect on fire behavior. The chances for successful initial attack under this alternative would be increased and the risk to residential areas, the general public, and firefighters would be reduced. This is because treated stands would be expected to burn in a surface-fire configuration with isolated and small group torching, rather than in a crown-fire mode. An improvement in FRCC would be expected as fuels conditions were managed towards a more natural state.

This alternative would move 25,745 acres (60%) from the high and very high category to the low and moderate category. Resistance to control would rise again over time as the pine regeneration filled in, but Forest Vegetation Simulator (FVS) computer modeling revealed that forest fuel conditions would still show positive effects on fire hazard rating for over 30 years after treatment (see Table 3.46).

Accomplishing prescribed broadcast burning objectives is estimated to require approximately 10-15 ignition days per year for 3 to 5 years. Although usually short in duration, smoke from prescribed fires has the potential to affect air quality. The

South project area is in the vicinity of two Class 1 airsheds; Badlands National Park and Wind Cave National Park and three communities, Argyle, Pringle and Custer. The South project area is designated as a Class II area, allowing higher concentrations of pollutants than the Class I Airsheds. Smoke generated by wildfire is usually more abundant than smoke from prescribed burning and cannot be mitigated; however, smoke generated under controlled conditions can be mitigated using the following means:

- Limiting treatment area size
- Specifying wind directions and speed
- Specifying minimum mixing heights
- Staggering ignitions

These mitigation techniques, in addition to other control methods for smoke management, reduce the impacts of smoke to visibility and human health.

This alternative would meet the Forest Plan objective of reintroducing fire to the ecosystem and the standard for reducing the threat of a wildfire damaging public and private investments.

ALTERNATIVE 3

Direct and Indirect Effects

This alternative would treat 6,492 acres non-commercially; 31,527 acres commercially and up to 10,929 acres (see Map 18) could be treated with prescribed fire. All areas identified in Alternative 2 to be thinned to a 40 Basal Area would be thinned to a 60 Basal Area in this alternative. A 60 ft^2/ac basal area is the minimum needed to meet the recommended minimum crown spacing of 10 feet between crown canopies to reduce the potential for crown-fire spread and create defensible space (Hunter, et al).

As with Alternative 2, commercial and non-commercial fuel breaks are proposed on Forest lands adjacent to private lands. Many follow-up treatments are also proposed, resulting in more than one treatment in some sites. Reduction in crown-fire hazard would result from the creation of a mosaic pattern breaking vegetative continuity both vertically and horizontally across the landscape. The longevity of the effectiveness of these treatments would be 10+ years less than in Alternative 2.

Treatments outlined in Alternative 3 would have similar effects as Alternative 2 post-harvest, however the improvements in fuels hazard would not have the longevity as those proposed in Alternative 2. This alternative would move 26,442 acres (61%) from the high and very high categories to the low and moderate categories. Forest vegetation simulator (FVS) computer modeling shows that the majority of the pine

sites would begin to increase in fire hazard as the fuels matured by 2024, with a few sites increasing in fire hazard as early as 2019. (see Table 3.41).

This alternative would meet the Forest Plan objective of reintroducing fire to the ecosystem and the standard for reducing the threat of a wildfire damaging public and private investments.

Table 3.46 Fire Hazard Rating comparison for each alternative

Fire Hazard Rating	Alternative 1		Alternative 2		Alternative 3	
	Acres	% of Project Area	Acres	% of Project Area	Acres	% of Project Area
Low	6275	15	25441	59	25420	59
Moderate	7409	17	13988	32	14706	34
High	9234	21	1204	3	1254	3
Very High	20126	47	2411	6	1664	4
Sustainability*	-NA-		2034		2024	

* projected year when existing fuel conditions would return, given no intervention.

Cumulative Effects

All Alternatives

In the South Project area, past, present, and reasonably foreseeable future actions are applicable to interpreting changes in fuel conditions. Past timber management activities may have created situations that could have increased as well as decreased the risk of large, high-intensity fires. For example, wildfire suppression leads to a buildup in down woody material, increased stocking, and increased ladder fuels, which all increase fire hazard. Past vegetation treatment activities retained a higher tree density than proposed in this project. With closely-spaced trees, wildland fire behavior can become unfavorable. Tree densities, the presence of ladder fuels, and dense crown closures all contribute to higher fire hazard. If fires had been allowed to burn over the last 75-100 years, a significant acreage would have burned at a more frequent interval and a lower intensity. However, current longer fire-return intervals now favor wildfires of increased fire intensity.

The cumulative effects area for fuels hazard is the project boundary. The cumulative effects would include actions on all ownerships that fall within the designated area; however, ownership of lands other than Forest Service was not modeled. Fuel treatments are far more effective if collaboration occurs between landowners and other cooperators.

It is difficult to quantify how much crown-fire hazard mitigation work would take place in the future on non-FS lands. The effects of these treatments would be directly proportional to the amount of work accomplished. All crown-fire hazard mitigation work completed on non-FS lands would enhance the cumulative value of the South project action alternatives.

Under the No Action Alternative, fire hazard would be expected to increase in the future due to increasingly dense forests and heavy fuel loadings. The potential for sustained crown-fires, as well as fireline intensity would increase. With this type of fire behavior, forest suppression objectives would not be met.

Fire occurring several miles outside of the project area may affect South under the right conditions. On the Black Hills National Forest, fires in adjacent areas have previously had the ability to make large runs of up to 12 miles. Although this event is rare and requires extreme conditions, a large, high-intensity fire is more probable if no treatment is implemented. A fire start in South (under the right conditions) would not only threaten to damage/destroy improvements in the immediate area, but also would have the potential to burn into or affect surrounding communities such as Custer, Pringle and Argyle within one burning period (12 hours). A large, high-intensity wildfire brings with it numerous risks and effects. Homes in the path of a wildfire are perhaps the most immediately recognized value at risk, however, severe wildfires put numerous other important values at risk including critical infrastructure, fish and wildlife habitat, firefighter and public health and safety, soil productivity, clean air, and functional fire-adapted ecosystems (Graham et al., 2004). Some of these values are also threatened by the secondary effects of wildfire, such as landslides, soil erosion, and the spread of exotic species (Graham et al., 2004).

The action alternatives are expected to have positive, long-term cumulative effects related to fire risk and hazard. The proposed treatments combined with past, present and foreseeable future projects would decrease the risk of large, high-intensity fires as well as decrease fuel loading and continue to keep the forest within desirable conditions. The proposed treatments would reduce stand density and canopy closure, bringing the forest back to a more historical condition. Refer to Appendix E for a listing of past, present, and reasonably foreseeable future activities.

WILDLIFE

Plant Community Types

The Black Hills Community Inventory (conducted from 1996-1998) classifies and describes the vegetation types of the Black Hills (Marriott et al., 2000). The South project area is primarily a dry coniferous forest and woodlands type.

Forested Areas

The predominant vegetation-type is Ponderosa pine (89%). There is very little in the way of hardwoods (aspen <1%) or shrubs (<1%), and there are no areas of white spruce, and no significant riparian zones. In summary, the South project area is not

notably diverse in vegetation associations. For more information on effects to forest cover-types and structural stages, refer to the Silviculture section.

Late Succession

Affected Environment

Structural Stage 5 represents late-succession habitat in the Black Hills. This structural stage is characterized by very large trees (16”+ DBH) of at least 160 years in age. Late-succession Ponderosa pine may occur in dense stands but may also grow in open, ‘park-like’ stands. This structural stage is not automatically calculated by stand exam data, but rather is determined by field verification. In the South project area, there are three pine sites (133 acres) which were determined to be structural stage 5 by field verification.

ALTERNATIVE 1

Direct and Indirect Effects

Under Alternative 1 (No Action), there would be no direct effects to existing SS5 sites.

Indirect effects include increased potential for loss of these SS5 sites to a wildfire or insect infestation. Over time, barring a disturbance, this alternative would provide the most potential for development of SS5 as conifers become older and larger and these sites become more dense.

ALTERNATIVES 2 & 3

Direct and Indirect Effects

Under the Action Alternatives, direct effects to existing SS5 sites would occur from prescribed burning or understory improvement cutting.

Indirect effects to existing SS5 sites would include decreased potential for loss to a wildfire or insect infestation.

Harvest of mature trees in other sites would occur, which may both lessen or lengthen the time necessary to achieve a SS5 condition of very large trees (16”+ DBH) older than 160 years. Overstory removal treatments would remove all the mature overstory trees in a site and therefore move away from SS5. Other treatments which reduce the density of mature trees would allow for more rapid diameter growth to occur on residual trees and may hasten the development of SS5.

Dense, mature sites would be decreased under both of the action alternatives. Alternative 3 would treat fewer dense sites than Alternative 2. The proposed vegetation treatments would reduce fire hazard rating and insect susceptibility in treated sites.

Alternative 2

Understory prescribed burning is proposed in 97 of the 133 acres of late succession in South. This action would reduce pine understory and remove fuels which would reduce the risk of site loss to wildfire. Project design criteria includes an overstory mortality limit of 5% within late sucession sites proposed for burning. Individual trees or pockets of fire-caused mortality in the overstory could increase the site's value to cavity-nesting animals. Species that are not cavity dependent and prefer live overstory trees could see a decrease in site's habitat value.

No other activities are proposed within late succession stands in Alternative 2.

Indirect effects of treating areas surrounding these late-succession sites would be to lessen the potential for mountain pine beetle infestation or loss to large-scale wildfire. Ongoing and proposed mechanical and prescribed burning treatments would reduce the likelihood that insects and wildfire would consume these sites.

Alternative 3

Understory prescribed burning is the same as described in Alternative 2. However, prior to burning, one of these sites (52 acres) would receive IC treatment (improvement cut) to reduce non-commercial-sized storm-damaged trees and dense pine regeneration. This action would further reduce the potential for overstory mortality during burning or during a wildfire. None of the other late succession sites contain storm-damaged trees.

Indirect effects are the same as described in Alternative 2.

Cumulative Effects

Future silvicultural treatments or fuels-related activities not connected to this analysis are expected to be minor in scope and would likely not occur within these late succession sites.

There are no known late-succession sites on private lands in the project area. Cumulative effect would include a higher likelihood for persistence of the existing late-succession sites after implementation of an action alternative.

Snags

Affected Environment

Insects and other natural mortality factors have created standing dead trees (snags) in all diameter size classes, well distributed across the South project Area. The Jasper Fire of 2000 burned 1,758 acres within South, and snags still exist from this event. This assessment is based on ocular estimates made during wildlife field surveys. Mountain pine beetle (MPB) infestations are present, and currently 14,447 acres of pine habitat is considered at high risk for MPB infestation. High -risk sites are those pine stands that are designated as structural stages 3C, 4B, 4C and 5.

The 2006 Forest Monitoring Report states: "The addition of recent wildfires and insect tree mortality results in above 3 snags per acre well dispersed across the Forest." (USDA Forest Service, 2007). Therefore, Forest Objective 211 is being met. The South project area contributes to Forestwide snag density and Objective 211.

Currently there is a Forest-wide policy (Standard 2304) in effect which prohibits the cutting of standing dead trees except within specific designated areas. There are no designated areas for cutting of standing dead trees within the South project area. This policy is expected to remain in place for the foreseeable future.

ALTERNATIVE 1

Direct and Indirect Effects

This alternative allows forested sites within the South project area to remain as they are currently. The number of acres at high-risk for insect infestation would not be reduced, and would likely increase over time. Since these sites are more stressed and vulnerable to insect outbreaks and wildfire, snag density would be expected to increase. Existing populations of Mountain Pine Beetles in the area are expected to increase if sites are not treated. No large-diameter trees would be removed (harvested), and the number of large-diameter snags would be highest with the No Action alternative. There would also be no loss of snags as a result of timber harvesting (i.e. snags removed as safety hazards).

ALTERNATIVE 2

Direct and Indirect Effects

Alternative 2 does not propose to cut snags, unless they are a safety hazard. Therefore, standards 2301 and 2305 would be met. This alternative treats the most acres of all alternatives and opens up forest canopy in the treated sites. Insect risk and fire hazard would be greatly reduced, which reduces potential natural tree mortality. This alternative could result in a higher loss of snags than alternative 3

because more acres of commercial treatment are proposed in Alternative 2. Also, this alternative proposes 3,456 acres of overstory removals which would result in fewer large-diameter trees available to develop into large snags in the future. However, large diameter trees would be available in other portions of the project area which are not treated with overstory removal.

Prescribed burning (8,796 acres) could result in losses of existing snags, especially soft snags that are easily ignited. Project design criteria is included to protect soft snags during prescribed burning operations (see Appendix B), therefore, standard 2305 would be met. Soft snags with characteristics such as cavities and sloughing bark currently provide valuable wildlife habitat for birds, bats, and other small animals.

Prescribed burning is expected to both eliminate and create snags (Saab, et. al. 2007). However, where prescribed burning occurs after timber harvesting activities that have removed mature trees, there would be fewer large diameter trees to become snags, if killed by fire. Snags created by prescribed burning would, over time, develop the characteristics preferred by many species of wildlife. Project design criteria in Appendix B limits the amount of acceptable overstory mortality resulting from prescribed burning.

Overall, the density of hard snags within the project area is not expected to substantially change with this alternative. There would be losses as described above but, there would also be new snags created by natural means and prescribed burning.

ALTERNATIVE 3

Direct and Indirect Effects

This alternative would have less risk of loss of existing snags during commercial harvest than Alternative 2 since it treats fewer acres. The loss of some snags would occur as a result of being safety hazards. As described in Alternative 2, design criteria in Appendix B would reduce the potential for snag losses.

Alternative 3 proposes 2,133 more acres of prescribed burning than alternative 2, for a total of 10,929 acres. This additional burning is focused in MA5.1A (Southern Hills) where the desire to return to a more natural fire frequency is being proposed. Fire both eliminates and creates snags (Saab, et al. 2007).

Overall, the density of hard snags within the project area is not expected to substantially change with this alternative. There would be losses as described above but there would also be new snags created by natural means and prescribed fire.

Cumulative Effects

Past firewood cutting, timber harvest and fuels management activities have all contributed to losses of snag habitat. Fire, insects, weather and other causes of tree mortality continue to create snag habitat. Private (forested) lands within the project area generally have few snags since they are often removed as safety hazards. Wildfire hazard and risk of insect mortality would be reduced as a result of the proposed actions, therefore snags created by related natural tree mortality would be reduced.

No adverse cumulative effect to existing snags is expected because all alternatives would retain snags unless they are a safety hazard, consistent with Forest Plan Standard 2301. Prohibition of cutting of standing dead trees for fuelwood, except in designated areas (Standard 2304) would not be changed by the South project. Prescribed burning would be expected to both eliminate and create snags.

Given the expected structural stage distribution, existing snag densities and large numbers of mature trees that would remain, none of the alternatives would be expected to affect achievement of Forest Plan Objective 211.

Shrubs

Affected Environment

In general, there are limited shrubs within the Project Area. Four shrub vegetation sites (23 acres total) are identified within the Forest's vegetation database. These sites are typed as western snowberry (*Symphoricarpos occidentalis*). The sites are located in draws surrounded by pine forested areas. Western snowberry has good forage value for big game, and the fruits provide food for birds and small mammals. Snowberry also provides cover for turkeys and other wildlife.

There is some mountain mahogany located in the south-western portion of the project area. It is considered a component of the understory within pine sites. Common juniper is also present at scattered locations. See the silviculture section for further discussion of juniper.

ALTERNATIVE 1

Direct and Indirect Effects

No direct effects to shrubs would occur. Conifers would slowly encroach into shrub sites. This alternative would be expected to have a neutral to slightly negative effect on shrubs.

ALTERNATIVES 2 & 3

Direct and Indirect Effects

Conifer removal within and adjacent to existing snowberry sites would be expected to have a beneficial effect by reducing competition. Shrubs in general would be expected to increase gradually if conifer tree competition were reduced. Prescribed burning would be expected to rejuvenate shrubs such as mountain mahogany.

Cumulative Effects

No adverse cumulative effects on shrubs are anticipated from any alternative. The benefits of Alternatives 2 and 3 would likely be slow in producing measurable results.

Meadows

Affected Environment

Within the South project area, 11% (4,727 acres) of the National Forest lands are classified as a 'grass' cover type. Projects to remove pine from meadows have occurred in the past and there is still a need to do more of this treatment in some meadow and grassland sites.

The South Dakota Game, Fish and Parks Department owns 1,197 acres designated a Game Production Area within South. The majority of this property is meadow and is managed to provide big game forage. It is located along Pleasant Valley road (FSR #715) approximately 12 miles south of Highway 16.

Refer to the silviculture section for further discussion of meadows.

Riparian Habitat

Affected Environment

Riparian habitat is present around some springs and along a portion of Lightning Creek that feeds an old CCC (Civilian Conservation Corps) dam. This location is between vegetation (RIS) site numbers 31010-07, 39 and sites 31003-12, 19, 25.

ALTERNATIVE 1

Direct and Indirect Effects

Since there would be no vegetation treatments, there would be no potential for disturbance to riparian areas.

ALTERNATIVES 2 & 3

Direct and Indirect Effects

Sites adjacent to the Lightning creek riparian area contain proposed vegetation treatments. Design criteria is included to protect the riparian habitat (see Appendix B).

Presence of sensitive species within this riparian area has not been confirmed therefore the conservative approach of application of design criteria to satisfy FP Standard 3106 is warranted. Requiring application of design criteria eliminates the potential for direct and indirect impacts to the riparian area from vegetation treatments.

Cumulative Effects

No activities are proposed within any riparian areas so there would be no direct or indirect effects, and therefore no cumulative effects resulting from implementation of any alternative.

Management Indicator Species (MIS)

The Phase II Amendment to the 1997 Forest Plan-FEIS (USDA Forest Service, 2005) lists MIS to be considered during project-level planning. MIS species were selected from that list for analysis if they have habitat or populations present within the South Project Area (Table 3.47). Some MIS species have other status (such as R2 sensitive), and additional analyses are provided for them in the South Biological Assessment/Biological Evaluation (BA/BE), which is summarized in Appendix D.

Four of the nine Forest MIS were selected for analysis for the South project. This was based on whether the South project could affect habitat or populations (see Table 3.47), these are: **white-tailed deer, black-backed woodpecker, brown creeper, and grasshopper sparrow**. The remaining Forest MIS species were not selected because the South project area does not provide suitable habitat for these species. Proposed project activities would not have any affect (positive or negative) on these species or their habitat. MIS not selected: ruffed grouse (aspen), beaver (riparian), song sparrow (willows-riparian), mountain sucker (streams), and golden-crowned kinglet (spruce). There are very limited opportunities to increase habitat for these species in the South project area. The South project area is a dry, southern Hills Ponderosa pine habitat type.

Table 3.47 MIS List and Rationale for South Project-Level Analysis

Species	Analyzed in Rep.	Rationale	Habitat Description
Beaver (Castor canadensis)	NO	There are no active beaver colonies in the South Project Area	Large rivers and lakes down to streams, marshes and small lakes with seepage/weak flows adequate for damming and suitable woody vegetation (Higgens et al. 2000).
White-tailed deer (Odocoileus virginianus)	YES	Species was observed throughout the Project Area.	Very adaptable species that can live in almost any habitat. In South Dakota, this includes grasslands, wetlands and woodlands (Higgens et al. 2000).
Golden-crowned kinglet (Regulus satrapa)	NO	There is no spruce vegetation. This species is not known to occur in the Project Area.	Found almost exclusively in white spruce habitat but occasionally present in habitats with a spruce component (Panjabi 2003).
Grasshopper sparrow (Ammodramus savannarum)	YES	Prairie habitat limited to most southern portion of the project area. RMBO (2005) found the species just outside the project boundary.	Found almost exclusively in native mixed-grass prairies (Panjabi 2003).
Black-backed woodpecker (Picoides arcticus)	YES	Species was observed occasionally foraging in stands of various stand densities.	Burned areas with a high density of pre-burn snags; dense and/or mature forests with a high snag density (Anderson 2002, Panjabi 2003).
Brown creeper (Certhia americana)	YES	Species was observed or heard on a few occasions throughout the Project Area in ss5, and 4C pine sites.	In the Black Hills, white spruce and late-successional pine appears to be the most important habitat type for this species (Panjabi, 2003).
Ruffed grouse (Bonasa umbellus)	NO	Not known to occur in the project area. Areas of aspen are insufficient for this species.	Variable aged aspen stands, other hardwood/conifer mix forests provide habitat. Winter habitat is almost exclusively aspen (DeGraaf et al. 1991, Tallman et al. 2002).
Song sparrow (Melospiza melodia)	NO	There is minimal riparian habitat in the Project Area.	Streamside thickets, particularly shrubby willows, are required for habitat. Occasionally found in adjacent spruce habitat (Panjabi 2003).
Mountain sucker (Catostomus platyrhynchus)	NO	There is no suitable fish habitat in the project area.	Large rivers, lakes, reservoirs, prairie streams but most often in cool, clear, moderately swift mountain streams with mud, cobble, or boulder substrate (Isaak et al. 2003).

Monitoring of MIS is accomplished through coordinated efforts involving US Forest Service biologists, researchers, contracted monitoring surveyors and State agencies. Forest monitoring of land bird species is accomplished currently by a contract with the Rocky Mountain Bird Observatory (RMBO). Game species (e.g., white-tailed deer) are monitored by a combination of research by SDSU, SDGFP biologists and reported observations. The Forest Plan monitoring reports (2001-2007) summarize the best available population and habitat information from available sources.

White-tailed Deer (MIS)

Affected Environment

An important limiting factor for white-tailed deer in the Black Hills may be a lack of desirable hardwoods and shrubs for food, and cover habitat (DePerno et al. 2002). For example, DePerno (2002) found that in winter, white-tailed deer in the central Black Hills selected forested habitat with shrubs 1.5 to 4.7 times more frequently than shrub habitats occurred on the Forest. Stefanich (1995) found that hardwood stands which provided abundant forage, combined with screening cover, were the best predictors of white-tailed deer diurnal summer use.

While Uresk and Severson (1998) found that open-canopy conditions are necessary to foster understory shrubs, it is also known that white-tailed deer utilize dense forested areas. Therefore, the Science Application International Corporation (SAIC, 2003) memorandum recommendations for deer (fall and winter) stated that it was important to ensure adequate cover adjacent to foraging sites.

White-tailed deer move to low-elevation winter range from October to January depending upon snow and forage conditions (Stefanich 1995, Griffin et al. 1999). Black Hills white-tailed deer populations have steadily increased in recent years from an estimated population of 28,000 in 1999 to 50,000 in 2005 (Huxoll 2006). Habitat trend at the Forest-level suggests that summer habitat has increased while winter habitat has remained relatively stable to slightly decreasing (USDA, Forest Service 2007). Forest-level monitoring data suggests habitat is not limiting population growth of deer and the Forest is meeting Objective 238a.

While white-tailed deer habitat in the South project area lacks the hardwoods and shrubs considered important for providing high quality habitat. Despite this, deer are found year-long throughout the project area. Since snow depth is rarely a limiting factor, white-tailed deer can find forbs and grasses sufficient for survival in winter.

Past timber harvesting and other vegetation management activities have opened up many timbered stands and these actions have provided some benefit towards the growth of herbaceous vegetation, shrubs and the few hardwoods present in the project area.

Road density can also affect deer habitat. Roads-beds directly reduce habitat and increased vehicular volume indirectly degrades habitat. Forest Plan Guideline 3203 gives guidance for providing ‘screening habitat’ to provide escape cover for deer along arterial and collector roads. See Table 3.48.

Table 3.48 Big-Game Screening Cover by Arterial/Collector Road

Road Name	Road miles with screening cover potential[a]	Road miles currently providing screening cover	% of road miles providing screening cover (existing condition)
Lightning Creek (288)	8.8	5.9	66%
Pleasant Valley (715)	9.0	5.8	64%
Pass Creek (273)	8.4	6.4	76%
Stagg Road (653)	3.8	1.9	50%
North Pole Road (287)	3.4	2.4	70%
Warren Gulch (665)	6.8	3.4	50%
Martin Draw (310)	3.6	2.3	64%
Loring Siding (316)	2.1	1.9	90%
Hopkins Flats (315)	1.5	1.2	80%
S&G Canyon Road (725)	7.2	3.6	50%
Griffis Canyon Road (307)	12.2	6.7	55%

[a]Potential only includes that portion of the road within or facing into forested portions of the project area on National Forest. Does not include roads miles through or adjacent to private/state lands, or road miles through large open meadows since screening cover is based on a 200 ft distance from the edge of the road.

At this time the South project area exceeds required screening cover along arterial and collector roads, exceeding Guideline 3203. Design criteria in Appendix B will ensure continued existence of screening cover. Existing seasonal road closure areas (in MA 5.4) allow deer to forage undisturbed by vehicles and humans during critical winter months (December 15-May15).

ALTERNATIVE 1

Direct and Indirect Effects

Since no timber harvest would occur, pine sites would be expected to become more dense and cover habitat to become more abundant. Foraging habitat would likely be reduced as pine encroachment into meadows, shrub areas, and hardwood sites would be left untreated. This alternative would increase the likelihood of wildfire hazards, as well as the risk of insect-related (pine beetle) tree mortality. While these natural processes would be expected to enhance foraging habitat in the project area, they would also remove cover habitat. Open road density would remain at current levels.

ALTERNATIVE 2

Direct and Indirect Effects

Overall, this alternative would result in a reduction of SS 4B and 4C and an increase in SS 2 and 4A. SS 4B and 4C would provide cover for white-tailed deer in the area. These sites are proposed for treatments such as commercial thinning, seedcut and overstory removals. SS 2 would increase due to overstory removal treatments. Structural stage 2 would increase to 3,005 acres, from 561 acres in the existing condition. SS 4A would increase to 23,554 from 10,500 acres in the existing condition. SS 4B would decrease from 9,454 acres to 1,259 acres. SS 4C would decrease from 2,342 acres existing to 1,246 acres post-harvest. Structural stage 5

(133 acres) would remain unchanged. By increasing SS 4A acreage, completing pine encroachment, hardwood release, and harvesting in general, forage production (grasses, forbs and shrubs) for white-tailed deer would increase.

This alternative would increase early successional vegetation stages, which would provide more forage and hiding/fawning cover. Past declines in deer populations have been attributed to a decrease in early successional stages and an increase in pine-dominated communities (DePerno 1998, Griffin et al. 1999).

Proposed activities may cause short-term displacement of individual animals from sites where activities occur. However, activities would not occur over the whole area at the same time. There would continue to be ample area without disturbance which is available to big game species. The proposed reduction of open roads would improve habitat security for white-tailed deer.

ALTERNATIVE 3

Direct and Indirect Effects

This alternative would also result in a reduction of SS 4B and 4C and an increase in SS 2 and 4A. Structural stage 5 (133 acres) would remain unchanged. SS 4A, pine encroachment treatments, hardwood release, and harvesting in general would increase forage production (grasses, forbs and shrubs) and hiding/fawning cover for white-tailed deer.

Alternative 3 would close roads adjacent to the South Dakota State property which is managed for big game production. This would result in improved big game security and habitat. As with Alternative 2, proposed activities may cause short-term displacement of individual animals during activities, but areas without disturbance would still be available for big game.

Cumulative Effects

The No Action Alternative (Alternative 1) would not result in adverse cumulative effects as no direct or indirect effects would occur.

Alternatives 2 and 3 propose vegetative treatments and prescribed burning that is expected to increase foraging opportunities and be the most beneficial for providing forage for this species in the long-term. The amount of (thermal) cover habitat would be reduced for the foreseeable future.

Many private land in-holdings in South are currently used for summer livestock grazing and the grass is considered livestock forage. Some of these in-holdings are being developed for residences. Roads on and to private lands contribute to wildlife disturbance levels.

The state of South Dakota (SDGF&P) owns 1,197 acres of grassland habitat within the South Project Area. This area is designated a Game Production Area to provide big game forage habitat. Road closures in Alternative 3 would increase security habitat for big game which utilize this game production area.

Past fires have produced areas of forage and have decreased cover. Pine insects continue to kill trees, which opens up the canopy and encourages the growth of pockets of forage for white-tailed deer.

Foreseeable future activities within the project area that may alter white-tailed deer cover and forage include thinning, prescribed burning, and pine encroachment removal. Most of these activities are associated with the recently-closed Martin timber sale, and recent fuels-reduction projects. For a list of activities, refer to Appendix E.

The proposed activities described in the action alternatives would help increase white-tailed deer winter forage habitat but would reduce deer cover habitat (summer and winter) in the project area. Therefore it is not expected that the action alternatives would contribute positively to the Forestwide winter (cover) habitat trend. However, the analysis completed for the Phase II Forest Plan amendment concluded that there would be adequate habitat for maintaining viable populations of white-tailed deer (page III-298, USDA Forest Service 2005) by following Forest Plan standards and guidelines and moving toward Forest Plan objectives. The South project would be consistent with the Forest Plan and therefore, white-tailed deer are likely to persist.

State of South Dakota deer harvest management will continue to be one of the factors that affect the population of white-tailed deer in the Black Hills

Grasshopper Sparrow (MIS)

Affected Environment

The grasshopper sparrow is selected as an MIS to evaluate the effects of Forest Plan implementation and natural change on the ability of grasslands to support characteristic grassland species that rely on a variety of grassland conditions to meet their needs. It was selected for this project because of species presence and potential effects of proposed prescribed burning on this bird's habitat.

The grasshopper sparrow is found in a variety of open grassland types, but appears to be area sensitive, preferring grasslands >20 acres in size (Slater 2004). They may select larger patches to avoid predation associated with edge habitats (Slater 2004). In South Dakota, they are primarily found in mixed-grass prairies and avoid habitats where vegetation is less than 4 inches tall (Slater 2004). They require some areas of bare ground for foraging and some taller vegetation (tall grasses, forbs, or scattered

shrubs) for singing perches (Slater 2004). Grasshopper sparrows can be locally abundant in some prairies, especially where there is a greater proportion of tall grass (Panjabi 2005). They typically avoid areas with more than 35 percent shrubs, but will tolerate some scattered trees. This species nests on the ground, usually at the base of a clump of vegetation.

Breeding Bird Survey (BBS) data shows an average decline of 3.7 percent per year in the US for Grasshopper sparrows between 1966 and 2005. In South Dakota and the Black Hills, the declines are 4.7 percent and 4.8 percent per year for the same 39-year period, respectively (Sauer et al. 2005). Population declines have been attributed to the loss of habitat by urbanization, conversion of native grasslands to croplands, and intensive livestock grazing (Slater2004). Grasshopper sparrows have been monitored on the Black Hills since 2002 in cooperation with the RMBO (Panjabi 2003, 2005). It occurs widely in native mixed-grass prairies in the southern Black Hills and locally further north in the central Black Hills (Panjabi 2005). This species has also been observed in the Jasper Fire Area. Monitoring suggests an upward Forest-wide population trend between 2002 and 2004. (USDA Forest Service, 2007)

There are 4,727 acres (10 percent) of the South Project Area classified with a 'grass' vegetation type. Grasshopper sparrows generally prefer large grassland patches (Johnson and Igl 2001). This species has been observed in the larger grassland areas located in the southwestern portion of the project area. Habitat trend at the Forest-level appears to be increasing; the vegetation database shows an increase in grassland cover types since 1997 (USDA Forest Service, 2007). Projects across the forest have been emphasizing meadow and grassland restoration through removal of encroaching pine. Activities that enhance meadow/grassland habitat are proposed in the South project.

ALTERNATIVE 1

Direct and Indirect Effects

There would be no direct effects to this species as no activities would occur under this Alternative. Indirect effects include pine encroachment into meadows. The potential for a large-scale, high-intensity wildfire would be highest of all alternatives. Such a fire would be expected to have a beneficial effect for this species because meadow habitat would be created.

ALTERNATIVE 2

Direct and Indirect Effects

This alternative proposes to remove encroaching pine from 3,070 acres of meadow habitat and conduct prescribed burning on 8,796 acres. These activities would benefit this species. Design criteria in Appendix B requires that the large meadows be

burned only in the Fall to avoid possible impacts to nesting grasshopper sparrows in the Spring. Burning would improve habitat for the sparrow.

Treatments in surrounding pine sites would reduce the potential for large-scale natural disturbances and consequently reduce potential for creating additional meadow habitat

This action alternative would contribute toward meeting Forest Plan Objective 238a.

ALTERNATIVE 3

Direct and Indirect Effects

This alternative proposes the same amount of pine encroachment removal as Alternative 2. Alternative 3 proposes prescribed burning on 2,133 more acres than Alternative 2. Since this additional prescribed burning is located in the southern portion of the project area, it has greater potential to improve grasshopper sparrow habitat than Alternative 2.

This action alternative would contribute toward meeting Forest Plan Objective 238a.

Cumulative Effects

The No Action alternative would not have adverse cumulative effects on this species as no direct or indirect effects would occur. Insects and wildfires would eliminate tree cover in the southern Hills, which could improve grassland habitat, the grasshopper sparrows' preferred niche. The potential for large-scale, high-intensity events that create open, grassland habitat would be higher with the No Action alternative compared to the action alternatives.

The large grasslands within the South project area are limited to the extreme southwest corner. Proposed vegetation management in the action alternatives would focus on Ponderosa pine stands. Past timber harvesting and prescribed burning have likely improved habitat for this species, and large-scale wildfires (Jasper fire) have increased grassland habitat. No future projects are known that would reduce habitat for this species.

The state of South Dakota (SDGF&P) owns 1,197 acres of grassland habitat within the South Project Area. This area is designated a Game Production Area to provide big game forage habitat. It may also provide habitat for the grasshopper sparrow.

The Forest's vegetation database shows increased acres of Black Hills grassland cover types since 1995. Projects across the Forest have been emphasizing meadow and grassland restoration through removal of pine encroachment. Some of this,

particularly pine removal on the periphery of prairies, is likely contributing to an increased habitat trend for the grasshopper sparrow (USDA Forest Service, 2007).

The proposed treatments associated with the action alternatives, using project design criteria from Appendix B, would be expected to maintain or enhance habitat for the grasshopper sparrow. A beneficial effect would be expected.

Black-backed Woodpecker (MIS and R2 sensitive species)

Affected Environment

Black-backed woodpeckers inhabit coniferous forests throughout their range, especially recently burned or beetle-killed areas where insects are abundant (USDA Forest Service, 2000). In the Black Hills, black-backed woodpeckers are associated with Ponderosa pine habitats that have high populations of their main prey: the larvae of wood-boring beetles, engraver beetles and bark beetles (Anderson 2003). Black-backed woodpeckers are cited to prefer dense, mature pine stands with a canopy cover greater than 70 percent (i.e.structural stage 4C) over more open stands (Mohren 2002); however, they are also adept at using the foraging and nesting opportunities provided by large-scale-fire and insect-caused-tree-mortality. Monitoring results showed this species is most likely to be found in burned landscapes compared to other habitat types in the Black Hills (Panjabi 2001, 2003, 2005; Beason et al. 2006). They also occur at lower densities throughout the remainder of the unburned Forest (Mohren 2002, Panjabi 2001, 2003, 2005).

The Jasper fire of 2000 burned approximately 1,758 acres within the northwestern portion of the project area. This 83,000-acre wildfire provided vast acreages of burned trees. A study conducted in the Jasper Fire Area found that these woodpeckers selected areas with high snag densities and avoided areas with low snag densities (e.g., salvage-logged areas) (Vierling, 2004). Nest trees are usually hard snags >15” DBH, but they will nest in smaller snags >9” DBH (Saab and Dudley 1998; USDA Forest Service, 2000). Bonnott (2006) found that the probability of an area being selected for nesting increased with increasing densities of all snags, and the mean nest-tree diameter selected was 25.2cm (10”dbh).

Observations from Rocky Mountain Bird Observatory (RMBO) monitoring data showed a nearly eight-fold increase in black-backed woodpeckers using burned areas from 2001 to 2002 (Panjabi 2001, 2003; USDA Forest Service 2004a). More recent monitoring data reveals that populations are returning to more endemic levels (USDA Forest Service, 2007). Beetle activity within the South project area is at endemic levels and provides forage for the black-backed woodpecker.

The black-backed woodpecker is present in the project area. The species was observed occasionally in various locations during general habitat surveys. All observations were of the bird foraging in trees affected by Mountain Pine Beetle.

These beetle-affected areas varied in size from less than an acre to over 10 acres and were scattered throughout the project area. Non-burned habitat for this species (SS4C pine) in the South project area totals 2,342 acres or 6% percent of the total Ponderosa pine habitat.

ALTERNATIVE 1

Direct and Indirect Effects

This alternative would allow natural successional changes to occur in vegetation, which means that dense sites of pine would be more susceptible to wildfire and to insect attack. Insects would provide food for woodpeckers, and trees killed by insects or fire would provide snags for nest sites. This alternative would provide for the greatest potential increase in black-backed woodpecker habitat over time.

ALTERNATIVE 2

Direct and Indirect Effects

Treatments included in this alternative are designed to thin overstocked tree stands by harvesting commercial and non-commercial-sized trees. This creates more open stands that are less susceptible to wildfire and insects. It reduces the total acres of dense stands and the number of mature (>9” DBH) trees. Treatments may disturb nesting woodpeckers if harvest occurred during the nesting season.

Under this alternative, the resulting acreage of SS 4C pine would be 1,246 acres, a 46% reduction. Structural stage 4B would be reduced to 1,259 acres, an 87% reduction. The majority of these pine sites would be thinned to a 40BA, which would retain some mature trees. The 3,456 acres proposed for overstory removal harvest would not retain mature trees. These treatments are not expected to improve habitat for the black-backed woodpecker, they are designed to open the canopy, remove ground fuels and reduce the risk of tree mortality from fire and insects. Structural stage 5 acreage would remain the same as existing (133 acres).

IC (Improvement Cut) understory thinning is proposed for 963 acres. This prescription would remove storm-damaged trees in order to thin ladder fuels and enhance the understory vegetation while retaining the overstory and the generally dense forest condition. This treatment would benefit the black-backed woodpecker long-term by improving vegetation vigor and reducing likelihood of wildfire within SS4C habitat.

Existing snags not considered safety hazards would remain (Standards 2301, 2305). Proposed fuel treatments (thinning, prescribed burning) have the potential to decrease existing snag habitat. Prescribed burning would be expected to both eliminate and create snags. See design criteria in Appendix B related to prescribed burning and

snags. Standard 2304 *(prohibit cutting of standing dead trees for fuelwood except in designated areas)* would be utilized to reduce snag loss. Proposed road closures would likely reduce snag losses related to illegal cutting of standing dead trees (snags).

ALTERNATIVE 3

Direct and Indirect Effects

This alternative would retain some additional mature trees when compared to Alternative 2 since the desired residual stand density would be slightly higher (60 BA). This could mean that there may be additional mature trees that would later provide foraging and nesting habitat for this species.

Treatments included in this alternative are designed to thin overstocked tree stands by harvesting commercial and non-commerical-sized trees. This would create more open stands that would be less susceptible to fire and insect effects. It would reduce the total acres of dense stands and the number of mature (>9” DBH) trees. Treatments related to this alternative may disturb nesting woodpeckers if harvest occurred during the nesting season.

Under this alternative, the resulting acreage of SS 4C pine would be 1,224 acres. Existing is 2,342 acres. Structural stage 4B would be reduced to 2,390 acres from 9,454 acres. The 3,441 acres proposed for overstory removal harvest would not retain mature trees. These treatments are not targeting improvement of habitat for the black-backed woodpecker, they are designed to reduce the hazards associated with wildfire by opening the canopy and managing ground fuels. Structural stage 5 acreage would remain the same as existing (133 acres).

IC (Improvement Cut) understory thinning is proposed for 3,317 acres. This prescription would remove storm-damaged trees that create ladder fuels. The treatment would reduce fire hazard and insect risk while retaining the overstory. The remaining dense, mature forest condition would benefit the black-backed woodpecker for the foreseeable future.

Existing snags not considered safety hazards would remain (Standards 2301, 2305). Proposed fuel treatments (thinning, prescribed burning) have the potential to decrease existing snag habitat. Prescribed burning would be expected to both eliminate and create snags. See design criteria in Appendix B related to prescribed burning and snags. Standard 2304 *(prohibit cutting of standing dead trees for fuelwood except in designated areas)* would be utilized to reduce snag loss. Proposed road closures would likely reduce snag losses related to illegal cutting of standing dead trees (snags).

Cumulative Effects

Under the No Action Alternative, lack of harvesting or prescribed burning would increase the potential for large-scale disturbances such as wildfire and insect-related tree mortality, which can be beneficial for this species.

No snags would be cut in the action alternatives, unless they are deemed a safety hazard. Prescribed burning both eliminates and creates snags (Saab, et al. 2007). Therefore, there would be no effects on existing snag densities. Standard 2304 would prohibit the cutting of snags for firewood (unless in designated areas). No designated fuelwood gathering areas are proposed in the South project.

Past timber harvest removed mature trees and thinned pine stands. This project would conduct similar timber management activities. However, natural succession and tree growth, coupled with fire suppression is expected to replace these dense stands, and mature, large-diameter trees would continue to occur in the future in both untreated and treated areas.

There are several foreseeable future activities on National Forest that may impact black-backed woodpecker cover and forage within and adjacent to the project area. These activities include thinning and prescribed burning. Most activities are associated with the recently-closed Martin timber sale or recent fuels-reduction projects. See Appendix E for a listing of projects.

The analysis completed for the Phase II Forest Plan amendment concluded that there will be adequate habitat to maintain breeding populations well distributed on the Forest (page III-246, USDA Forest Service, 2005). The determination in the effects analysis was based on the assumption that conservation objectives and protective standards and guidelines would be applied or implemented as described. This alternative would follow Forest Plan standards and guidelines to reduce snag loss at the project level. Across the Forest, breeding populations are expected to decline from the high levels seen a few years after the Jasper fire. However, abundance is expected to exceed levels which would lead to any concern for viability. Overall, habitat is relatively abundant, and it appears that Objective 238b is being met (USDA, Forest Service, 2007). Black-backed woodpeckers are likely to persist on the Forest (USDA Forest Service 2005a, and 2006b).

Objective 11-03 references stand-replacing fire acreage, however it also includes insect-caused stand-replacing tree mortality *(retain 50% of the recent stand replacing fire/insect acreage, up to 10,000 acres Forest-wide).* For a 5-year period (2001-2005) in the Black Hills 10,456 acres were considered high-intensity (stand-replacing) burned acres. The tree mortality from insects for the same period was estimated at 100,000 acres for a total of 110,456 acres. There were 3,140 acres of this fire and insect damage salvaged. Therefore, well over 100,000 acres of habitat, as described in Objective 11-03 (USDA Forest Service, 2006), is currently available.

The 2006 Forest Monitoring report lists 866 total acres burned in 2006, well below the Forest average. The Pass Creek fire (Hell Canyon District and west of the South project area) accounted for 73% (633 acres) of the total acres burned on the Forest. 160 of these acres were severely burned ponderosa pine and 0 acres were salvaged (USDA Forest Service, 2007). The Forest Plan monitoring report (USDA Forest Service, 2007) shows that Objective 211 is being met, which infers that habitat is available for this species Forest-wide.

Brown Creeper (MIS)

Affected Environment

The brown creeper is found most abundantly in mature, late-succession coniferous and mixed coniferous-deciduous forests. The preferred nesting habitat for this species is mature, late-succession forest that is undisturbed and contains a closed canopy (Hejl et al. 2002, Wiggins 2005). Nests are constructed in the bark cracks and folds of large-diameter (>20" DBH) Ponderosa pine. This small forest bird occurs in low abundance throughout the Black Hills and is associated with mature and late-succession forest conditions. Results from monitoring data identify white spruce and late-succession pine as the most important habitat types for this species (Panjabi 2001, 2003, 2005). Dead or decaying trees and snags provide substrate for nests and foraging.

This bird is considered an uncommon permanent resident of the Black Hills (Tallman et al. 2002), largely tied to late-succession pine and white-spruce habitats (Panjabi 2003, 2005). Breeding Bird Survey (BBS) data shows an average decline of 0.8 percent per year in the US for brown creepers between 1966 and 2005. In South Dakota and the Black Hills, the species has actually increased at a level of 39.7 percent and 39.9 percent for the same 39-year period, respectively (Sauer et al. 2005). In the Black Hills, habitat-specific density estimates were 14.1 birds/km^2 for late-succession Ponderosa pine forest (i.e., structural stage 4C and 5)(Panjabi 2005). The Forest-wide habitat trend is stable, as determined by comparing acres of preferred habitat available in 2006 with that in 1995, (USDA, Forest Service 2007).

This species was observed a few times during field visits in sites of structural stage 4C pine. In 2005, RMBO also observed brown creepers within the project area (Beason et al. 2006). The distribution and abundance of brown creepers appears to be closely tied to the availability of mature and late-succession stand conditions, as evidenced by the fact that 96% and 90% of all brown creeper observations in 2002 and 2003 respectively, were recorded at sites where the surrounding habitat was classified as either structural stage stage 4C or 5 (Panjabi 2003,2004). Monitoring results on the Black Hills indicate that the density of brown creepers is twice as high in late-succession pine as in other habitat types (Panjabi 2001). Spruce is the second most frequently used habitat type but there is no white spruce habitat in the project area. The South project area currently provides 2,475 acres in pine habitat structural

stages SS4C, and SS5, and approximately 428 acres of pine stands in the project area are in the very large size class.

ALTERNATIVE 1

Direct and Indirect Effects

Alternative 1, No Action, is the preferred alternative for the brown creeper. This alternative results in the most acreage of dense, mature (SS4C) and late-succession pine (SS5). No change to existing brown creeper habitat would occur in the short-term with this alternative. Over time and in the absence of disturbance, trees within mature pine sites would become larger and sites would become more dense, which is more preferred habitat for brown creepers than SS 4A, or smaller-diameter pine sites. As mature stands of Ponderosa pine become more dense, they consequently become more susceptible to large-scale wildfire and insect infestation. This alternative presents the highest potential for losses of preferred brown creeper habitat due to wildfire or MPB-caused mortality.

There are currently 428 acres of Ponderosa pine in the “Very Large” size category (15+ inch DBH). Numbers of snags would be expected to increase based on increased potential for natural disturbance-caused mortality.

ALTERNATIVE 2

Direct and Indirect Effects

No treatment would occur in the 133 acres of structural stage 5 sites. Therefore, this habitat would continue to be available to the brown creeper.

Alternative 2 would treat approximately 79% of the mature pine sites (SS 4B and 4C) currently existing within the project area. The proposed treatments would reduce the overall acres of preferred habitat and potential habitat by decreasing the density of pine sites. These decreases in dense and moderately-dense mature pine sites would likely negatively impact brown creeper habitat. These acres would move to a SS 4A (40 or 60 BA) open-forest condition. Dense (4C) and moderately dense (4B) pine stands (potential habitat) would be reduced to 2,505 acres. This decrease in structural stages 4B and 4C would impact the acreage of brown creeper habitat within the project area for the foreseeable future.

ALTERNATIVE 3

Direct and Indirect Effects

No treatment would occur in the 133 acres of structural stage 5 sites. Therefore, this habitat would continue to be available to the brown creeper.

Alternative 3 would treat approximately 70% of the mature pine sites (SS 4B and 4C) currently existing within the project area. The proposed treatments would reduce the overall acres of preferred habitat by decreasing the density of pine stands. These decreases in dense and moderately-dense mature pine stands would impact brown creeper habitat for the foreseeable future. Dense (4C) and moderately dense (4B) pine stands (potential habitat) would be reduced to 3,614 acres.

The effect regarding overall habitat suitability and availability for the brown creeper is similar to Alternative 2. However, the 60 sq.ft/acre BA commercial thinning target in Alternative 3 would provide slightly more canopy, and additional mature trees, which is preferred by this species, when compared to the 40 sq.ft/acre BA target in Alternative 2

Any vegetation treatments and/or post-harvest projects proposed under all action alternatives could cause displacement of individual birds. Nesting birds may be disturbed if harvest occurs during the nesting season. This impact is expected to be short-term.

Cumulative Effects

The No Action alternative would not have adverse cumulative effects on this species as no direct or indirect effects would occur.

The action alternatives would reduce 4B and 4C pine stands.

Since wildfires can reduce habitat if they become stand-replacing events, the proposed vegetation treatments (including thinning, prescribed burning) would aid in the reduction of the likelihood of wildfires and insect-caused tree mortality, and help maintain the remaining dense, mature and late-succession stands for this species.

Past timber harvest treated SS4C habitat, reducing dense canopies and the potential number of future large-diameter snags. This project would also reduce dense, mature pine stands. Natural succession and tree growth, coupled with fire suppression is expected to replace these dense stands and large-diameter trees long-term.

Five years of *Monitoring Birds of the Black Hills (RMBO)* data suggests that the brown creeper is well distributed throughout the Black Hills. The Forestwide habitat trend (1995 and 2006 data comparison) is stable (USDA Forest Service, 2007). Progress is being made towards the (management area) structural stage Objectives, therefore it appears that Objective 238a is being met. Efforts to promote and designate Structural Stage 5 (USDA Forest Service, 2007) would likely benefit this species.

The analysis completed for the Phase II Forest Plan amendment concluded that there will be adequate habitat for maintaining viable populations of brown creeper (USDA

Forest Service, 2005). This alternative would follow Forest Plan standards and guidelines and move toward Forest Plan objectives. Therefore, brown creepers are likely to persist on the Forest.

SPECIES OF LOCAL CONCERN (SOLC)

Black Hills Supplement "r2_bh_2600-2005-1" to Forest Service Manual 2600 became effective November 2005 and provides direction for the management of SOLC (USDA, Forest Service 2005c). As defined by this supplement, a species of local concern is a plant, fish or wildlife species (including subspecies or varieties) that does not meet the criteria for sensitive status. These could include species with declining trends in only a portion of R2, or those that are important components of diversity in a local area. The local area is defined as Forest Service lands within the Black Hills National Forest. The supplement also provides a detailed explanation of the evaluation criteria used to select species of local concern and a current list for the Black Hills National Forest (USDA, Forest Service 2005c). Table 3.49 lists potential SOLC for the Black Hills and whether or not they are included in the analysis for this project area.

Table 3.49 SOLC List and Rationale for South Project Analysis.

Species	Species Presence Known?	Habitat Present? (Y/N)	Included in document? (Y/N)	Rationale for NOT carrying species forward into the NEPA document
Atlantis fritillary (Speyeria atlantis pahasapae)	NO	NO	NO	Surveys failed to detect this species in project area. Preferred habitat (spruce) not present.
Tawny crescent (Phycoides batesii)	NO	YES	YES	
Callused vertigo (Vertigo arthuri)	YES	YES	YES	
Mystery vertigo (Vertigo paradoxa)	YES	YES	YES	
Frigid ambersnail (Catinella gelida)	NO	NO	NO	Surveys failed to detect species, habitat lacking.
Striate disc (Discus shimekii)	YES	YES	YES	
Sharp-shinned hawk (Accipiter striatus)	NO	YES	YES	
Cooper's hawk (Accipiter cooperi)	YES	YES	YES	

Species	Species Presence Known?	Habitat Present? (Y/N)	Included in document? (Y/N)	Rationale for NOT carrying species forward into the NEPA document
Broad-winged hawk (Buteo platypterus)	NO	NO	NO	There is no preferred nesting habitat.
Northern saw-whet owl (Aegolius acadicus)	YES	YES	YES	
Pygmy nuthatch (Sitta pygmaea)	NO	YES	YES	
American dipper (Cinclus mexicanus)	NO	NO	NO	There is no suitable habitat in the project area.
Black and white warbler (Mniotilta varia)	NO	NO	NO	There is no deciduous-riparian habitat.
Northern long-eared myotis (Myotis septentrionalis)	YES	YES	YES	
Small-footed myotis (Myotis ciliolabrum)	YES	YES	YES	
Long-eared myotis (Myotis evotis)	YES	YES	YES	
Long-legged myotis (Myotis volans)	YES	YES	YES	
Northern flying squirrel (Glaucomys sabrinus)	NO	YES	YES	
Meadow jumping mouse (Zapus hudsonius campestris)	NO	NO	NO	There is no suitable riparian habitat.
Mountain goat (Oreamnos americanus)	NO	NO	NO	Goats/goat habitat not present in project area.
(Rocky Mountain) bighorn sheep (Ovis canadensis)	NO	NO	NO	Listed as R2 Sensitive Species as of June 8, 2007. Bighorn sheep and their preferred habitat not present.

Tawny Crescent (SOLC)

Affected Environment

The tawny crescent butterfly is found in open moist meadows, stream bottoms, and riparian woodlands (Marrone, 2002). The tawny crescent's distribution in the Black Hills is predictably tied to macro and/or micro sites characterized by mesic conditions (Stefanich 2001). Moist meadow or grassland habitats along forest streams or woodland edges are characteristics preferred by this species (Royer and Marrone 1992, Stefanich 2001, Marrone, 2002).

Very limited suitable habitat exists in the project area for this species. One section of Lightning Creek is possible habitat. While mesic forest, riparian, or hardwood habitat conditions are not generally present in the South project area, observations of this species were reported at two spring sites north and west of the project area (Royer and Marrone 1992). However, a recent butterfly survey of the Southern Black Hills (Marrone, 2006) failed to locate a single tawny crescent specimen.

ALTERNATIVE 1

Direct and Indirect Effects

Under this alternative, riparian areas and wet meadows within the project area would not receive any treatment. Removal of pine encroachment would not be accomplished. Pine trees would continue to encroach into meadows/grasslands and meadow acreage would decrease over time, which could result in a decrease in foraging plants needed by the tawny crescent butterfly. However, the risk of large areas of beetle-caused tree mortality or wildfire increases with this alternative, which could increase foraging habitat (meadow/grassland acreage) that could benefit this butterfly species.

The No Action alternative does not include any habitat-enhancing projects for the tawny crescent butterfly.

ALTERNATIVES 2 & 3

Direct and Indirect Effects

Dry, Ponderosa pine is not preferred habitat for this species. The species is not likely present, therefore proposed vegetation management activities (timber harvest, prescribed fire) in these dry pine sites are not expected to affect this species. Project design criteria (See Appendix B) would be used to avoid wet meadows and the riparian habitat along Lightning Creek, which is the closest thing to suitable habitat that the project area has to offer. All action alternatives prescribe the same acreage for pine encroachment treatment within meadows. Alternative 3 proposed 2,133 more acres of prescribed burning than Alternative 2. These projects associated with the action alternatives could enhance habitat for the tawny crescent butterfly by improving grassland vegetation and possible improving water flow to wet meadow habitat. Noxious-weed treatments could impact the tawny crescent if nectar (dogbane, Indian hemp, many composites) or larval host plants (asters) were inadvertently treated. Conversely, treating noxious weeds and other proposed post-harvest work could aid native plant restoration.

Cumulative Effects

The No Action alternative would not have adverse cumulative effects on this species as no direct or indirect effects would occur.

Past encroachment of trees into meadow acreage and riparian areas may have impacted this species. Livestock grazing and activity on private land, especially riparian acreage, has likely impacted potential habitat for this species. These activities are expected to continue in the future. Drought conditions (past and present) may be affecting the habitat for the tawny crescent. This may continue into the future as well.

Any cumulative effects from the action alternatives would be beneficial for the tawny crescent due to habitat enhancement and protection of existing habitat (wet meadows/riparian), therefore Objective 221 would be met for this species.

The Environmental Impact Statement for the Phase II Amendment determined that this species should persist across the Planning Area if Forest Plan standards and guidelines are followed. The proposed alternatives would meet these standards and guidelines. In addition, the size of this project area represents a rather small piece of potential habitat for this species when considering the potential habitat across the entire Planning Area (Black Hills National Forest). Therefore, this species is likely to persist on the Forest.

Callused Vertigo (SOLC)

Affected Environment

The Black Hills land snail survey report (Frest and Johannes 2002) found the Callused vertigo in 63 of 357 sites inventoried/monitored. The sites at which most callused vertigo were found were wet, relatively undisturbed forest, most often closed-canopied white spruce or Ponderosa pine with a varied understory. No spruce sites occur within the South project area. The species was most common at sites with relatively diverse floras and deep litter, generally on shaded north-facing slopes and often at the slope base or extending slightly onto an adjacent floodplain. The most common substrate was limestone. Down woody material helps maintain moist soil conditions and lessens sun exposure, which is an important habitat element for this species. Foraging substrate appears to consist of decayed deciduous leaves and herbaceous plants. The narrowly restricted geographical range of the callused vertigo includes South Dakota (51 sites), Wyoming (12 sites in the Bear Lodge Mountains), North Dakota, Minnesota, and Alberta (Frest and Johannes 2002). The callused vertigo is currently ranked imperiled globally and in South Dakota; it has not been ranked in Wyoming (NatureServe 2004).

Land snails, in general, are susceptible to habitat changes that increase sun exposure, disturb ground cover, reduce micro site humidity, or compact the soil. According to Frest and Johannes (2002), the callused vertigo may be negatively affected by road construction, livestock grazing, timber harvest, herbicides and pesticides, and high-intensity forest fires. Timber harvest and grazing may affect snails if it affects the amount of litter, soil moisture or temperature in snail colonies. Although fire is a natural disturbance, it can potentially eliminate snail habitat. The intensity of fire this species is able to survive is unknown. Road construction and maintenance can affect snails by eliminating habitat or killing snails. Roadside brushing or weed spraying can
damage snails and/or their habitat (Anderson 2004).

This species was found at two Frest snail survey sites within the South project area (#267 and #128). In 2006 and 2007, biological technicians looked for snails during field visits to the South project area, but no additional callused vertigo snails were found.

ALTERNATIVE 1

Direct and Indirect Effects

Under this alternative, there would be no treatment in dense canopy (SS 3C/4C) pine sites. There is no spruce habitat. These dense pine sites are more susceptible to stand-replacing wildfire or insect infestation which could result in a loss of habitat.

ALTERNATIVE 2

Direct and Indirect Effects

Acres of dense pine stands (SS 3C/4C) would be reduced from the existing 4,860 acres to 1,809 acres post-treatment. Harvest activities could impact snails directly, if present, and may have an indirect effect on habitat by changing the microclimate of unknown colonies for the callused vertigo. No new road construction is proposed with the action alternatives.

ALTERNATIVE 3

Direct and Indirect Effects

Under this alternative, dense canopy pine sites (SS 3C/4C) would decrease from the existing 4,860 acres to 1,955 acres post treatment. Therefore, if this snail is present, Alternative 3 would likely cause less impact to its habitat than Alternative 2. No new road construction is proposed with the action alternatives.

ALL ACTION ALTERNATIVES

Direct and Indirect Effects

Frest snail survey sites within the project area where this snail was observed are #128 and #267. Vegetation treatment and prescribed burning are proposed within the stands containing these sites. Design criteria are included to avoid the Frest sites during implementation (see Appendix B).

Implementing project design criteria found in Appendix B would ensure conservation of known habitat for this species, therefore Objective 221 would be met.

The Environmental Impact Statement for the Phase II Amendment determined that this species should persist across the Planning Area if Forest Plan standards and guidelines are followed. The proposed alternatives would meet these standards and guidelines. In addition, the size of this project area represents a rather small piece of potential habitat for this species when considering the potential habitat across the entire Planning Area (Black Hills National Forest). Therefore, this species is likely to persist on the Forest.

Cumulative Effects

No adverse cumulative effects would be expected under the No Action Alternative because no activities would be implemented. If this species is present, dense forest conditions may lead to improved site (soil moisture) conditions in the next 10 years. Conversely, a higher chance would exist for habitat destruction due to stand-replacing wildfires.

Activities, such as timber harvest, thinning, or prescribed burning proposed in the action alternatives could cause impacts to unidentified snail colonies.

Both action alternatives would implement design criteria to protect the two known snail sites, therefore would be consistent with Forest Plan Standard 3103, and Objective 221. No adverse cumulative effects would be expected for known snail colonies.

Mystery Vertigo (SOLC)

Affected Environment

Mystery vertigo was found in 23 of 357 sites inventoried/monitored (Frest and Johannes, 2002) and they were not abundant at any site. One of these sites is located in the South project area. Mystery vertigo is generally restricted to rich, lowland wooded sites, quite often in white spruce, but occasionally in Ponderosa pine. Frest and Johannes (2002) stated in their report that all sites with mystery vertigo were in

the central or northern Black Hills or the Bear Lodge Mountains. However, the report site-chart shows this species present (live specimen) at a Frest site (#129) located within the South project area along Pleasant Valley, near Griffis Canyon.

Land snails, in general, are susceptible to habitat changes that increase sun exposure, disturb ground cover, reduce micro site humidity, or compact the soil. Additional risks include direct loss of habitat, barriers to dispersal (e.g., roads), predation, trampling by grazing animals, intense wildfires, herbicide or pesticide application, and toxic leachates from mining activities. According to Frest and Johannes (2002), road construction, livestock grazing, timber harvest, herbicides and pesticides, and high-intensity forest fires may negatively affect the mystery vertigo. This land snail's sessile nature gives it limited ability to disperse and colonize adjacent habitats.

ALTERNATIVE 1

Direct and Indirect Effects

Under this alternative, no treatment would occur in the vicinity of the known site. No harvest would occur in other areas of dense canopy (SS 3C/4C) pine sites. The slightly more mesic conditions (due to the dense canopy) provide habitat characteristics preferred by land snails. These dense pine sites are more susceptible to stand-replacing wildfire and bark beetle infestations, which can drastically remove forest canopy and therefore change microsite conditions preferred by snails.

ALTERNATIVES 2 & 3

Direct and Indirect Effects

The action alternatives do not propose any management activities in the Frest snail site (#129) where this species presence was recorded in 2002. This complies with Forest Objective 221. No further site-specific project design criteria are needed to protect the site. Acres of dense pine sites (SS 3C/4C) would be reduced from the existing condition in both alternatives. This may impact unidentified mystery vertigo snail habitat directly, if present. No new road construction is proposed with the action alternatives. Alternative 3 would affect fewer acres of dense-canopy pine sites (SS3C/4C), which could provide additional habitat for this species when compared to Alternative 2.

Cumulative Effects

Frest (2002) observed the mystery vertigo snail at site #129. Both action alternatives would defer timber treatments and prescribed burning associated with this site, therefore would be consistent with Forest Plan Standard 3103, and Objective 221. No adverse cumulative effects would be expected for known snail colonies. Harvest

activities or prescribed burning could impact unidentified mystery vertigo snail colonies, and these activities could have an indirect effect on potential habitat by changing the microclimate.

The monitoring protocol for snails was not funded in 2005 or 2006 (USDA Forest Service, 2006b, 2007), therefore data to assess the status of SOLC snails is not available. Avoidance of know sites is currently the best available option for conserving and/or enhancing habitat at known snail colonies.

Population viability for this species was evaluated during the Phase II Amendment to the 1997 Land and Resource Management Plan. Phase II determined that population viability across the planning area would be maintained for this species if Forest standards and guidelines are followed. The proposed activities are expected to meet these standards and guidelines. Therefore, this species is likely to persist on the Black Hills National Forest.

Frigid Ambersnail (SOLC)

Affected Environment

Nekola (2003) considered this species a "duff-specialist." The frigid ambersnail was found in 12 of 357 sites inventoried/monitored (Frest and Johannes 2002). The frigid ambersnail was rare at all locations, and very few live adults were observed during the early 1990s surveys. The closest site (#124) where this snail occurred was approximately 12 miles to the northwest of the South Project Area. The most likely habitat for this species is in the steep limestone canyon areas where moisture, duff, shrubs and some hardwoods provide shade (e.g. Layton Canyon). However, this species was not detected during 2006 and 2007 surveys.

ALTERNATIVE 1

Direct and Indirect Effects

With this alternative there would be no proposed activities. There would be no direct effects from activities. Possible direct effects could occur if dense pine acreage led to stand-replacing wildfires. The indirect effect of desiccation of potential habitat related to a change in microclimate could occur if large areas of pine die due to insect outbreaks.

ALTERNATIVES 2 & 3

Direct and Indirect Effects

Due to the dry environment, commercial timber harvest, non-commercial thinning and fuels treatments proposed in all action alternatives are not expected to influence

potential habitat for this snail species. Activities proposed under the action alternatives may cause mortality, either directly or indirectly, if the species is present in the area. This species is not able to disperse from activity, other than to retreat deeper into soil. No new road construction is proposed.

Cumulative Effects

There are no known frigid ambersnail colonies within the project area. Potential habitat could exist in the shaded, limestone canyons. There is a potential for impact from the proposed activities on unidentified colonies of this species. If additional snail colonies of this species were detected prior to harvest, Standard 3103 would be applied to protect the site. Protecting any new site would meet the intent of Objective 221.

The monitoring protocol for snails was not funded in 2005 or 2006 (USDA Forest Service, 2006b, 2007), therefore data to assess the status of SOLC snails is not available. Avoidance of know sites is currently the best available option for conserving and/or enhancing habitat at known snail colonies.

Striate Disc (SOLC)

Affected Environment

Live specimens of the striate disc were found in only 18 of 357 sites (Frest and Johannes 2002). Striate disc was most often found in litter in rich, mesic forest, generally on shaded, north-facing slope bases, often bordering or ranging slightly onto stream floodplains. They were most frequently in white spruce communities but also aspen and riparian habitats at the base of slopes where deciduous trees and shrubs were often common. Most sites had soils derived from weathered limestone.

Until project-level surveys, the closest Frest survey site where the striate disc snail was found was Site #122 (Tepee Canyon- approximately 8 miles west of the project area) during the 1992 survey. The Tepee Canyon site was re-surveyed in 1999 and no mollusks were found. Frest noted that the area had been logged sometime between those dates.

During a project field survey (10/2006) shells were found that appeared to be striate disc in vegetation site 030809-28, a moderately dense, mature pine site with limestone rock outcrops. No live snails were observed at that time, and the site has not been further evaluated.

Land snails, in general, are susceptible to habitat changes that increase sun exposure, disturb ground cover, reduce micro site humidity, or compact the soil. Additional risks include direct loss of habitat, barriers to dispersal (e.g., roads), predation, trampling by grazing ungulates, intense wildfire, application of herbicides or

pesticides, and toxic leachates from mining activities. According to Frest and Johannes (2002), the striate disc may be negatively affected by road construction, livestock grazing, timber harvest, herbicides and pesticides, and high-intensity forest fires. Due to the sessile nature of land snails, they have limited ability to disperse and colonize adjacent habitats.

ALTERNATIVE 1

Direct and Indirect Effects

Under this alternative, there would be no harvest or thinning activities in areas of dense pine, which provide suitable habitat due to more moist site conditions. These dense pine sites are also at higher risk of loss to stand-replacing wildfire or Mountain Pine Beetle infestation.

ALTERNATIVES 2 & 3

Direct and Indirect Effects

Each action alternative proposes to defer activities in the site where the presumed striate disc was found, therefore avoiding disturbing the site. No additional specific project design criteria would be necessary.

Both action alternatives would decrease the amount of dense Ponderosa pine sites (SS3C/4C). This could adversely affect unidentified striate disc snail colonies if they were located within these treated areas. Both alternatives would retain some sites of dense pine forest. Alternative 3 would maintain slightly more (+199 acres) dense pine sites than Alternative 2.

Cumulative Effects

No adverse cumulative effects would be expected under the No Action Alternative because no activities are planned. It would maintain the more dense forest conditions which lead to slightly moister site conditions. However, a greater chance of habitat destruction would exist due to higher risk of stand-replacing wildfires and insect infestation.

The site with the suspected presence of this species would not receive any of the proposed management activities under this project. Therefore no site-specific project design criteria would be needed. There would be no direct or indirect effects to this site. Activities proposed under the action alternatives may cause direct or indirect mortality of this species if unidentified snail sites are present in the area. This species is not able to disperse from activity, except by retreating deeper into the soil. Opening up the canopy and other activities that change moisture levels in the ground litter layer have the potential to negatively affect unidentified colonies.

If additional snail colonies of this species were detected prior to harvest, Standard 3103 would be applied to protect the site. Protecting any new site would meet the intent of Objective 221.

The monitoring protocol for snails was not funded in 2005 or 2006 (USDA Forest Service, 2006b, 2007), therefore data to assess the status of SOLC snails is not available. Avoidance of know sites is currently the best available option for conserving and/or enhancing habitat at known snail colonies.

Population viability for this species was evaluated during the Phase II Amendment to the 1997 Land and Resource Management Plan. Phase II determined that population viability across the planning area would be maintained for this species if Forest standards and guidelines are followed. The proposed activities are expected to meet these standards and guidelines. Therefore, this species is likely to persist on the Black Hills National Forest

Sharp-shinned Hawk (SOLC)

Affected Environment

Sharp-shinned hawks nest almost exclusively in conifers, with the exception of some densely-leafed deciduous trees that also provide nest concealment (Platt 1976, Reynolds et al. 1982, Joy 1990). On the Forest, nests occur in white spruce (Stephens and Anderson 2002) and Ponderosa pine (district biologists). Sharp-shinned hawks have also recently been detected in riparian, aspen, and burned habitats on the Forest, but these were not observations of nest sites (Panjabi 2001, 2003 and 2005). Sharp-shinned hawks occur in most forest types across their range (Bildstein and Meyer 2000).

The association between nesting habitat and young seral stage has been noted by several authors (Bildstein and Meyer 2000, Bosakowski and Smith 2002, Stephens and Anderson 2002). On the Black Hills National Forest, one of the two documented sharp-shinned hawk nests (within spruce) was located in a 42-acre stand of white spruce sapling/pole-sized trees. Canopy closure ranged from 30 to 70%, but previous studies have tended to find high canopy closure (68% and higher) characterizing nesting habitat (Bildstein and Meyer 2000, Bosakowski and Smith 2002). Habitat loss or alteration resulting in a loss of suitable nesting habitat as well as a decrease in prey abundance and availability are thought to be the most significant threats to accipiter species' persistence (Reynolds 1983, Stephens and Anderson 2002).

If sharp-shinned hawks do prefer spruce-mix habitat types, then the South project area does not provide preferred habitat because no spruce stands occur within South. There are no known sharp-shinned hawk nests in the project area.

Based on nesting preferences for canopy density alone (>40% forest canopy) the amount of existing potential nesting habitat (SS 3B, 3C, 4B, 4C and 5 pine) in the project area is 21,336 acres or approximately 50% of the project area. In the Black Hills, they have been observed at all elevations (Peterson 1995). The species has been observed west of the South project area (Panjabi 2005), in habitat similar to the project area.

ALTERNATIVE 1

Direct and Indirect Effects

Under this alternative, pine stands would become more dense. Conifers would continue to encroach into meadows and hardwoods. Potential nesting habitat for the sharp-shinned hawk would likely remain highest under this alternative. However, the threat of stand-replacing wildfire and beetle infestation would increase, which could dramatically reduce preferred habitat.

ALTERNATIVE 2

Direct and Indirect Effects

This alternative would reduce the threat of fire and insects by reducing the canopy in treated stands to 40BA. Structural stages that are considered potential nesting habitat (SS3B,3C,4B,4C,5) would be reduced to 3,993 acres from the existing 21,336 acres. If there are unknown nests in the project area, any of the action alternatives may disturb nesting if harvest occurred during the nesting season. Known nests would be protected through Standard 3204. Protection of known nests and the retention of suitable habitat meet the intent of Objective 221.

ALTERNATIVE 3

Direct and Indirect Effects

Alternative 3 also reduces the threat of fire and insects but would take a slightly more moderate approach by reducing much of the forest canopy to 60BA rather than 40BA as in Alternative 2. Slightly more potential nesting habitat would be retained. Structural stages that are considered potential nesting habitat (SS3B,3C,4B,4C,5) would be reduced to 5,408 acres. If there are unknown nests in the project area, any of the action alternatives may disturb nesting if harvest occurred during the nesting season. Known nests would be protected through Standard 3204. Protection of known nests and the retention of suitable habitat meet the intent of Objective 221. Alternative 3 would provide more potential nesting habitat and would be expected to have fewer potential impacts on Sharp-shinned hawk habitat than Alternative 2.

Cumulative Effects

No adverse cumulative effects would be expected under the No Action Alternative because no activities are planned. The No Action alternative provides diverse habitats and the most potential nesting habitat for the sharp-shinned hawk. Dense forest (pine) conditions would remain, but risk of habitat loss may increase due to stand-replacing wildfires in the future.

All action alternatives would reduce potential nesting habitat for this species. The treatments would increase shrub and meadow acreage, and improve the growing conditions for the existing aspen which would enhance foraging opportunities by improving habitat for prey species.

Past harvest of pine on private lands may have negatively impacted habitat for this species. Future activities on private land, such as tree harvesting and/or development, may affect habitat for this species. Past fire suppression has created pockets of dense timber that may be preferred by this species. Forest-wide, spruce acreage has increased in the Black Hills by approximately 3,725 acres from 1997 to 2005 (USDA Forest Service 2006b). The South project area does not contribute to that spruce acreage.

Known nests would be protected through Standard 3204. Protection of known nests and the retention of suitable nesting habitat at the project level contribute to meeting the intent of Objective 221. The Forest appears to be achieving Objective 221 for this species through achievement of hardwood, riparian and structural stage objectives (USDA Forest Service, 2007).

The Environmental Impact Statement for the Phase II Amendment determined that this species should persist across the Planning Area if Forest Plan standards and guidelines are followed. The proposed alternatives would meet these standards and guidelines. In addition, the size of this project area represents a rather small piece of potential habitat for this species when considering the potential habitat across the entire Planning Area (Black Hills National Forest). Therefore, this species is likely to persist on the Forest.

Cooper's Hawk (SOLC)

Affected Environment

The Cooper's hawk has been observed in a variety of habitats in the Black Hills, including Ponderosa pine, white spruce, riparian, shrublands, and burned areas (Panjabi 2001, 2003 and 2005; Peterson 1995). The species appears to be widespread but uncommon on the Forest. Forest-level monitoring over the past three years yielded no observations within the project area (Panjabi 2005, Beason 2006, Hutton, 2007). One historic nest within South, which has been field checked annually, was

last active in 2004. The nest tree was in a 4B/4C Ponderosa pine site, which is consistent with the literature. Stephens and Anderson (2002) analyzed the likely habitat preferences of the Cooper's hawk on the Forest based on information from nearby regions. Range-wide, most pairs nest in patches of mature forest with moderate-to-high (60 to 90%) canopy closure near openings. Nest tree diameters are usually larger than what is randomly available. In Ponderosa pine, structural stages 4B (mature stands with 40 to 70% canopy closure) and 4C (mature stands with >70% canopy closure) correspond most closely to the nesting habitat preferences of the Cooper's hawk. There are currently 11,796 acres of SS 4B/4C pine in the project area.

The Cooper's hawk is considered a habitat generalist but typically requires wooded areas for nesting. The bird is known to nest in riparian, conifer, and aspen forests. The Cooper's hawk forages opportunistically across a diversity of habitats and preys on a variety of mid-sized birds and mammals (Stephens and Anderson 2002). The Cooper's hawk often nests and hunts along forest edges and clearings. Riparian-woodland communities also provide potentially important habitat for the Cooper's hawk. Habitat loss or alteration resulting in a loss of suitable nesting habitat, as well as a decrease in prey abundance and availability are thought to be the most significant threats to accipiter species' persistence (Reynolds, 1983).

ALTERNATIVE 1

Direct and Indirect Effects

Under this alternative no treatments would occur in the project area. Pine sites would likely become more dense over time, providing more nesting opportunities (SS 4B/4C). This condition may lead to an increased chance of stand-replacing wildfire and beetle infestation, both of which could decrease habitat.

ALTERNATIVE 2

Direct and Indirect Effects

Alternative 2 would result in a reduction of 9,291 acres of SS 4B/4C pine compared to the existing condition. This would reduce potential nesting habitat for this species within the project area.

ALTERNATIVE 3

Direct and Indirect Effects

This alternative would reduce potential nesting habitat for this species. Alternative 3 would result in a reduction of 8,128 acres of SS 4B/4C pine compared to the existing

condition. This alternative would provide more potential nesting habitat than Alternative 2.

Cumulative Effects

No adverse cumulative effects would be expected under the No Action Alternative because no activities are planned. Dense forest conditions would remain, but there would be a higher chance of habitat loss due to stand-replacing wildfires.

Past harvest of pine on private lands may have negatively impacted habitat for this species. Past timber harvest activities on National Forest land within the project area reduced dense, mature conifer stands. Fire suppression has allowed natural succession to occur, which has developed dense stands. Although the proposed activities would reduce the dense, mature stands, some dense stands would be retained.

Known nests would be protected through Standard 3204 (See Appendix B). Protection of known nests and the retention of suitable nesting habitat at the project level contribute to meeting the intent of Objective 221. The Forest appears to be achieving Objective 221 for this species through achievement of hardwood, riparian and structural stage objectives (USDA Forest Service, 2007).

The Environmental Impact Statement for the Phase II Amendment determined that this species should persist across the Planning Area if Forest Plan standards and guidelines are followed. The proposed alternatives would meet these standards and guidelines. In addition, the size of this project area represents a rather small piece of potential habitat for this species when considering the potential habitat across the entire Planning Area (Black Hills National Forest). Therefore, this species is likely to persist on the Forest.

Northern Saw-whet Owl (SOLC)

Affected Environment

The northern saw-whet owl is a habitat generalist found at lower to middle elevations in forested habitat, particularly in riparian areas. The highest densities of this species tend to be found in coniferous forests (Cannings 1993). This species nests in cavities in snags excavated by flickers and other large woodpeckers. Nests tend to be in mature forest, while dense, sapling-pole-sized stands are preferred for roosting (Johnson and Anderson 2003). Saw-whet owls also utilize dense riparian woodlands for roosting. This species often forages along forest edges, preying on small mammals (Cannings 1993). There are historic observations of the northern saw-whet owl in the South project area (B. Phillips, personal observation), however, no nests have been located.

Structural stages 4C and 5 are considered the preferred breeding and nesting habitat for the saw-whet owl. These structural stages contain mature and late-succession forest attributes (larger diameter snags) and cover (at least 70% canopy). Currently, 133 acres of SS5 and 2,342 acres of SS4C exist within South. This species is dependent on snags for nesting. Larger diameter snags (flicker nests) are preferred. There are 428 acres of pine sites in the "very large tree" size class (>15"DBH). Providing these very large-diameter trees is important for this species because they provide the future large-diameter snags required for nesting.

ALTERNATIVE 1

Direct and Indirect Effects

No treatments would occur in the project area under this alternative. Pine sites would become more dense. Pine trees would increase in size and provide larger future snags. Sites with very large trees (16"+ DBH) would be expected to increase over time. Some insect or fire-related tree mortality would create snags and increase opportunities for flickers to provide nesting sites for this species. However, the dense pine conditions could also lead to stand-replacing wildfires and/or large scale beetle infestation. Either of these events could reduce preferred nesting and roosting cover habitat, but would create snags.

ALTERNATIVE 2

Direct and Indirect Effects

Alternative 2 would retain 1,246 acres of SS 4C, a 47% reduction from the existing condition. Sites with very large trees (16"+ DBH) would increase to 796 acres. Alternative 2 proposes 8,796 acres of prescribed burning. Prescribed burning would have the potential to consume existing 'soft' snags, but would likely create new snags.

ALTERNATIVE 3

Direct and Indirect Effects

This alternative would retain 1,277 acres, 31 more acres than Alternative 2. Sites with very large trees (16"+ DBH) would increase to 520 acres over time. Alternative 3 proposes more acres of prescribed burning (10,929 acres) than Alternative 2. Prescribed burning would have the potential to consume existing 'soft' snags, but would likely create new snags.

Cumulative Effects

The No Action alternative would not have adverse cumulative effects on the saw-whet owl as no direct or indirect effects would occur. The No Action alternative provides the most potential pine nesting habitat for the northern saw-whet owl.

Past harvest of pine on private lands may have negatively impacted habitat for this species. Past timber harvest on National Forest land removed large-diameter trees which reduced the number of potential large-diameter snags. Past and present beetle infestation has and will continue to create snags of variable sizes within the project area. The action alternatives would reduce 4C pine stands in the project area. The action alternatives propose treatments that could decrease the chances of stand-replacement wildfire or insect outbreaks that may negatively impact the habitat desired by this species.

Habitat for this species would be conserved following Forest Plan Management Area objectives (structural stage Objectives 5.1-204, & 5.4-206, and thermal cover Objective 5.1A-204), and snag Standards 2301a and 2305. Known nests would be protected through Standard 3204. Protection of known raptor nests and the retention of suitable nesting habitat at the project level contribute to meeting the intent of Objective 221.

Management Area structural stage objectives are expected to meet the intent of Objective 221 by conserving habitat for this species, though it may take some time to reach the desired amounts of some structural stages (USDA Fortest Service, 2007).

The Environmental Impact Statement for the Phase II Amendment determined that this species should persist across the Planning Area if Forest Plan standards and guidelines are followed. The proposed alternatives would meet these standards and guidelines. In addition, the size of this project area represents a rather small piece of potential habitat for this species when considering the potential habitat across the entire Planning Area (Black Hills National Forest). Therefore, this species is likely to persist on the Forest.

Pygmy Nuthatch (SOLC)

Affected Environment

The pygmy nuthatch is a primary cavity nester that also uses secondary cavities (Ghalambor 2003, Kingery and Ghalambor 2001) found in mature Ponderosa pine throughout the West (Ghalambor 2003). Pygmy nuthatches prefer old or mature undisturbed forests, but are also known to use open, park-like stands of Ponderosa pine (Kingery and Ghalambor 2001). Pygmy nuthatches likely need heterogeneous forests with a mixture of well-spaced old trees and trees of intermediate age (Kingery and Ghalambor 2001). The preference for undisturbed forests may relate to the

availability of large snags. The nuthatch is a weak cavity excavator, requiring soft, large snags for nesting and communal winter roost sites (USDA Forest Service, 1996). Nesting habitat generally includes trees that average 15 to 27 inches in diameter (Ghalambor 2003, Kingery and Ghalambor 2001). Suggested practices include managing for at least three to five snags (19 or more inches in diameter) per acre (Kingery and Ghalambor 2001).

There are no reliable estimates of pygmy nuthatch abundance for the Black Hills (Ghalambor 2003). Estimates of local abundance are unavailable due to the scarcity of this species and its unpredictable distribution (Panjabi 2003). The pygmy nuthatch has been observed within the town of Custer (4 miles east of the project area), within the project area at a private residence bird feeder (B.Koncerak, personal communication), and in Jewel Cave National Monument, just west of the South project area (Giroir, 2007). Rocky Mountain Bird Observatory (RMBO) surveyors have detected this species occasionally in the Black Hills over the last 5 years.

ALTERNATIVE 1

Direct and Indirect Effects

No activities related to this project would occur in the project area under this alternative.
Pine sites would likely become more dense over time. Pine trees would increase in size and provide future large-diameter snags. The dense pine conditions could lead to stand-replacing wildfires and/or beetle infestation. Either of these events could eradicate this species' preferred nesting and roosting habitat but would create snags. Structural stages 4A, 4C and 5 represent preferred habitats of open, park-like, mature forest and mature, dense forest. Currently there are 10,500 acres of SS4A and 2,475 acres of structural stages 4C and 5.

ALTERNATIVE 2

Direct and Indirect Effects

After harvest, SS 4A pine would occupy 23,554 acres, an increase of 13,054 acres. Under this alternative, 1,246 acres of SS4C would remain after treatment. The 133 acres of SS 5 acres would not be treated.

This action alternative may disturb nesting if harvest occurs during the nesting season. No snags would be cut unless deemed a safety hazard during treatments. This alternative proposes prescribed burning on 8,796 acres. Prescribed burning would have the potential to consume existing snags, but would likely create new snags.

ALTERNATIVE 3

Direct and Indirect Effects

After harvest, SS 4A pine would occupy 22,127 acres. Under this alternative, 1,224 acres of SS4C would remain after treatment. The 133 acres of SS 5 acres would not be treated.

This action alternative may disturb nesting if harvest occurs during the nesting season. This alternative proposes prescribed burning on 10,929 acres. Prescribed burning would have the potential to consume existing snags, but would likely create new snags.

Cumulative Effects

The No Action alternative would not have adverse cumulative effects on this species as no direct or indirect effects would occur.

Past timber harvest on National Forest land removed large-diameter trees in treated stands, which reduces the potential for future large-diameter snags. The action alternatives propose to remove large-diameter trees, which reduces the total number of large trees to recruit for snags. However, thinning of the forest allows the remaining individual trees to grow larger due to decreased competition for nutrients and other resources. Past and present Mountain Pine Beetle-related tree mortality created, and continues to create snags in the project area. Wildfires in the project area created snags. Past timber harvest reduced areas of dense, mature pine stands and the action alternatives propose reducing dense, mature pine stands. Past timber harvest created open-forest, park-like habitat, which the pygmy nuthatch is known to use (Kingery and Ghalambor 2001). Proposed prescribed burning may enhance the open-forest, park-like condition of pine sites, which may benefit the species. All action alternatives may cause pygmy nuthatches, if present, to avoid or move from localized areas while those sites are being treated.

Private lands within the project area are predominantly meadow habitat. Where private lands are forested, owners tend to retain large-diameter trees in an open-forest configuration, which may also provide habitat for this species.

The action alternatives would continue to provide habitat elements preferred by the pygmy nuthatch. Habitat for this species would be conserved following Forest Plan Management Area objectives (structural stage Objectives 5.1-204, & 5.4-206, and thermal cover Objective 5.1A-204), and snag Standards 2301a and 2305.

Management Area structural stage objectives are expected to meet the intent of Objective 221 by conserving habitat for this species, though it may take some time to reach the desired amounts of some structural stages (USDA Fortest Service, 2007).

The Environmental Impact Statement for the Phase II Amendment determined that this species should persist across the Planning Area if Forest Plan standards and guidelines are followed. The proposed alternatives would meet these standards and guidelines. In addition, the size of this project area represents a rather small piece of potential habitat for this species when considering the potential habitat across the entire Planning Area (Black Hills National Forest). Therefore, this species is likely to persist on the Forest.

Northern Long-Eared Myotis(SOLC)

Affected Environment

At the western edge of its range, the northern myotis is found in a variety of habitats from wooded riparian in the prairies to higher elevation coniferous and deciduous woodlands. It is found throughout the Black Hills region. Hibernacula include caves and mines. Individuals tend to wedge into crevices and are not easily detected or counted. Day roosts include exfoliating tree bark, tree cavities or crevices of trees, and in caves, mines, and quarries (Schmidt 2003b). Maternity roosts have been reported under loose bark and in crevices and cavities of deciduous trees and Ponderosa pines. Northern myotis have been documented using Ponderosa pine snags as summer/maternity roosts in the Black Hills (Cryan et al. 2001). Rabe et al. (1998) summarize some key snag characteristics for the northern myotis and four other Myotis species in Arizona; roost snags were generally larger in diameter, had more loose bark, and were found at higher densities. Cryan et al. (2001) reported the average snag size for roosts in the Black Hills was about 15.6 inches. Maternity roosts are typically small and comprise 5 to 65 individuals (Schmidt 2003b). A single offspring is born in late July (Higgins et al. 2000).

Foraging areas may include hillsides, ridge tops, and riparian woodlands (Luce et at. 1999, Schmidt 2003b). The loss of suitable hibernacula, maternity roosting sites, and foraging areas all represent potential risk factors for this species (Schmidt 2003b).

District biologists found this species adjacent to the project area during bat surveys in similar pine forest habitat. The project area contains numerous caves and limestone cliff fissures. There are two mine sites in the project area that are known to provide roost habitat for bats; both have bat-gates to protect these sites from human disturbance.

ALTERNATIVE 1

Direct and Indirect Effects

No treatments would occur in the project area under this alternative and pine sites would become more dense through time. Currently there are 10,500 acres of SS4A,

and SS4B and 4C total 11,796 acres. Pine trees would increase in size and provide future large-diameter snags. The dense pine conditions could lead to stand-replacing wildfires and/or beetle infestation. Either of these events could eradicate some foraging habitat for this species but would create snags. Recreational caving would likely remain at current levels.

ALTERNATIVES 2 & 3

Direct and Indirect Effects

No snags would be cut, unless deemed a safety hazard, under any of the Action Alternatives. Grasses, shrubs and forbs should benefit from any of the Action Alternatives, which may consequently increase prey species and foraging habitat for this bat. The project may decrease or slow-down snag recruitment by making the thinning units less susceptible to wildfire and insect outbreaks, which would increase tree vigor and likelihood of survival. However, snags from the Jasper Fire (2000) and snags in localized pockets of pine beetle activity likely provide roosting habitat for this species in the area. Prescribed burning would both eliminate and create snags (Saab, et. al. 2007).

In Alternative 3, commercial thinning treatments retain a slightly higher canopy density (60 BA) than Alternative 2. These additional trees would provide additional potential roosting and foraging habitat. Pine encroachment removal and hardwood release acres are the same in the two Action Alternatives. Both of these activities are expected to improve habitat for bats by improving foraging habitat. Neither of the Action Alternatives propose treatment in the 133 acres of SS5. Proposed road closures would benefit snag retention by limiting opportunities for illegal cutting of standing dead trees.

All Action Alternatives may disturb/displace roosting bats. This may be a short-term effect. Bats may return to roosting sites, if still intact, after treatments are completed. Snag protection standards and project design criteria reduce the potential of loss of bat maternity roost sites (See Appendix B).

Disturbance to cave and mine openings that changes airflow patterns, temperature regimes, and bat access can also impact bats. Project design of the action alternatives takes into account the protection of known caves and abandoned mines. Any newly discovered caves and/or mines determined to be important bat habitat would also be protected through Forest Plan Standards 1401 and 3207.

The Action Alternatives would enhance foraging habitat and maintain suitable roosting snags.

Cumulative Effects

The No Action alternative would not have adverse cumulative effects on this species as no direct or indirect effects would occur.

Past activities such as road building, timber harvest, and burning may have caused displacement and/or mortality of roosting bats. Past fires and beetle infestation created habitat (snags) for this species. Beetles are still active at endemic levels in the area and this is expected to continue into the future.

Action alternatives have the potential to remove tree roosts and snags (safety hazards).

In both action alternatives, activities are designed to protect caves and mines that provide bat roosting habitat. Human disturbance in or near hibernacula can cause site abandonment and local population losses. Recreational caving can disturb roosting/hibernating bats.

On private lands, habitat loss may occur with the closure of abandoned mines or destruction of buildings used by bats.

Beyond this project, there are no known future activities which would impact this bat species' habitat in the project area.

There are two monitoring indicators for the SOLC bats, roost protection measures, and availability of snags. Roost protection measures stem from Standards 3208 and 3209. Protective bat gates have been installed at the two known mine roost sites within the project area, which satisfy Standards 3208 and 3209, and the Action Alternatives would enhance foraging habitat and maintain suitable roosting snags. This would meet the intent of Objective 221.

The Environmental Impact Statement for the Phase II Amendment determined that this species should persist across the Planning Area if Forest Plan standards and guidelines are followed. The proposed alternatives would meet these standards and guidelines. In addition, the size of this project area represents a rather small piece of potential habitat for this species when considering the potential habitat across the entire Planning Area (Black Hills National Forest). Therefore, this species is likely to persist on the Forest.

Small-footed Myotis(SOLC)

Existing Condition

The small-footed myotis is found in a variety of habitats ranging from arid desert and badlands habitat, to grasslands and riparian zones. It is usually associated with rocky

areas like bluffs, dissected breaks, ridges, cliffs, and major rock outcroppings within these habitats (Schmidt 2003c).

Hibernacula for this species include rock cliff faces, mines and caves. Maternity and summer roosts are usually associated with rock features (e.g., bluffs, ridges, cliffs, boulders, and major outcroppings) within a variety of habitats (Schmidt 2003c). The small-footed myotis has been found to use a variety of day roosts: exfoliating bark, rock crevices, holes in banks and hillsides, and in abandoned swallow nests. The availability of suitable hibernacula, maternity roosting sites, and foraging areas all represent potential risk factors for this species (Schmidt 2003c).

This species has been found roosting in caves (hibernacula) within the project area. There are two known mine sites that could provide roost habitat for this species; both have protective bat-gates.

ALTERNATIVES 2 & 3

Direct and Indirect Effects

The action alternatives have the potential to impact this bat species while roosting. There may be impacts to rock outcroppings, ground rocks, and roosting trees during harvest operations. Impacts such as this may be more prevalent under Action Alternative 2, which proposes the most vegetation treatment. Localized roosting disturbance would be of short duration.

The Environmental Impact Statement for the Phase II Amendment determined that this species should persist across the Planning Area if Forest Plan standards and guidelines are followed. The proposed alternatives would meet these standards and guidelines. In addition, the size of this project area represents a rather small piece of potential habitat for this species when considering the potential habitat across the entire Planning Area (Black Hills National Forest). Therefore, this species is likely to persist on the Forest.

CUMULATIVE EFFECTS

Refer to ‘Northern long-eared myotis’ section above.

Long-eared Myotis(SOLC)

Existing Condition

This species is associated with coniferous montane habitats and has been reported foraging among trees and over woodland ponds (Schmidt 2003c). Limited data suggest that the long-eared myotis uses Ponderosa pine snags as summer and

maternity roosts in other regions (Rabe et al. 1998, Vonhof and Barclay 1997). Rabe et al. (1998) summarize some key snag characteristics for the long-eared myotis and four other bat species in Arizona: these snag roosts were generally large-diameter, had more loose bark, and the snags were found in higher densities when compared to average forest conditions. Stumps, also of large-diameter, have been documented as summer roost sites for the long-eared myotis in British Columbia (Vonhof and Barclay 1997). Tigner, et al. (2003) reported netting this species at a stock tank near Jewel Cave approximatetly 2 miles west of the project area. This species is likely present in the project area, but to what degree is uncertain. Hibernation sites include caves and mines (Higgins et al. 2000), but it is not certain they hibernate in the caves or abandoned mines located in the project area.

Reproductive females have been found in buildings, rock crevices, and hollow trees. Reported day roosts for this species include exfoliating tree bark, hollow trees, caves, mines, and cliff fissures (Schmidt 2003c). This bat uses caves and mine tunnels as nightly roosts (Higgins et al. 2000, Schmidt 2003c).

CUMULATIVE EFFECTS

Refer to ‘Northern long-eared myotis’ section above.

Long-legged Myotis(SOLC)

Affected Environment

The long-legged myotis is primarily associated with montane forest. This species has been documented using Ponderosa pine snags as summer/maternity roosts in the Black Hills (Cryan et al. 2001) and in other regions (Rabe et al. 1998). Cryan et al. (2001) found the long-legged myotis roosting in rock crevices. Snags used for roosting in the Black Hills were larger in diameter, in a greater state of decay, and were in higher densities when compared to random snags (Cryan et al. 2001). Roosts were generally on south-facing slopes within late-succession pine forests. Day roosts are usually under the bark of Ponderosa pine and in snags. Reproductive females have been found roosting in rock crevices, under the bark of trees, and in hollow trees (Schmidt 2003d). Hibernating individuals are known to use caves in the Black Hills, including Jewel Cave (Schmidt 2003d, Luce et al. 1999, Turner 1974).

The long-legged myotis forages over meadows, ponds, streams, and open forest habitats of the Black Hills where it feeds on flying insects, particularly moths (Luce et al. 1999, Turner 1974). The reported preference of this bat for roosting in snags suggests that the availability of mature forests with abundant snags may be a limiting factor (Schmidt 2003d).

This bat has been found at the Lithograph Spring mist-net survey site just west of the project area. Caves in the project area are known to serve as hibernation sites for Myotis species. It is presumed that this species is present in the project area. The Forest is conserving habitat for this species through cave, mine and snag management.

ALL ALTERNATIVES

Direct and Indirect Effects

Refer to 'Northern long-eared myotis and small-footed myotis' sections above.

CUMULATIVE EFFECTS

Refer to 'Northern long-eared myotis and small-footed myotis' sections above.

Northern Flying Squirrel (SOLC)

Affected Environment

Optimal northern flying squirrel habitat has been reported as cool, moist, mature forest with abundant standing snags and down woody material. It is often most abundant near surface water (swamps and streams) (NatureServe 2006). Recent studies have indicated that the nocturnal northern flying squirrels occupy a variety of forest types and are not necessarily old-growth dependent (Cotton and Parker 2000). However, Duckwitz (2001) also mentions that a forest with a multi-layered canopy, that is "characteristic" of old growth, develops the hypogeous sporocarps of mychorrizal fungi (truffles), which are a major food source for northern flying squirrels.

Flying squirrels tend to avoid large openings, possibly because they cannot cross them by gliding in the air (USDA Forest Service, 1996). They use hollow trees, cavities, abandoned woodpecker holes, or densely branched portions of trees (i.e.'witches broom') as nest sites (USDA Forest Service 1996, Wells-Gosling and Heaney 1984).

Although flying squirrels are thought to prefer mesic, mature, spruce forests in the Black Hills, mature and late-succession pine forests (Structural Stages 4C and 5) on more mesic sites may also contain the snag resources northern flying squirrels appear to require. Large trees may also be important for this species. It is assumed that higher snag densities would be better than lower densities. Habitat fragmentation is a concern for flying squirrels. Spruce and late-succession pine is distributed across the

Black Hills landscape as patches and there are gaps where habitat is absent or only present in low abundance.

There is a lack of specific data on habitat use by northern flying squirrels in the Black Hills. Turner (1974) noted that the highest densities are likely found in white spruce forests in moist canyons of the northern Black Hills. In Wind Cave National Park, Duckwitz (2001) found flying squirrels in Ponderosa pine sites that had an open canopy which allowed understory grasses to prosper, and found that they avoided 'dog-hair' pine sites. It is likely that northern flying squirrels are present in the project area. In 2007, biological technicians observed a flying squirrel near Richardson Spring which is two miles west of the project area.

ALTERNATIVE 1

Direct and Indirect Effects

Under this alternative, no treatments would occur in the project area. Sites with pine trees would become more dense over time. Thick 'dog-hair' pine would increase over time, which flying squirrels tend to avoid. More SS 4C/5 pine sites would develop, which could provide more large-diameter snags in the future. These conditions may also lead to an increased chance of stand-replacing wildfire and beetle infestation, which would reduce potential habitat for this species.

ALTERNATIVES 2 & 3

Direct and Indirect Effects

Acres of 4A Ponderosa pine would be increased after implementation of the action alternatives compared to the existing condition. SS 5 acres would not be treated under any alternative. There is no spruce habitat in the project area. All action alternatives propose removing pine from existing aspen stands. The action alternatives have the potential to disturb nesting/denning sites if present within a treatment area.

In Alternative 3, commercially thinned sites would retain a slightly higher canopy density (60 BA) than Alternative 2. This could provide additional potential gliding (cover) habitat for this species.

By following the Phase II Objectives for landscape vegetative diversity, landscape structural diversity, and snags and down woody material, the South project would conserve habitat for this species.

Cumulative Effects

The No Action alternative would not have adverse cumulative effects on this species as no direct or indirect effects would occur.

Harvest activities such as overstory removal and commercial thinning could negatively affect northern flying squirrel habitat by increasing gliding distance between trees. Timber harvest activities that occur within occupied flying squirrel nesting habitat during the nesting season could directly displace, harm, or kill flying squirrels. Past fires and beetle infestation created potential habitat (snags) for this species. The current level of beetle activity is expected to diminish with implementation of either action alternative. Proposed prescribed burning may consume existing snags; however, it may also create new snags.

Privately-owned forested lands within the project area may provide suitable habitat for the northern flying squirrel.

There are no known future activities in the project area which would adversely impact habitat for this species.

Monitoring for this species shows that the Forest is conserving flying squirrel habitat (spruce, SS5 and 4C pine w/very large tree size). Progress is still needed to meet SS5 Objectives. (USDA Forest Service, 2007). The South project area contributes 133 acres of SS5 and would provide SS4C ponderosa pine habitat for this species under all alternatives. Management Area structural stage objectives are expected to meet the intent of Objective 221.

The Environmental Impact Statement for the Phase II Amendment determined that this species should persist across the Planning Area if Forest Plan standards and guidelines are followed. The proposed alternatives would meet these standards and guidelines. In addition, the size of this project area represents a rather small piece of potential habitat for this species when considering the potential habitat across the entire Planning Area (Black Hills National Forest). Therefore, this species is likely to persist on the Forest.

ENDANGERED/THREATENED/PROPOSED and R2 SENSITIVE Wildlife SPECIES

ENDANGERED, THREATENED and PROPOSED SPECIES

The US Fish and Wildlife Service (USFWS 2006) lists the following endangered, threatened and proposed species for the Black Hills, Custer County, South Dakota:

Black-footed Ferret (*Mustela nigripes*) - Endangered

Affected Environment

Recently, black footed ferrets were released in Wind Cave National Park. The Forest Service's black footed ferret determination of **no effect,** which was made in the Biological Assessment done for the Phase II Amendment (9/2005), is still valid, providing no prairie dog reduction efforts occur on Forest Service lands adjacent to Wind Cave National Park. The South project area is approximately 10 miles west of Wind Cave National Park.

The South project area has one small (20 acres) prairie dog town located at the southern end. The prairie dog town is too small to support a black-footed ferret population.

ALL ALTERNATIVES

Direct and Indirect Effects

None of the alternatives would have any effect on black-footed ferrets.

Cumulative Effects

With the design criteria applied (See Appendix B), there would be no direct, indirect or cumulative effects to the prairie dog colony from the proposed activities. Since no black-footed ferrets utilize the colony, there would be no effect to ferrets.

SENSITIVE SPECIES - Rocky Mountain Region - Black Hills National Forest

Sensitive Species and Contractual Obligations (SSC)

See design criteria in Appendix B – Standard 3115.

Affected Environment

Table 3.50 lists endangered, threatened and R2 sensitive species and the Determination for each. Determinations are based upon potential effects from the action alternatives on individuals or to suitable habitat. Refer also to the South project Biological Assessment/ Biological Evaluation (BA/BE) in Appendix D for sensitive species determinations related to effects from alternatives. For R2 sensitive species not listed in the table below, no habitat was present within the project area (i.e. No Impact).

Table 3.50 Threatened, Endangered and R2 Sensitive Species

Species	Status	Determination
Black-footed ferret *(Mustela nigripes)*	Endangered	No effect
Fringed myotis *(Myotis thysanodes)*	R2 Sensitive Species	May adversely impact individuals, but not likely to result in a loss of viabi Planning Area, nor cause a trend toward federal listing
Townsend's big-eared bat *(Corynorhinus townsendii)*	R2 Sensitive Species	May adversely impact individuals, but not likely to result in a loss of viabi Planning Area, nor cause a trend toward federal listing
Black-tailed prairie dog *(Cynomys ludovicianus)*	R2 Sensitive Species	May adversely impact individuals, but not likely to result in a loss of viabi Planning Area, nor cause a trend toward federal listing
Rocky Mt. bighorn sheep *(Ovis canadensis canadensis)*	R2 Sensitive Species	No impact
Northern goshawk *(Accipiter gentilis)*	R2 Sensitive Species	May adversely impact individuals, but not likely to result in a loss of viabi Planning Area, nor cause a trend toward federal listing
Burrowing owl *(Athene cunicularia)*	R2 Sensitive Species	May adversely impact individuals, but not likely to result in a loss of viabi Planning Area, nor cause a trend toward federal listing
Flammulated owl *(Otus flammeolus)*	R2 Sensitive Species	May adversely impact individuals, but not likely to result in a loss of viabi Planning Area, nor cause a trend toward federal listing
Black-backed woodpecker *(Picoides arcticus)*	R2 Sensitive Species	May adversely impact individuals, but not likely to result in a loss of viabi Planning Area, nor cause a trend toward federal listing
Bald eagle *(Haliaeetus leucocephalus)*	R2 Sensitive Species	No impact
Long-billed Curlew *(Numenius americanus)*	R2 Sensitive Species	No impact
Black Hills redbelly snake *(Storeria occipitomaculata pahasapae)*	R2 Sensitive Species	May adversely impact individuals, but not likely to result in a loss of viabi Planning Area, nor cause a trend toward federal listing

Fringed myotis

Affected Environment

This subspecies of fringe-tailed bat will roost during summer in caves, abandoned mines, tree cavities (snags) and man-made structures. Late-succession pine sites with high densities of snags in early to medium stages of decay appear to be suitable tree roosting and maternity habitat (Keinath 2004). Hibernation roosts can be in caves, abandoned mines, rock fissures and man-made structures. This species feeds mainly on flying beetles, moths and other flying insects high in the forest canopy and on or near the ground near thick or thorny vegetation. They may occasionally glean insects from leaves (Barbour and Davis 1969, Higgins et.al. 2000).

This species is known to occur in the project area. There are known caves and mines within the South Project Area. There are two known mine sites that could provide roost habitat for this species; both have protective bat-gates. There are also exposed rock outcrops and snags within the area that have the potential for use as roost sites for bats.

ALTERNATIVE 1

Direct and Indirect Effects

Changes in habitat due to natural succession would occur. Stands would gradually become more dense and individual trees would become larger. Dense pine sites

would become more susceptible to insect-induced mortality. This condition may also increase the risk of stand-replacing wildfires which would reduce habitat for this species. There would be no change to caves, mines, or cliff-rock fissures. Alternative 1 would be most favorable to this species because no large trees would be removed and the potential for snag creation would be the greatest with this alternative. However, the area could lose green tree stand structure (prey habitat) to large-scale, high-intensity wildfire or large-scale insect-caused tree mortality. Both have a higher probability of occurrence under this alternative than under the action alternatives.

ALTERNATIVES 2 & 3

Direct and Indirect Effects

Under the action alternatives, bats may be directly affected if bats were roosting in trees or under bark during timber felling. The removal of commercial-sized wood could result in fewer large trees for roost sites. Snag loss could also occur depending on their status as a hazard (safety). Prey species may increase over time due to increases in grass/forb SS 1 and hardwood release treatments. Both action alternatives would provide the same 133 acres of SS5 habitat. Alternative 3 would retain more trees in commercially thinned areas (60BA) than would Alternative 2 (40BA), and this could provide additional forest structure for foraging habitat and roost site selection. Both action alternatives would implement design criteria to protect cave resources and the gated mines that provide bat roosting habitat.

Cumulative Effects

The No Action alternative would not have adverse cumulative effects on this species as no direct or indirect effects related to this project would occur.

Past activities may have caused displacement and/or mortality of roosting bats. Past fires and beetle infestation created potential habitat (snags) for this species. Beetles are still active in the area and this is expected to continue into the future. Cave and mine sites provide roost habitat for this species.

Action alternatives have the potential to remove tree roosts and snags (safety hazards). Prescribed burning also has the potential to consume existing snags, as well as create new snags.

Human disturbance in or near hibernacula may cause site abandonment and local population losses. Recreational caving can disturb hibernating bats. This activity is expected to continue at current levels.

On private lands, habitat loss may occur with the closure of abandoned mines or destruction of buildings used by bats.

There are no known future activities in the project area which would impact this bat species' habitat.

Population viability for this species was evaluated during the Phase II Amendment to the 1997 Land and Resource Management Plan. The Phase II Black Hills BA/BE, Amendment Environmental Assessment determined that population viability across the Planning Area would be maintained for this species if Forest standards and guidelines are followed. The proposed alternatives would meet these standards and guidelines. To meet the intent of Objective 221, Forest managers are conserving and enhancing habitat for this species through cave, mine and snag management. In the South project area the two mine sites with bat roost potential have been protected. Existing snags (not safety hazards) would be retained. Caves would be protected from direct impacts using project design criteria. In addition, the size of this project (roughly 4 percent of the Forest) represents a rather small percentage of potential habitat for this species when considering the potential habitat across the entire Planning Area (Black Hills National Forest). Therefore, this species is likely to persist on the Forest.

Townsend's big-eared bat

Affected Environment

This bat occurs in a wide variety of habitats, but its distribution tends to be strongly correlated with the availability of caves or cave-like roosting habitat (Pierson, et al. 1999). Temperature seems to be the most site-specific requirement for roost selection for this species. It is primarily a cave-dwelling species that also roosts in man-made cave-like structures (i.e. abandoned mines). These sites are used for hibernation, maternity, and night/day roosts. This species has been known to roost in large-diameter trees/snags in other parts of their range, but this has not been documented in the Black Hills. A lepidopteran (moth) specialist, the Townsend's big-eared bat typically feeds late in the evening on moths taken from the ground, on vegetation, or in the air (Higgens et al. 2000). Population trend appears to be declining in the Black Hills as well as throughout their range. Loss and disturbance of roost habitat is the main contributor to lower numbers, which is attributed to the loss of large caves and dilapidation of mines. This species is highly sensitive to human disturbance, especially at maternity roost sites (Pierson et al. 1999, USDA Forest Service, 2000). Suitable roosting and foraging habitat is present, and surveys for this species have found it to use both caves and mines in the project area as hibernacula. There are two abandoned mines in the project area that are known to provide bat roosting habitat. Both have protective bat-friendly gates.

ALTERNATIVE 1

Direct and Indirect Effects

There would be no direct or indirect impacts on this species as a result of this alternative. No change to caves, mines, rock outcrops or cliff-face crevices and fissures would occur and there would be no disturbance to roosting bats.

ALTERNATIVES 2 & 3

Direct and Indirect Effects

Under the action alternatives, prey species may increase due to increases in grass/forb SS1 and hardwood release treatments. Alternative 3 would retain more trees in commercially thinned areas (60BA) than would Alternative 2 (40BA) and this could provide additional forest structure for foraging habitat. The action alternatives could affect individual use of treated areas as conditions change. Both action alternatives would implement design criteria to protect cave resources and mines that provide bat roosting habitat.

Cumulative Effects

The No Action alternative would not have adverse cumulative effects on this species as no direct or indirect effects would occur.

Past activities such as road building, timber harvest, mine closures, and burning may have caused displacement and/or mortality of roosting bats. Past fires and beetle infestation created openings in the forest canopy that may have improved foraging habitat. Beetles are still active in the area and this is expected to continue into the future. Cave and mine sites in the project area provide roost habitat for this species.

Action alternatives have the potential to remove tree roosts and snags (safety hazards). Prescribed burning also has the potential to consume existing snags, as well as create new snags.

Human disturbance in or near hibernacula may cause site abandonment and local population losses. Recreational caving can disturb hibernating bats. This activity is expected to continue at current levels.

On private lands, habitat loss may occur with the closure of abandoned mines or blocking entry-points of buildings used by bats.

There are no known future activities which would impact this bat species' habitat in the project area.

Population viability for this species was evaluated during the Phase II Amendment to the 1997 Land and Resource Management Plan. The Phase II Black Hills BA/BE, Amendment Environmental Assessment determined that population viability across the Planning Area would be maintained for this species if Forest standards and guidelines are followed. The proposed alternatives would meet these standards and guidelines. To meet the intent of Objective 221, Forest managers are conserving and enhancing habitat for this species through cave, mine and snag management. In the South project area the two mine sites with bat roost potential have been protected. Existing snags (not safety hazards) would be retained. Caves would be protected from direct impacts using project design criteria. In addition, the size of this project (roughly 4 percent of the Forest) represents a rather small percentage of potential habitat for this species when considering the potential habitat across the entire Planning Area (Black Hills National Forest). Therefore, this species is likely to persist on the Forest.

Black-tailed Prairie Dog (R2 Sensitive Sp)

Affected Environment

This is primarily a grassland species. However it occasionally is found in upland meadow situations in the southern Black Hills. The prairie dog creates underground burrows and den sites in a colony or 'town'. They feed on herbaceous vegetation and can remove ground cover to the exclusion of providing forage for other animals. The prairie dog has been referred to as a 'keystone species' since it provides the environment for many other wildlife species, most notably the black-footed ferret and the burrowing owl. There is one prairie dog colony located at the southern end of the South project area. This 'town' is approximately 20 acres in size and is partly on Forest Service land and partly on adjacent South Dakota State-owned land. Reduction or elimination of this prairie dog town is not proposed in the South project.

ALTERNATIVE 1

Direct and Indirect Effects

There would be no direct or indirect impacts on this species as a result of this alternative. No change to the prairie dog town would occur. Pine encroachment into grasslands would slowly continue, which could reduce the acreage of habitat available for the "town".

ALTERNATIVES 2 & 3

Direct and Indirect Effects

The action alternatives propose the removal of Ponderosa pine trees in the vicinity of the prairie dog colony and this is not expected to have an adverse effect on this

species. In fact it likely could have a positive effect by reducing tree cover. Prairie dogs prefer open grassland. Prescribed burning of this town is unlikely due to the limited amount of grass (fuel) to carry a fire within the colony perimeter. Design criteria (See Appendix B) would prohibit logging equipment and piling of slash within the colony perimeter to eliminate the likelihood of disturbance and disruption of normal prairie dog activities (breeding, foraging, etc.).

Cumulative Effects

No adverse cumulative effects are expected with any alternatives. There would be no activities in or around the prairie dog town with the No Action alternative. The action alternative's design criteria would not allow spring prescribed burning in the town, nor would harvest equipment and logging slash be permitted within the town.

Past activities have not hindered this town's establishment or growth. There are no activities planned that would affect this town in the foreseeable future.

Prairie dogs that are located on private land have been poisoned or otherwise reduced or eliminated. This activity is likely to continue.

The action alternatives would not be expected to affect this small prairie dog town in the South project area and therefore would not affect species viability throughout the planning area. Population viability for this species was evaluated during the Phase II Amendment to the 1997 Land and Resource Management Plan. The Phase II Black Hills BA/BE, Amendment Environmental Assessment determined that population viability across the Planning Area would be maintained for this species if Forest standards and guidelines are followed. The proposed alternatives would meet these standards and guidelines. The Forest is meeting the intent of Objective 211 by conserving and enhancing habitat for this species through Objective 237 (manage for 200-300 acres of prairie dog towns in at least 3 separate towns). This species is likely to persist on the Forest.

Northern Goshawk (R2 Sensitive Sp)

Affected Environment

Table 3.51 Goshawk Nest Territory Status: South Project Area

Territory Name	Year Last Active	Nesting Status	Comment
Comanche	2008	active	Fledged 2 in 2008.
Lightning Creek (new information)	2008	active	Fledged 2 in 2008 (new nest discovered 7/2008)
Martin	unknown	inactive	Storm damage (2000) in and around nest stand.
Ninemile	unknown (2000?)	inactive	Area around nest stand was logged in 2001
Pleasant	2004	inactive	Nest found during Pleasant timber sale Rx burn (2004). Timber sale and fuels activities may impact future use.
Wabash	2007	active	Nest in Wabash timber sale unit #23

All forested sites with suitable nesting habitat for northern goshawks (SS4B & 4C) within the South project area were surveyed in the summers of 2006-2007. There are 11,796 acres (31%) of SS 4B/4C Ponderosa pine in the project area. The structural stage 5 stands present in the South project area are not considered suitable nesting habitat because they either lack the minimum size of 30 acres or contain a canopy closure of less than 50%.

Natural conditions and past timber management are the primary factors that influence the amount of suitable goshawk nesting habitat the project area provides. There are six goshawk territories in the project area This includes a new nest which was discovered in July, 2008. This new nest and associated territory is referred to as 'Lightning Creek'.

ALTERNATIVE 1

Direct and Indirect Effects

No activities would occur around goshawk nest sites. All the existing acres of structural stage SS4B & 4C (suitable nesting habitat) would remain untreated. Changes in habitat due to natural succession would occur. Pine sites would gradually become more dense and individual trees would become larger over time. Stands suitable for nesting would become more common as stands mature and become more dense. However, these dense stands would also become more susceptible to wildfire and insect-related mortality.

ALL ACTION ALTERNATIVES

Direct and Indirect Effects

Standard 3108 (goshawk nest protection) is designed to improve Forest-wide goshawk distribution long-term. The action alternatives designate a minimum of 180 acres of the best suited nesting habitat within ½ mile of each historically active goshawk nest site, as directed under Standard 3108(a). All designated sites have been reviewed in the field and do not require commercial vegetation treatment to enhance or maintain their value for goshawks. Non-commercial vegetation treatments, in the form of Improvement cutting, are proposed in some of the nest stands where storm damaged trees occur to enhance development of the understory in these stands. In addition, prescribed burning is proposed in the Martin nest areas, following improvement cutting, to maintain this stand's value for goshawks.

Under the action alternatives, acreage of the preferred nesting habitat for the northern goshawk (SS 4B and 4C) would decrease from the existing condition. Alternative 2 would reduce acres of 4B and 4C to approximately 2,500 acres which is 7% of ponderosa pine in the project area. Alternative 3 would reduce acres of 4B and 4C to approximately 3,615 acres which is 9% of pine stands. On a forest scale, these changes assist in moving toward Forest structural stage objectives in management areas 5.1 and 5.4. Both of these management areas would continue to exceed target percentages of structural stage 4B and 4C, forestwide, following implementation of either action alternative.

Known nests would be surveyed for activity each year. If active, these stands would be protected by implementing timing restrictions of no new activity from April 1st-August 15th (see Appendix B).

The action alternatives would limit individual use of treated areas. Of the action alternatives, Alternative 3 would likely have the least impact on the goshawk due to the fewer acres treated. More stands with higher residual canopy cover preferred by northern goshawk, would remain in Alternative 3.

Cumulative Effects

The No Action alternative would not have adverse cumulative effects related to this project as no direct or indirect effects would occur. However, there may be adverse effects under the No Action alternative if dense forest conditions led to habitat destruction due to Mountain Pine Beetle infestations or to stand-replacing wildfires.

Past timber harvest contributed to the loss of large trees and blocks of mature, densely forested pine sites. The action alternatives would continue to reduce the number of potential large nest trees and nest sites, but would maintain habitat as required by Forest Plan Standard 3108. Identified nest areas around historically active nests

would be deferred from commercial treatment in the action alternatives. The proposed activities move toward Forest structural stage objectives.

Fires and insect outbreaks are expected to continue to occur and would impact dense stands and large trees.

No substantial habitat or management changes are expected with regards to private land in-holdings.

The Forest is meeting the intent of Objective 221 of conserving and enhancing habitat for this species by moving towards structural stage Objectives and complying with Standards that protect known goshawk nest territories. Population viability for this species was evaluated during the Phase II Amendment to the 1997 Land and Resource Management Plan. The Phase II Black Hills BA/BE, Amendment Environmental Assessment determined that population viability across the Planning Area would be maintained for this species if Forest standards and guidelines are followed. The proposed alternatives would meet these standards and guidelines. Specifically, the South project would use project design criteria to protect known nests (Standards 3108, 3111, 3115), and provide prey species habitat (i.e. snags and down woody material). The size of this project (roughly 4 percent of the Forest) represents a rather small percentage of potential habitat for this species when considering the potential habitat across the entire Planning Area (Black Hills National Forest). Therefore, this species is likely to persist on the Forest.

Burrowing owl

Affected Environment

The western burrowing owl is a grassland specialist. They are found in open, dry, treeless areas, typically occupied by burrowing mammals that provide nest burrows for the owl (McDonald, et al. 2004). They forage primarily on rodents and insects. Burrowing owls were observed in 2006 in the small prairie dog town located in the southern portion of the project area. Another observation of (nesting) burrowing owls was made in 2005 that was approximately 7.4 miles southwest of the South project area in a prairie dog town located on private land (R.Griebel, 2005-2006).

ALTERNATIVE 1

Direct and Indirect Effects

There would be no direct or indirect effects on this species as a result of this alternative. No change to the prairie dog town would occur, therefore there would be no change to potential burrowing owl habitat. Pine encroachment into grasslands would slowly continue which could reduce opportunities for prairie dog town expansion.

ALTERNATIVES 2 & 3

Direct and Indirect Effects

Vegetation management activities of both action alternatives are not expected to have an effect on this species. Project design criteria would be used to avoid the prairie dog town and protect potential burrowing owl nesting habitat. Logging equipment and piling of slash would not be done within the town perimeter in order to avoid the potential for disturbance to burrowing owls. Prescribed burning would be confined to a 'fall season' burn to reduce disturbance of owls that could be nesting in the prairie dog town (See Appendix B).

Cumulative Effects

No adverse cumulative effects are expected with any alternative. There would be no activities in or around the prairie dog town with the No Action alternative. The action alternatives would not allow spring or summer prescribed burning in the town, nor would harvest equipment and logging slash be permitted within the town where burrowing owls nest.

Past activities have not hindered this prairie dog town's establishment or growth. There are no activities planned that would affect this town in the foreseeable future.

Prairie dog towns that are located on private land may provide additional burrowing owl habitat.

Population viability for this species was evaluated during the Phase II Amendment to the 1997 Land and Resource Management Plan. The Phase II Black Hills BA/BE, Amendment Environmental Assessment determined that population viability across the Planning Area would be maintained for this species if Forest standards and guidelines are followed. The proposed alternatives would meet these standards and guidelines. The Forest is meeting the intent of Objective 221 by conserving and enhancing habitat for the burrowing owl by providing for black-tailed prairie dog towns (Objective 237). This one 20-acre town represents approximately 5% of the currently occupied prairie dog habitat (386 acres of NFS land) across the entire Planning Area (USDA, Forest Service, 2005).

Flammulated owl

Affected Environment

This species primarily inhabits open Ponderosa pine forests, dry montane conifer forests or aspen forests, often with dense saplings, oak or other brushy understory. This owl is primarily insectivorous (moths, crickets, grasshoppers, and beetles), but is

known to prey on small mammals and birds as well. They hunt exclusively at night. Flammulated owls nest in natural cavities or old woodpecker holes and are known to re-use nests year after year. Nests sites that provide open, mature canopy conditions (open flight path to nest) appear to be preferred (McCallum 1994).

Until 2002, this species had not been confirmed to occur in the Black Hills. An incidental observation (unconfirmed) was reported in the summer of 1994 by a bat biologist doing mist netting in the southern Black Hills. He reported a "small, dark-eyed owl" becoming entangled in the net. He released the owl. However, in 2002 at least two and maybe three flammulated owls were observed in the northern Black Hills (Panjabi 2003). These observations do not prove a flammulated owl population has become established in the Black Hills. There were no flammulated owl observations on the Forest in 2005 or 2006 (USDA, Forest Service, 2007).

Based on published information and the recent Black Hills sightings, it is reasonable to assume that suitable habitat for flammulated owls may be present in the South Project Area.

ALTERNATIVE 1

Direct and Indirect Effects

There would be no direct or indirect effects to this species as a result of this alternative. Additional nesting habitat could become available through time when snags are created due to insect-related tree mortality.

ALTERNATIVES 2 & 3

Direct and Indirect Effects

Accidental removal of trees with occupied cavities could cause direct effects to the flammulated owl under any action alternative. All action alternatives have the potential to reduce preferred habitat for this species by removing large overstory trees, and possibly removing snags (if deemed safety hazards during harvest operations). Aspen acreage would be expected to increase slightly under both action alternatives. Increases in the owl's prey population may occur from activities that encourage growth of under-story vegetation such as grasses, forbs and shrubs, thus improving insect and small mammal habitat. Ground fuel (down woody material) is expected to be decreased in fuel treatment areas and this would reduce cover for some prey species. Of the action alternatives, Alternative 3 would likely be favorable to this species because more mature trees would be retained, and more structural stage diversity would be maintained in the South project area.

The Forest Plan (Standard 2301) requires all snags >20" DBH be retained unless deemed a safety hazard. In addition, hardwood enhancement, pre-commercial

thinning and fuel reduction treatments that reduce dense, sapling (regeneration) pine under-story may also benefit this species, if present.

According to the Phase II Amendment to the 1997 Land and Resource Management Plan there is no information suggesting that flammulated owls are established or breeding in the area. Objective 221 would be met for this uncommon or accidental species if Forest standards and guidelines are followed. The alternatives are not likely to affect the establishment of flammulated owls in the project area or on the Forest since the proposed alternatives would comply with standards and guidelines.

Cumulative Effects

No adverse cumulative effects are expected with any alternative. Large areas of snag habitat have been made available from wildfires and insect outbreaks in the Black Hills. However, these 'open areas' are not considered preferred flammulated owl nesting habitat. They may improve prey species abundance on a general scale. Mature trees and relatively open, park-like, stands are considered more suitable habitat.

Removal of mature overstory and a loss of snags related to timber harvesting could potentially reduce suitable habitat. However, an abundance of SS4A (mature, open forest) could be expected to provide habitat for this species within the project area.

Timber management on private land in-holdings within South is expected to be insignificant in acres treated and not expected to affect this species.

No known future activities are proposed that would affect flammulated owl habitat.

The Forest uses incidental observations to track species like the flammulated owl that are considered uncommon, rare, casual, or accidental to the Black Hills. Data collected through the Monitoring Birds of the Black Hills (MBBH) program is also used (USDA Forest Service, 2007). Management Area structural stage Objectives are expected to provide suitable habitat for this species throughout the Planning Area.

Black-backed Woodpecker

Refer to black-backed woodpecker in MIS section

Bald Eagle

Affected Environment

Bald eagles are observed occasionally in the fall and winter months throughout the Black Hills, including the South project area. Wintering eagles feed primarily on

carrion and are usually spotted along major highways where carrion is available, or along water bodies that are free of ice. They have been observed roosting in trees and feeding on carrion along the portion of US Hwy 16 within the project area.
Winter roost sites consist of trees that are large, have a characteristically strong, open-branch structure that can be easily accessed, provide good visibility, and are near water or other feeding sources (Johnsgard 1990).

There are no known nesting attempts within the South project area. A successful nest was documented at Deerfield Lake (16 miles north of the South project area) August 2008.

ALL ALTERNATIVES

Direct and Indirect Effects

No direct effects to eagles would occur. Indirect effects include the removal of large trees that could provide potential winter roost and perch sites. However, not all large trees would be removed, therefore large-diameter roosting/perching trees would continue to be available throughout the project area. Prey for this species would not be affected. Deer are expected to continue to thrive in the project area, and would continue to be a source of carrion along major roadways.

Cumulative Effects

No adverse cumulative effects to bald eagles are expected. The alternatives will have no impact on the bald eagle, which is an occasional winter visitor to the project area.

Black Hills Red-Bellied Snake

Affected Environment

Black Hills red-bellied snakes find food and shelter in the ground litter of moist habitats. Within the Black Hills they area known to occur in wet meadows, woodlands and moist forest-meadow edge habitats (Smith et al. 2003). Stumps, downed woody material and rotting tree roots all provide valuable habitat. Their diet consists mainly of earthworms, slugs, insects and possibly snails (USDA Forest Service, 2000). This Black Hills subspecies is an isolated population; the next nearest population is located in the eastern part of South Dakota, some 300 miles away (USDA Forest Service, 2000). In the Black Hills, the biggest threat appears to be removal of large, downed woody material and logging in wet areas (USDA Forest Service, 2000).

Suitable habitat is suspected in isolated areas in the South Project area. Fourmile, Hay, Lightning and Pleasant Valley Creeks would be the most likely habitat for this species. Most of the limited perennial creeks within the project area are on private

land. These sites do provide some moist meadow habitat. This species was not observed during project surveys, and there are no records of this species occurring in the project area.

ALTERNATIVE 1

Direct and Indirect Effects

There would be no direct effects to the red-bellied snake as a result of this alternative. There may be increased downed woody material available in the project area as a result of insect-related tree mortality.

ALTERNATIVES 2 & 3

Direct and Indirect Effects

Action alternatives would enhance the limited aspen (hardwood) habitat where it exists. Riparian habitats, also very limited, would be protected with project design criteria. The action alternatives would decrease the amount of downed wood available as habitat for this species in the treated areas. Fuels treatments and prescribed burning would decrease existing woody debris. Harvest treatments would require road maintenance which has the potential to affect individuals or unidentified denning sites. Herbicide treatment for noxious weeds in riparian areas may potentially affect water quality and prey for this species. Road maintenance could create barriers to movement. The action alternatives could affect individuals if they are present within areas of project-related activity.

To reduce the potential for adverse effects, the proposed action alternatives avoid activity within riparian areas, which follows Standard 3106, If red-bellied snake hibernacula were found, Standard 3116 would be applied to avoid creating barriers between hibernacula and wetlands (See Appendix B).

Cumulative Effects

No adverse cumulative effects on this species are expected with any alternative. Past timber harvest and associated vegetation management activities have released aspen clones and individuals where they exist, and have avoided the limited riparian habitat present in the South project area. There would be no activities in or around the few riparian areas. The action alternatives would continue to enhance aspen clones and protect riparian habitats.

Proposed timber harvesting, fuels treatments, prescribed burning and road maintenance may adversely alter site conditions (e.g., warming, drying, soil compaction, and den disturbance, barriers to movement, and direct mortality).

Livestock overgrazing around springs and other wet areas could reduce grass cover, therefore negatively impacting this species.

Activities on private land that reduce water quality and riparian habitat could adversely impact this species, if present.

Population viability for this species was evaluated during the Phase II Amendment to the 1997 Land and Resource Management Plan. The Phase II Black Hills BA/BE, Amendment Environmental Assessment determined that population viability across the Planning Area would be maintained for this species if Forest standards and guidelines are followed. The proposed alternatives would meet these standards and guidelines. The Forest is meeting the intent of Objective 221 by conserving and enhancing habitat for this species by protection of known denning sites, monitoring the trend in riparian habitat condition, and the amount of hardwood habitats. Neither riparian nor hardwood habitat are abundant in the South project area. Project design criteria would conserve or enhance these habitats where they do occur.

The Forest appears to be conserving habitat for the red-bellied snake, therefore this species is likely to persist on the Forest. More effort toward improving riparian condition and increasing aspen habitat would likely benefit this species (USDA Forest Service, 2007).

Other Wildlife

Raptors

Protecting known raptor nests (Standard 3204) is part of project design criteria (See Appendix B).

Affected Environment

In addition to the known goshawk nest areas, three other raptor nests were identified during field surveys (fall 2006). Surveys in 2007 found one nest used by a red-tailed hawk. The other two nests were not used in 2007. Raptors typically show a relatively high degree of nest site fidelity; which means they will return to the same nest or nest area year after year. These sites usually contain desirable habitat attributes in regards to nesting and foraging. Buffer zones and timing restrictions have been used in the past to reduce disturbance pressure on nesting raptors (USFWS, 2002). Nest site protection recommendations emphasize the importance of protecting both occupied and unoccupied nests since raptors do not necessarily breed every year or use the same nest.

ALTERNATIVE 1

Direct and Indirect Effects

Vegetation management activities would not occur and the existing condition would continue until some large scale event (wildfire, pine-beetle-caused tree mortality) causes a major change in the landscape. Those raptors that prefer more densely forested landscapes (e.g. Cooper's hawk and sharp-shinned hawk) would benefit more from the No Action alternative. Those species that prefer more open habitat such as the red-tailed hawk and American kestrel are likely not to benefit as much (DeGraaf et al. 1991, Tallman et al. 2002). Impacting known and unknown raptor nest sites would not occur.

ALTERNATIVES 2 & 3

Direct and Indirect Effects

No commercial treatments are proposed in the action alternatives in sites containing the 3 known raptor nests. Prescribed burning is proposed for the red-tailed hawk nest stand (031401-10), and one of the unknown raptor nests (031007-20). A fuel break is proposed (non-commercial thinning) along private land that is located adjacent to the other raptor nest stand (031010-07). This fuel break treatment would be a band 300 feet wide along the property boundary and would not reach the nest.

The action alternatives could affect other nesting raptors during timber felling operations. Effort would be made to educate the timber marking crew members and contractors to identify stick nests and defensive behavior by hawks/raptors. Despite these efforts, the possibility exists that raptor species could be adversely affected and active nests lost. Alternative 2 proposes commercial treatment in more sites near the known nests. Alternative 3 proposes fewer commercial treatments, and would retain more mature trees often used by raptors as nest trees and hunting perch sites.

Cumulative Effects

Past timber harvest has contributed to the loss of large mature trees often used by raptors as nest trees.

Action alternatives may decrease potential future nesting habitat for some raptor species by removing large trees, and thinning dense pine stands. However, raptor species that prefer more open habitat conditions may benefit. Alternative 3 would retain more large mature trees than would Alternative 2. Action alternatives propose to remove pine encroachment from meadows. Ground vegetation would be expected to increase in these sites, therefore increasing habitat for raptor prey species (i.e. small mammals and insects).

Substantial habitat or management changes with regards to private land in-holdings are not expected.

Implementation of design criteria in Appendix B would ensure that Standard 3204 would be met to protect known raptor nests.

Merriam's Wild Turkey

Affected Environment

The Merriam's turkey was introduced to the Black Hills in the late 1940s and early 1950s and is common in and around the South project area. In the Black Hills, turkeys use a variety of habitats. Winter cover consists primarily of Ponderosa pine with >70 percent canopy cover (SS4C, 5 and 3C). Winter forage (pine seeds, forbs) habitat is often within these same cover areas since snow depth is reduced due to interception by the tree canopy. Open stands of Ponderosa pine with sufficient ground vegetation provide good summer habitat in the central Black Hills (Rumble and Anderson 1996). Roost sites are typically on top of slopes or ridges in trees ≥9" DBH with layered horizontal branches (Rumble, 1993). Winter diets consist mainly of Ponderosa pine seeds and summer diets are of grass seed and foliage (Rumble and Anderson 1996). There appears to be a preference for rock or rock outcrops for first-time nesting attempts. In the southern Black Hills, successful nests were located in pine sites with 41-70 percent canopy cover on steep slopes, and areas with greater visual obstruction, vegetation height and shrub cover (Lehman, 2005). Spring weather is probably the single most significant factor in determining turkey populations. Livestock grazing in conjunction with or independent of drought can reduce herbaceous vegetation, which is important in maintaining high-quality summer brood habitat (Rumble and Anderson 1996, Rumble et al. 2003).

Currently 14,447 acres of the Project Area consists of Ponderosa pine at structural stages SS 3C,4B,4C, and 5 which can provide turkeys with roost sites and/or wintering habitat opportunities.

ALTERNATIVE 1

Direct and Indirect Effects

No adverse cumulative effects would be expected under this alternative related to this project There would be no harvesting of structural stages that currently provide roosting, winter cover and foraging habitat. There would be no harvesting of mature trees that could serve as roosting habitat. There would be an increased risk of wide-spread insect-caused tree mortality and large wildfires which could greatly reduce roosting and wintering habitat.

ALTERNATIVE 2

Direct and Indirect Effects

This alternative would reduce roosting/winter habitat to 3,201 acres. More open-forest habitat would be expected to increase summer foraging opportunities for this species. Guideline 3205 would be met by utilizing project design criteria in Appendix B to identify turkey roost sites within harvest units.

Any vegetative treatments and/or post-harvest projects proposed under the action alternatives may cause displacement of individuals or disruption of nesting; however, turkeys would be expected to return to the affected areas in a short time period.

ALTERNATIVE 3

Direct and Indirect Effects

This alternative would reduce roosting/winter habitat to 4,479 acres. This alternative would retain more mature trees and a slightly higher canopy density (60BA) when compared to Alternative 2 (40BA). This would provide additional roosting/cover/nesting opportunities. Alternative 3 would provide a substantial increase in open-forest habitat increasing summer foraging habitat. Guideline 3205 would be met by utilizing project design criteria in Appendix B to identify turkey roost sites within harvest units.

Any vegetation treatments and/or post-harvest projects proposed under the action alternatives may cause displacement of individuals or disruption of nesting; however, turkeys would be expected to return to the affected areas in a short time period.

All Action Alternatives

Direct and Indirect Effects

Project design criteria to retain roost sites is included in Appendix B, therefore both alternatives would meet Forest Plan direction for turkey management. The Guideline calls for 2-6 turkey roost sites per section. There are approximately 67 square miles (sections) of National Forest pine habitat in the South project area, therefore between 134 roosts (minimum) and 402 roosts (maximum) are to be designated during presale-layout operations. There are 11,796 acres (National Forest System) of existing SS4B or 4C Ponderosa pine habitat in this project area and these areas are likely to provide the best opportunities for turkey roost sites, but pre-sale marking crews will be allowed flexibility in roost site selection. Existing roost trees located during pre-sale activities would be preferred for designation.

Project Design Criteria, located in Appendix B, lists sites that are recommended as potential candidates for placement of turkey roots sites (roost sites are 1/4 acre minimum, and greater than 90 BA).

Cumulative Effects

Under the No Action alternative no adverse cumulative effects would be expected related to this project. Turkeys would have the most roosting habitat opportunities and winter habitat. Summer habitat may slightly decrease under this alternative over time.

Past timber harvesting, thinning, and prescribed burning does not appear to have had an adverse impact on the turkey population in the project area. Weather appears to be a primary factor for changes in turkey populations from year to year.

The wild turkey is listed as a game bird by the SD Game, Fish & Parks (SDGFP) department, and they encourage prosperous turkey populations. Hunting of Merriam's turkey is allowed on the Forest. The turkey population is monitored by SDGFP and hunting seasons are adjusted accordingly.

Management of private and State lands within and adjacent to the project area has an unknown effect on turkey populations. However, the public tends to favor turkey presence and often feed them.

The proposed project would reduce wintering habitat, but would increase foraging opportunities for this game bird. There is potential for direct and/or indirect effects to this species from the action alternatives, but most of these would be short-lived. Summer and winter habitat would be provided throughout the project area in both alternatives, although Alternative 3 likely provides a more optimum mix of habitats for turkeys. No adverse cumulative effects are expected for this species related to the action alternatives.

MIGRATORY BIRDS

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

A variety of Forest Plan objectives, standards and guidelines further the conservation of migratory birds. Objectives describe desired resource conditions. The most relevant objectives for bird conservation are those relating to vegetation diversity, landscape structural diversity, snags and down woody material, riparian condition, habitat improvements, and disturbance processes (see Forest Plan Objectives 201-232). Standards and guidelines are designed to help achieve those objectives, and are implemented at the project level. The standards and guidelines most relevant to migratory birds are 2101-2109 (Forested Landscapes), 2201-2208 (Hardwoods and Shrubs), 2301-2308 (Snags and Down Woody Material), 2505-2508 (Proper Use or Residual Levels – Riparian/Uplands), 3101-3115 (Endangered, Threatened or Sensitive Species Protection and Management), and 3202-3212 (General Fish and Wildlife Direction).

Bird monitoring is conducted at the Forest-level to determine species distribution, relative abundance and trend (Panjabi 2001, 2003, 2005, Beason 2006, Hutton 2007). The monitoring is designed and conducted by the RMBO to provide statistically rigorous population trend data for at least 61 species that breed in the Black Hills. Trend data assists the Forest in determining whether additional conservation measures are necessary.

Migratory bird species of concern applicable to project-level conservation are identified by many sources, including the Endangered Species Act, the Regional Forester's sensitive species list, the Black Hills National Forest MIS list, the Species Of Local Concern list (SOLC), internal and public scoping efforts, and the USFWS Birds of Conservation Concern (BCC) (USFWS 2002). All of these sources and their respective species of concern, except the BCC, have been examined elsewhere in this document.

The BCC 2002 publication 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 also evaluated in the BA/BE if they have potential to occur in the Black Hills and the project area. Eleven species are not expected to occur in the Black Hills due to lack of habitat. A summary account of these species can be found in Table 3.52. There are six remaining species (these do not include species analyzed in BA/BE) that could potentially occur in the Black Hills: golden eagle, prairie falcon, red-naped sapsucker, black-billed cuckoo, upland sandpiper and dickcissel. Of these six species, three **(golden eagle, red-naped sapsucker, and upland sandpiper)** are known to occur or have the potential (habitat) to occur within the South Project Area. Black-billed cuckoo, prairie falcon and dickcissel will not be analyzed because suitable habitat is not present.

Table 3.52 Bird Conservation Region 17 Species List

Species	Status in Project Area
Golden Eagle (Aquila chrysaetos)	Foraging (nesting?) habitat present; addressed in Wildlife Specialist Report
Red-naped Sapsucker (Sphyrapicus nuchalis)	Very limited nesting/foraging habitat present; addressed in Wildlife Specialist Report
Prairie Falcon (Falco mexicanus)	Species present on Forest; no habitat present in Project Area (prairie)
Upland Sandpiper (Bartramia longicauda)	Species present on Forest and observed adjacent to project area. Habitat limited to grasslands adjacent to southern portion of Project Area (prairie).
Black-billed Cuckoo (Coccyzus erythropthalmus)	Species present on Forest; no habitat present in Project Area (riparian hardwood)
Dickcissel (Spiza americana)	Species present on Forest; no habitat present in Project Area (prairie)
Peregrine Falcon (Falco peregrinus)	R2 Sensitive Species – Addressed in BA/BE
Burrowing Owl (Athene cunicularia)	R2 Sensitive Species – Addressed in BA/BE. Known to occur in and adjacent to the project area.
Lewis' Woodpecker (Melanerpes lewis)	R2 Sensitive Species – Addressed in BA/BE. Known to occur in the Jasper fire area.
Grasshopper Sparrow (Ammodramus savannarum)	R2 Sensitive Species – Addressed in BA/BE. Habitat limited to grasslands adjacent to southern portion of Project Area (prairie). Known to occur in the Jasper fire area.
Ferruginous Hawk (Buteo regalis)	R2 Sensitive Species – Addressed in BA/BE
Mountain Plover (Charadrius montanus)	R2 Sensitive Species – Addressed in BA/BE
Long-billed Curlew (Numenius americanus)	Species present on Forest and observed adjacent to project area. Habitat limited to grasslands adjacent to southern portion of Project Area (prairie). R2 Sensitive Species – Addressed in BA/BE
Marbled Godwit (Limosa fedoa)	No habitat on Forest or in Project Area (prairies and prairie wetlands)
American Golden-Plover (Pluvialis dominica)	No habitat on Forest or in Project Area (prairie)
Sanderling (Calidris alba)	No habitat on Forest or in Project Area (prairie wetlands)
Wilson's Phalarope (Phalaropus tricolor)	No habitat on Forest or in Project Area (prairie wetlands)
Short-eared Owl (Asio flammeus)	No habitat on Forest or in Project Area (shortgrass prairie)

Species	Status in Project Area
Sprague's Pipit (Anthus spragueii)	No habitat on Forest or in Project Area (prairie)
Brewer's Sparrow (Spizella breweri)	No habitat on Forest or in Project Area (shrub-steppe)
Baird's Sparrow (Ammodramus bairdii)	No habitat on Forest or in Project Area (shortgrass prairie)
Le Conte's Sparrow (Ammodramus leconteii)	No habitat on Forest or in Project Area (prairie wetlands)
McCown's Longspur (Calcarius mccownii)	No habitat on Forest or in Project Area (shortgrass prairie)
Chestnut-collared Longspur (Calcarius ornatus)	No habitat on Forest or in Project Area (prairie)

Golden Eagle (Migratory Bird)

Affected Environment

The golden eagle is typically found in open country from desert grasslands to above timberline; it usually avoids densely forested areas. Typical habitat is grass-shrub, shrub-
sapling and/or open coniferous forests (Johnsgard 1990). This species prefers large trees
and cliffs for roosting and perching (DeGraaf et al. 1991). Additionally, cliffs overlooking grasslands serve as typical nest sites. They may use the same nest or alternate nests between years (DeGraaf et al. 1991). Golden eagles hunt by soaring-searching and using perch sites to identify prey (Johnsgard 1990).

They are considered uncommon permanent residents in western South Dakota (Tallman et al. 2002). In the 1970's and 1980's golden eagle nests were reported in the canyon areas north of Edgemont, SD. There was a report of a nesting attempt (July, 1991) within the South Project Area (Layton Canyon-T4S, R3E, Section 27), but for unknown reasons it was abandoned. There are no other known historic golden eagle nests in the project area. Only two have been detected during recent breeding bird monitoring efforts (Panjabi 2003). In 2003, an observation was reported approximately 12 miles south of the Project Area (~6 miles northeast of Edgemont in Red Canyon). Three golden eagles were observed in 2005 near the Red Canyon area hunting over a prairie dog colony on the Forest (R.Griebel, personal observation). Golden eagles are seen feeding on carrion along roads in the Black Hills during fall-winter months (B.Phillips, personal observations).

Contiguously forested habitats, such as those found throughout much of the Project Area are not preferred by golden eagles, but they may be included in a home range if

suitable nesting or foraging habitat is intermixed. The South Project Area does contain some rim-rock outcrops that could provide typical nesting substrates (e.g. Layton Canyon). Eagles could forage in meadow or grassland areas, and/or in areas of past large fires such as the Jasper fire or the Rogers Shack fire.

ALTERNATIVE 1

Direct and Indirect Effects

No activities are proposed in the No Action alternative, therefore there would be no direct or indirect effects on Golden Eagles.

ALTERNATIVES 2 & 3

Direct and Indirect Effects

The vegetation management activities proposed in the action alternatives would not be expected to reduce potential golden eagle nesting habitat. Disruption of breeding activities could occur if an active eagle nest was present. It is possible that a golden eagle nest could be detected in the available cliff habitat within the project area. In this situation, the site would fall under the protection of Standard 3204 - Protect Known Raptor Nests.

Cumulative Effects

There are no recent records of golden eagles nesting in the project area.
Cliffs and large trees would continue to be available for this species, and Standard 3204 would protect golden eagles should they nest in the project area. Adverse cumulative effects from the proposed activities are not expected.

Red-naped Sapsucker (Migratory Bird)

Affected Environment

The red-naped sapsucker is closely associated with broad-leaved, deciduous, woody vegetation such as aspen (Tallman et al. 2002, Panjabi 2003 and 2005). Monitoring data in 2004 showed that highest densities (i.e., birds/km^2) were located in aspen-dominated communities. Other habitat types within the Black Hills where this species was observed include north-facing pine sites, montane riparian and white spruce (Panjabi 2003).

This species is considered an uncommon summer resident in the Black Hills (Tallman et al. 2002). Recent monitoring data demonstrates that the species is located

throughout much of the Black Hills in low to moderate numbers (Panjabi 2001, 2003, 2005). The species was not observed in the Project Area during 2006-2007 field surveys. The lack of aspen would tend to make the South project area marginal habitat for this species.

ALTERNATIVE 1

Direct and Indirect Effects

No activities are proposed in the No Action alternative, therefore there would be no direct or indirect effects on red-naped sapsuckers. The lack of aspen management (hardwood release) could further reduce the extent of aspen, which could indirectly affect this species.

ALTERNATIVES 2 & 3

Direct and Indirect Effects

In the Black Hills, this species prefers mature aspen. Action Alternatives 2 and 3 do not propose to cut aspen. Pine would be removed from the few aspen clones in the project area. Encouraging growth and persistence of aspen would improve habitat for this species long-term.

Cumulative Effects

Past timber harvest and thinning removed pine from existing aspen (hardwood release). The proposed activities would continue to remove pine from in and around these small aspen clones within the project area. Release of aspen would have a beneficial effect on this species as its preferred habitat would be enhanced.

The effect of private land aspen management is unknown. Generally, landowners favor aspen since it provides some tree diversity other than ponderosa pine.

Action alternatives that remove pine from aspen could cause a short-term impact or displacement of this species, if present. But since preferred habitat would not be removed, but enhanced by hardwood release, no adverse cumulative effects are expected.

Upland Sandpiper (Migratory Bird)

Affected Environment

In the Black Hills, the upland sandpiper is uncommon and local (Tallman et al. 2002, Panjabi, 2005). It has been observed primarily in the southern Hills, where they are

restricted to large expanses of mixed-grass prairie. RMBO detected this species on the periphery of the South project area in 2004. Additional observations that year were in Wind Cave National Park (Panjabi, 2005). In 2006 this species was again observed (RMBO) in the Hopkins Flats area and south of Richardson Well (Hutton et al. 2007). These mixed grassland habitats occur at the southern end of the project area.

ALTERNATIVE 1

Direct and Indirect Effects

No activities are proposed in the No Action alternative, therefore there would be no direct effects on upland sandpipers. Pine encroachment into grasslands would continue, possibly having an indirect on this species due to reducing favorable habitat.

ALTERNATIVES 2 & 3

Direct and Indirect Effects

This is a prairie grassland species and timber harvest and mechanical thinning operations are not expected to have any adverse effect on this bird's habitat. A spring season prescribed burn in these larger contiguous grasslands could affect nesting habitat for this species, if present, therefore project design criteria that favors fall season burning is included in Appendix B for areas of contiguous grassland habitat. A fall burn would have no adverse effect on the upland sandpiper, as it generally migrates out of the area by that time.

Cumulative Effects

Past pine encroachment removal and prescribed burning have generally improved habitat for this grassland species. The action alternatives propose additional meadow enhancement through pine encroachment removal, which would enhance habitat for this species.

Effects on this species from State and private land prescribed burning are unknown since regulating timing of burning is not within the jurisdiction of the Forest Service.

A spring burn does not necessarily create an adverse affect on this species. Species presence, ground conditions and actual timing of burning periods are factors that must be considered. Project design criteria for the South project addresses the potential for adverse affects of a spring burn on nesting habitat if the species is present. With implementation of design criteria, no adverse cumulative effects area expected.

RANGE, NOXIOUS WEEDS and BOTANY

Affected Environment

The physiography of the area varies from gently sloping upland plateaus to deeply incised canyons and stringer meadows. The elevation ranges from 4,600 to 6,600 feet. In the northern portion of the project area, soil types are derived from metamorphic and igneous parent material such as weathered micaceous schist. Further south the soil types are derived from limestone and calcareous sandstone. Vegetation communities are adapted to moisture conditions found in the 18-to-22 inch precipitation zone in the north and in the 10-14 inch precipitation zone in the south. Ponderosa pine (*Pinus ponderosa*) dominates the area.

The South project area has a diverse topography, ranging from plateaus with limestone rock outcrops and deeply incised canyons in the north to gently rolling uplands in the south. Ponderosa Pine Woodland community types (Marriot and Faber-Langendoen 2000) dominate the majority of the area. Wetter areas contain pockets of quaking aspen (*Populus tremuloides*) in the north, while in the south Ponderosa pine/Chokecherry Woodland (*Pinus ponderosa/ Prunus virginiana*) community type (Marriot and Faber-Langendoen, 2000) is present with a few small pockets of hardwoods, generally cottonwood (*Populus deltoides*), in more mesic areas. These more mesic areas may contain habitat for a Black Hills species of local concern, pleated gentian (*Gentiana affinis*), although no individuals were found during surveys.

The three main Ponderosa pine woodland community types present are Ponderosa pine/Common juniper (*Pinus ponderosa/Juniperus communis*), Ponderosa pine/Western wheatgrass (*Pinus ponderosa/Pascopyrum smithii*) and Ponderosa pine/Little bluestem (*Pinus ponderosa/ Schizachyrium scoparium*) (Marriot and Faber-Langendoen 2000). Many of the Ponderosa pine/Common juniper communities have a very strong graminoid component, which according to Marriot and Faber-Langendoen (2000) is not typical for this community type.

The rangelands in this analysis area are predominately shallow/silty range site complexes and thin upland range sites. Dominant rangeland species are western wheatgrass, prairie junegrass (*Koeleria macrantha*), sedges (*Carex spp.),* Kentucky bluegrass (*Poa pratensis*), and blue grama (*Bouteloua gracilis*). Recent studies have indicated that in general, the upland rangeland vegetation is in satisfactory range condition. Many of these upland sites were surveyed for two R2 sensitive species: Iowa moonwort (*Botrychium campestre*) and narrowleaf grapefern, (*Botrychium lineare*). Although no individuals of either of these species were found during surveys, habitat may exist in the open areas that are underlain by limestone-derived soils.

Range

The South project area includes portions of seven grazing allotments as follows: Limestone Allotment, a portion of the Windmill unit; French Creek Allotment, portions of the North Pole and Pope Springs units; South Custer Allotment, portions of the Yellow Jacket and Painter units; the entire Bull Flats Allotment; Water Draw Allotment, portions of the North and East units; Pleasant Valley Allotment, portions of the Layton, Long Draw, Dean, Callon and Hand Springs units; and Richardson Allotment, a portion of the Big Richardson unit.

Range condition, trend and inventory for the analysis area were measured on the various allotments in 1978, 1990, 2001, 2002 and 2005.

There are currently a total of 16 grazing permits, (3 private land permits, and 13 term permits) within the analysis area. There are numerous structural range improvements on Federal land within the project area including boundary fences, unit division fences and water developments.

Noxious weeds

The project area contains the past analysis areas of Crawford, Michaud, Pleasant, Comanche, Garsong, Painter and Pleasant Fuels. Those areas were surveyed during noxious weed treatment in 2000-2006.

Canada thistle (*Cirsium arvense*) and leafy spurge (*Euphorbia esula*) are the main invaders in this analysis area. Smaller infestations of common mullein (*Verbascum thapsus*), spotted knapweed (*Centaurea maculosa*), yellow toadflax (*Linaria vulgaris*), black henbane (*Hyoscyamus niger*) and common tansy (*Tanacetum vulgare*) also exist.

In the South project area at least 600 acres of noxious weed infestations are known to exist. Previous disturbances within the project area and current infestations put this area at high risk for continued invasion. The infestations can be expected to spread at least 30% per year when there is disturbance. Timely treatment and constant monitoring (and re-treatment as needed) can reduce infestations of noxious weeds by approximately 20% per year.

Botany

Botanical surveys were conducted in 2004, 2005, 2006 and 2007 to collect information related to plant communities, assess sensitive species habitat and identify locations of target plant species (ie - sensitive species, state-listed species and species of local concern). Hillshade, a GIS model which estimates high probability sensitive plant habitat based on the amount of shade, and therefore moisture, was used to help

determine survey sites within the analysis area. Additional areas surveyed included meadows underlain with a limestone-derived soil.

No R2 sensitive species or species of local concern have been located within the South project area. However, there may be habitat for two sensitive species in the open meadows. There may be habitat for one species of local concern in wet/riparian areas in the analysis area. Avoiding disturbance of meadows and riparian areas, and therefore conserving the sensitive species and species of local concern habitat, can help meet Forest Plan direction.

Environmental Consequences

Range and Weeds

Impacts to the range resource are mainly centered on changes in forage amount and quality resulting from timber removal and the introduction and spread of noxious weed species. The total amount of herbaceous and shrub production in the area varies as a result of the basal area and overstory density after timber and fuels management treatments are applied. Management activities that reduce the tree density of the forested stand will increase the amount of available forage. When there is an increase in forage in an area, there may be a reduction of impacts from grazing in other areas as grazing pressure is reduced on those areas. However, the disturbance created by timber removal creates a seedbed for noxious weeds that has the potential to out-compete native vegetation.

No changes are proposed for the number of animal months (AMs) or permitted livestock use in any alternative. Grazing would be expected to continue as authorized.

ALTERNATIVE 1

Direct and Indirect Effects

The No Action alternative would eventually result in a decrease of grassland communities in the area as forested stands became denser and Ponderosa pine continued to encroach upon meadow areas.

The amount of available forage would decrease as grassland communities declined and the Ponderosa pine became denser. This would make it more difficult to meet the Forest Plan guideline 2505[1] with the current grazing permits. Having less area available to grazing animals would increase the grazing pressure on those areas, resulting in a possible decrease in the condition of rangelands. A decrease in

[1] Forest Plan guideline 2505 states that livestock and wild herbivore allowable forage use ranges from 40 to 60%, depending on the grazing system and range condition.

condition of the rangelands would eventually lead to an additional decrease in the amount and quality of forage available.

Noxious weed populations would be limited to current infestations unless disturbance occurred from natural events or large-scale fire. Noxious weed infestations are known to increase with large fire events.

ALTERNATIVE 2

Direct and Indirect Effects

If implemented, Alternative 2 would increase the amount of available forage by decreasing the Ponderosa pine density. Increasing the amount of forage available would lessen the pressure on primary range, which would aid in maintaining or improving the desired range condition. There may be short-term loss of grazing access during the timber harvest, thinning activities and/or prescribed burning, but in the long-term, livestock distribution would improve as more areas became accessible to grazing.

Under Alternative 2, 32,118 acres have the potential for being disturbed as trees are dropped and skidded to landing decks and understory fuels are treated. Thus skid trails, landings, burn piles and areas where machinery is working would create a seedbed for noxious weeds. Past experience indicates that populations of plants with pappiferous fruit, such as Canada thistle, have the potential to spread 30 percent a year with disturbance. The amount of disturbance is dependent on the type of equipment used and the time of year the disturbance occurs.

Proposed post-harvest application of herbicides would be critical for noxious weed control to mitigate the spread of invasive plant species. Biological controls would be used in areas that are difficult to access, and in riparian areas that are infested. Monitoring of the effectiveness of treatment, and retreatment as needed, would be essential.

Closing roads (as proposed) can be beneficial related to livestock management. The likelihood of gates being left open (which increases the chance of livestock being outside the permitted area) increases as the number of roads increases.

Closing roads using an administrative closure would provide access into areas for weed treatment while reducing overall use of those roads.

Various post-harvest activities are proposed for the area such as recreation, fencing, water development, signing, and noxious weed control. Table 3.53 illustrates effects of proposed projects on rangeland vegetation and sensitive species/species of local concern habitat.

Table 3.53 Effects of Proposed Projects: Range & Botany

	Rangeland Vegetation	Sensitive Species/Species of Local Concern Habitat
Recreation – Mountain Bike trail	No effects to vegetation, no effect to grazing permits are expected.	No effects.
Fencing	All these projects will help the rangeland vegetation by either improving livestock distribution, therefore alleviating grazing pressure in other areas, or by allowing for the rehabilitation of native vegetation.	Benefit, as habitat may be enhanced
Water Developments		Benefit, as habitat may be enhanced
Noxious Weed Control		Benefit, as habitat is enhanced, as long as individual plants are protected
Signing	No effect	No effect

ALTERNATIVE 3

Direct and Indirect Effects

If implemented, Alternative 3 would have the same effects as Alternative 2 except as follows:

- The 9,456 acres proposed for Commercial Thinning CT 40 in Alternative 2 would instead be taken to a basal area of 60. This would leave a denser stand of Ponderosa pine which would result in less additional forage than would be expected under Alternative 2.
- There are 2,133 more acres proposed for prescribed burning in Alternative 3. In the long-term, the additional prescribed burning would likely enhance the rangeland vegetation, sensitive species habitat, and plant species of local concern habitat as Management Area 5.1A was restored to a more savannah-like condition. There may be some short-term disruption of the grazing rotations as they are adjusted to plan for prescribed burning (See Appendix B).
- There would be an increase of 2,354 acres proposed for Improvement Cut. This additional thinning would likely result in an increase in forage production.
- Under Alternative 3, 31,527 acres have the potential for being disturbed as trees are dropped and skidded to landing decks and understory fuels are treated. When compared to Alternative 2, this would be 591 fewer acres that would have the potential to become infested with noxious weeds.

Botany

Impacts to the sensitive plant species/plant species of local concern may be direct impacts, i.e. trampling, exposure to grazing, mechanical damage, etc., or the impacts may be more indirect such as a change in the microclimate, which may result in a loss of habitat.

ALTERNATIVE 1

Direct and Indirect Effects

No treatment in the Ponderosa pine stands may increase the potential for large-scale fire in the area as the number of dead and stressed trees increases due to Mountain Pine Beetle infestation and drought. Large-scale fire could be a threat to the possible occurrences of sensitive plant species and plant species of local concern habitat in the area.

Lack of treatment within the hardwood stands may lead to a decrease in the viability of those stands.

ALTERNATIVE 2

Direct and Indirect Effects

Although specific data is lacking on the Black Hills National Forest, the earlier successional conditions that occur with opening the overstory canopy could produce conditions that would be beneficial to site colonization by wind-dispersed, spore-producing Botrychium species (R2 sensitive species which may have habitat in the project area; no individuals were found during the survey), if the associated mycorrhizal species and other microsite conditions are present (Farrar, 2004). See the summary of the Botany Biological Evaluation in Appendix D.

There are 8,736 acres identified for prescribed burning in Alternative 2. Many of these acres are in areas that may be potential habitat for the R2 sensitive plant species *Botrychium lineare* and *B. campestre*. Despite the fact that aboveground stems may be negatively affected, beneficial short- and long-term effects may be realized by the prescribed burning in the project area. Dr. Farrar (2004) indicated that when an occurrence has aboveground growth, a fast moving fire may not negatively impact it. The fire may remove aboveground stem portions, but would not be expected to affect belowground individuals or parts.

Decreasing the Ponderosa pine density and the proposed prescribed burning are expected to reduce the risk of wildfire, which will help protect sensitive plant species/species of local concern habitat and structural range improvements. Although

unknown, an intense fire (from wildfires or a high-intensity prescribed burn) that may have high severity effects such as deep soil heating could potentially negatively affect both the belowground and aboveground portions of *Botrychium* individuals. (USDA Forest Service, 2005).

Pleated gentian, a plant species of local concern that may be present in the project area, is primarily reported to occur in areas without tree canopies, or in areas of full or almost full sun conditions. Therefore, conifer encroachment is expected to present a risk to this species (USDA Forest Service, 2005). The pine encroachment treatments proposed in this alternative would be expected to benefit this species by enhancing/conserving the habitat conditions that are similar to conditions where pleated gentian has been found.

ALTERNATIVE 3

Direct and Indirect Effects

If implemented, Alternative 3 would have the same effects as Alternative 2 except as follows:

- There would be 2,133 additional acres proposed for prescribed burning in Alternative 3. In the long-term, the additional prescribed burning would likely enhance the rangeland vegetation, sensitive species habitat, and plant species of local concern habitat, as Management Area 5.1A is restored to a more savannah-like condition. There may be some short-term disruption of the grazing rotations as they are adjusted to plan for the prescribed burning.

Cumulative Effects

The cumulative effects area for this analysis is the South project area; activities beyond the project area have a diminished effect on the rangeland vegetation and sensitive species/species of local concern habitat within the project area. The timing limit for the cumulative effects analysis is estimated at 20 years, ten years prior to present and ten years into the future, which allows for an adequate length of time to record vegetative changes.

Past, present and reasonably foreseeable activities within the South project area include timber harvest, timber thinning, mining, wildfire, grazing, road construction and maintenance, noxious weed control, wildlife habitat improvement projects, and dispersed recreational use on both the public and private land in the area. Private lands in the area are likely to continue to be subdivided and developed. A list

documenting known past and planned future activities for this area is included in Appendix E.

Past timber harvest/thinning may have created, and any future timber harvest/thinning may create transitory range in the area. Transitory range temporarily produces an increase in rangeland vegetation due to the removal of the tree overstory. Thus, the amount of available forage is expected to increase, temporarily, with timber harvest. Increasing the amount of forage available can lower the overall level of livestock utilization, which can lead to maintaining or improving the satisfactory condition of the rangeland. Removing timber and thinning existing stands of Ponderosa pine may reduce the chance of large-scale fires that could threaten the sensitive plant species/species of local concern habitat.

Removing timber and thinning existing stands of Ponderosa pine may also create earlier successional conditions that would be beneficial to site colonization by wind-dispersed, spore-producing *Botrychium* species if the associated mycorrhizal species and necessary microsite conditions are present.

Any past, present or foreseeable future activity that causes soil disturbance has the potential to introduce and increase the rate of spread of noxious weeds and other exotic plants. This can be detrimental to sensitive plant species/species of local concern and native rangeland vegetation, as invasive species have the ability to out-compete desired native plants. The herbicides used in noxious weed control can also be detrimental to sensitive/species of local concern plants if the individuals are inadvertently exposed to the herbicides.

When properly managed, livestock grazing can have positive impacts on the rangeland vegetation. Grazing within the South project area would continue as identified in the Allotment Management Plans for the Limestone, French Creek, South Custer, Bull Flats, Water Draw, Pleasant Valley and Richardson Allotments. In the South area, the possible species of local concern habitat is in locations that have not historically been readily accessible to grazing animals. However, if conditions change and grazing animals utilized those locations more heavily, grazing could impact the pleated gentian.

Aside from the direct impact on the vegetation (ie – removal of vegetation, soil compaction and introduction of invasive species), road construction has the indirect impact of making formerly inaccessible areas available to both humans and grazing animals. However, no new or temporary road construction is proposed in the South project. Opening a new area to grazing can have a positive impact, by helping to distribute grazing animals. It can also have a negative impact by allowing access to areas that may be sensitive plant species/species of local concern habitat. The likelihood of gates being left open (which increases the chance of livestock being in unauthorized areas) increases as the number of roads increases. A reduction in the total miles of open roads is proposed in the South project area.

An increase in the development and subdivision of private land in the area may lead to an increase in the introduction of exotic plants and noxious weeds. Development of private land can lead to an increase in the likelihood of gates being left open (again, increasing the chance of livestock being in unauthorized areas) and fragmentation of the rangeland. The increase in development of private land could result in direct impacts to sensitive plant species, plant species of local concern and/or their habitat if they occur in those specific development locations.

In the South area, the primary impacts from recreational use to the rangeland vegetation, sensitive plant species habitat, and plant species of local concern habitat, are the negative direct impacts to the vegetation (ie – removal of vegetation, soil compaction, introduction of invasive species) that result from off-road travel. Off-road travel also indirectly impacts the rangeland vegetation resource by increasing the likelihood of gates being left open by the public. Leaving gates open makes livestock management difficult and often results in livestock being in unauthorized areas. Recreational use in an area increases the likelihood of plant collecting which can have an impact on sensitive plant species/species of local concern populations.

All of the above uses are limited in intensity and duration and therefore when combined with the alternatives analyzed, including the No Action alternative, do not result in adverse cumulative impacts to the rangeland vegetation, or to sensitive plant species/plant species of local concern habitat.

RECREATION

Affected Environment

The South Project Area (South or Area), is a familiar recreation setting to most residents and visitors of Custer as it is only a few miles west of town. The area provides recreation on public lands that border private homes and subdivisions very near the tourist base of Custer. South is heavily roaded and offers easy access to the National Forest for private landowners and visitors alike. With the exception of private housing developments located at Danby Park, Pass Creek and upper Pleasant Valley, the South area is mostly contiguous forest land. The transition from a rural setting to a roaded natural forest setting occurs quickly for residents and visitors. All roads off of Highway 16 are either gravel or native surface and provide an excellent resource for driving “backcountry” roads. Past, recent and on-going resource management actions are evident such as timber harvesting, mining, recreation and grazing; wildlife is common.

With the exception of lands to the north of Highway 16, the area receives very little snowfall. This makes most of the area an important and popular winter non-snow playground for residents and visitors. The southern and western portions of the project area are generally hotter and dryer during the months of July and August than

other areas of the Hell Canyon District. Geology changes from granite to limestone from east to west. Visitors can experience both granite monoliths and steep, eroded red limestone canyon bottom lands and plateaus in the area. The northwestern edge of the project area was burned in the large-scale Jasper wildfire of 2000.

A little less than half of the project area is classified as Management Area (MA) 5.1 Resource Production emphasis, more than half is MA 5.4 Big Game Winter Range emphasis and a small portion is MA 5.1A Southern Hills and Grasslands Area.

Primary recreational use of this area is dispersed in nature and includes hunting, hiking, mountain biking, horseback riding, OHV (off highway vehicle) riding, and pleasure driving. Developed recreation is provided at Comanche Campground. This semi-primitive campground has 34 campsites, a potable, pressurized water system and vault toilets.

Dispersed Recreation Use and Trails

Hunting, OHV use, hiking, horseback riding, mountain biking and driving for pleasure are current dispersed activities in the area. Hunting is the most popular use of the area, with fall big-game the busiest season followed by spring turkey season. OHV use is common with most hunting activities. OHV use of existing system, unauthorized and temporary roads is considered high year-round. Year-round OHV riding is possible due to no-snow or low-snow conditions for most or all of the winter months in the southern half of the project area. Cross country OHV use is low due to the abundance of various existing roads available for riding but it does occur for big-game retrieval on a limited basis. Cross-country OHV resource damage exists in the project area close to the town of Custer in the Wabash Spring area located in T3S, R3E, Section 36. In the Jasper fire area, travel is restricted to designated (signed) roads only. In MA 5.4, Big Game Winter Range, motorized travel is prohibited from December 15 to May 15 annually. Snowmobiling and cross country skiing is possible on a limited basis particularly in the far northern portion of the project area, but there are no established system trails. Hiking and mountain biking occur throughout the project area on a limited basis; no system trails are provided. Most of this activity is associated with residences bordering National Forest. The Lithograph Canyon area, located along the western border of the project area in the Jasper Fire, provides awe-inspiring views and challenging limestone formations. Horseback riding is similar in popularity to hiking and mountain biking and occurs on a limited basis. Overall, the South Project Area is primarily a motorized recreation opportunity area with high levels of use particularly during hunting seasons and in areas near privately developed land and the community of Custer.

Short-term, dispersed recreation users would be subjected to increased noise, dust and logging traffic from timber harvesting activities. Dispersed Recreation visitors may be negatively affected by activities such as logging equipment operating in specific sale units and large trucks using system roads. Short-duration smoke from post-sale prescribed burning may have a negative affect on the quality of a recreation

experience. Short-term changes caused by increased harvest and prescribed fire activities in specific areas may cause a shift of recreational use to other areas of the forest.

Non-motorized recreation opportunities would increase in Alternative 3 with designation of a mountain bike route in highly scenic Layton Canyon by a combination of Forest Roads 445 and 275.1A and 1.7 miles of new bike trail. Gravel parking areas with interpretive sign boards would be provided for visitors. Hiking, hunting, horseback riding and other dispersed recreation opportunities would increase in both alternatives over a broad area. These opportunities currently exist, however these recreational users would experience less disturbance from motorized vehicles due to the reduction in the miles of transportation system (mostly closure of user-created routes) open to motorized use. Motorized OHV use of Forest system roads would likely be concentrated on roads that remain open for this type of activity. OHV use is likely to remain stable or increase, but the miles of roads open for general motorized travel would decrease with implementation of Alternative 2 or 3.

Developed Recreation

The USFS Comanche Campground is located in the northern part of the project area in T4S, R3S, Section 1. This seasonal, fee campground has 34 sites, a water well and vault toilets. It has a 30% occupancy rate, which is considered moderate use.

Comanche Park Campground visitors may be subjected to increased noise, dust and logging traffic from nearby timber harvesting activities. The campground would be closed to the public during the off-season when logging would occur within and near this recreation facility. A small number of visitors do use the first four campsites for off-season camping & picnicking; therefore, a small number of visitors would be displaced during harvest operations. Smoke from post-sale prescribed burning could decrease the quality of a recreational experience. However, smoke from prescribed burning would last for a short duration, and normally occurs outside of the campground operating season.

Short-term changes caused by increased harvest and prescribed fire activities in specific areas may cause a shift of recreational use to other areas of the forest. Risk of wind-throw (trees knocked over) caused by thinning the forest to a 40 or 60 basal area may mean more risk from and removal of hazard trees within the campground.

Long-term effects may include: visual changes from a dense forest setting to a more open forest (either a 40 basal area in Alternative 2 or a 60 basal area in Alternative 3); less privacy between campsites with any action alternative(Alternative 2 to provide less privacy {tree screening} than Alternative 3); the campground would need less hazard tree maintenance work because commercial thinning would remove high-risk trees and reduce the chance of Mountain Pine Beetle infestation of the site.

Recreation Special Uses

One horseback riding outfitter and guide, Country Charm Cabins and Corrals, operates Memorial Day to Labor Day in the project area. Roads and trails used include those located in T5S, R4E, Sections 29, 30, 31 and 32 as well as T6S, R4E, Section 6. They have 200 priority service days authorized for day horseback riding.

The Boy Scouts of America conducts cave tours of S&G Cave under a special use permit.

Environmental Consequences

ALTERNATIVE 1

Direct and Indirect Effects

There would be no effect on developed recreation at Comanche Park Campground, no effect on dispersed recreation activities, and no effect on current outfitter & guide special use permits.

This alternative would have no effect on the recreation resource. No change to existing developed sites or dispersed recreation activities would occur.

ALTERNATIVES 2 & 3

Direct and Indirect Effects

The effects of the proposed treatments on the recreation resource are the same for Alternatives 2 and 3. The main impacts from both action alternatives would be related to closing roads, visual changes, and short-term disturbances from logging and prescribed burning activities. Alternative three includes one proposed change to the recreation resource. This alternative would provide the analysis and clearance to create the Layton Canyon mountain bike trail.

Proposed treatments in the action alternatives would reduce the potential for wildfire or insect infestation and provide a healthy, forested landscape for a quality recreational experience.

Open road density available for motorized use would decrease from approximately 3.6 miles per square mile to approximately two miles per square mile in the winter months (December 15 –May 15) in both action alternatives. This would increase non-motorized recreation opportunities and decrease motorized opportunities.

Open road density available for motorized use would decrease from approximately 4.1 miles per square mile to approximately 2.9 miles per square mile in the summer

months (May 15 – December 15) in both action alternatives. This would increase non-motorized recreation opportunities and decrease motorized opportunities.

Improvements to the transportation system and reducing the amount of roads open to motorized travel would protect sensitive cultural, wildlife, and plant community areas. An adequate resource for motorized recreational travel would still be available. This management would result in a more balanced, mixed spectrum of motorized, non-motorized, dispersed, and developed recreational opportunities benefiting a large variety of users.

Short-term adverse effects (less than 5 years) from the South project such as smoke from prescribed burning, and noise and dust from logging traffic would result in negligible shifts of recreational use from disturbed to undisturbed areas within the project area.

No change to recreation Special Uses would occur.

Cumulative Effects

The cumulative short-term effects on recreation are from disturbance caused by logging and prescribed burning activities during timber sales and closing of roads and other post-sale work.

Longer-term cumulative effects on the recreation resource are centered on providing both motorized and non-motorized quality dispersed recreation opportunities. This is different than today where motorized riding opportunities exist on a high density of open roads which can negatively impact opportunities for non-motorized recreation.

No adverse, long-term (beyond five years) cumulative effect to recreation is expected as a result of the South project.

VISUAL QUALITY/SCENERY

Affected Environment

Landscape Character

Landscape character gives a geographic area a visual and cultural image, and consists of the combination of physical, biological and cultural attributes that make each landscape identifiable or unique. Existing landscape character may range from predominantly natural landscapes to those that are heavily culturally influenced. The landscape character units are derived from an ecological framework utilizing ecological land descriptions and existing landscape uses. Ecological units are the

mapped landscape analysis units used for ecosystem planning and management. The visual image created by the physical, biological, and cultural factors in the ecological land unit description helps define the landscape character for scenery management. For descriptions of this area and landscape character, see USDA Forest Service, 1996: Ecological Land Unit – Limestone Plateau Valued Landscape Character Unit (LCU) Overview Moderately Dissected Terrain/Mixed Forest Landscape Character Unit; note: this area borders with, and has some of the attributes of the Gently Rolling Terrain/Ponderosa Pine/Prairie Grass Landscape Character Unit.

The South Project Area is within the southern portion of this plateau where the landscape character is predominantly made up of ephemeral/intermittent streams in shallow drainages, with low rounded ridges extending approximately 400 to 1000 feet above the drainages. Ponderosa pine and small pockets of aspen cover the area. Wildflowers in the spring and hardwoods in the fall present limited accents of vibrant colors in the landscape.

Inventoried Scenic Classes

Scenic Class measures the relative importance, or value, of discrete landscape areas having similar characteristics of scenic attractiveness & 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 upon human perceptions of the intrinsic beauty of landform, water characteristics, vegetative pattern, and cultural land use) and Landscape Visibility (which is based upon the distance zones from the observer and the concern level for scenery). (USDA Forest Service, Landscape Aesthetics, 1995).

The higher the Scenic Class, the more important it is to maintain the highest scenic value. The inventoried Scenic Class Values on the Black Hills NF are 1 (Highest), 2, 3, and 4 (Lowest). The scenic class values demonstrate the importance of the views in different areas. Approx. 8 % of South area is designated as a Scenic Class 1, 46% in a Class 2, 27 % in a Class 3, and 19 % in Class 4.

Scenic Attractiveness

Inherent Scenic Attractiveness is obtained by classifying the landscape into different 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 (USDA Forest Service, Landscape Aesthetics, 1995).

Scenic attractiveness classifications are: A - Distinctive, B - Typical and C - Indistinctive. A - Distinctive refers to those areas where landform, vegetative patterns, water characteristics and cultural features combine to provide unusual, unique or outstanding scenic quality. These landscapes have strong positive attributes of variety, unity, order, harmony, uniqueness, pattern and balance. B – Typical refers to those landscapes where landform, vegetation patterns, water characteristics and cultural land use combine to provide ordinary or common scenic quality. C - Indistinctive refers to those landscapes where landform, vegetation patterns, water characteristics and cultural land use have low scenic quality. Often water and rock-form of any consequence are missing in class C landscapes. Approximately 5% of the South area is in the A - Distinctive classification, 34 % in the B - Typical and 61 % in the C – Indistinctive classification.

Landscape Visibility

Landscape Visibility is the portions of landscapes visible from travel ways and use areas and are important to constituents for their scenic quality, aesthetic values, and landscape merits. Travel ways 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 travel ways that lead to important scenic features, residential areas, resorts, recreation areas, unique natural phenomena, wilderness trailheads, national parks, and State and county parks, attract a higher percentage of users having high concern for scenic quality, thus increasing the importance of those travel ways. (USDA Forest Service, Landscape Aesthetics, 1995).

From U.S. Hwy. 16 and U.S. Hwy. 385 Sensitivity Level 1 corridors, 24 % of the planning area is visible. The majority of these viewed areas are in the northern portion of the planning area. The most dominant visible areas are along the north and east facing hills in this area.

From the Sensitivity Level 2 corridors, county & major Forest Development Roads, 59 % of the planning area is visible. This includes numerous county roads: 273 (Pass Creek), 315 (Hopkins Flat), 316 (Loring Siding), 653 (Stagg), 715 (Pleasant Valley). Forest arterial roads include: Forest Development Road (FDR) 287 (North Pole), and 288 (Lightning Creek) which provides access from the Custer, SD area to Bear Mountain Lookout. A large portion of the planning area is visible from these roads.

From the Sensitivity Level 3 corridors, Forest Development Roads, 40 % of the planning area is visible. This analysis does not take into account the many private residences in the area, however many of the views from those residences would be included in the analysis from the roads.

Scenic Integrity Objectives

Scenic Integrity Objectives (SIO) are management objectives that were adopted from the 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 (USDA Forest Service, Landscape Aesthetics, 1995).

HIGH : A Scenic Integrity Level meaning human activities are not visually evident. In high scenic integrity areas, activities may only repeat attributes of form, line, color and texture found in the existing landscape character.

MODERATE : A Scenic Integrity Level that refers to landscapes where the valued landscape character “appears slightly altered”. Noticeable deviations must remain visual subordinate to the landscape character being viewed.

LOW : A Scenic Integrity Level that refers to landscapes where the valued landscape character “appears moderately altered”. Deviations begin to dominate the valued landscape character being viewed but they borrow valued attributes such as size, shape, effect, and pattern of natural opening, vegetative type changes or architectural styles within or outside the landscape being viewed. They should not only appear as valued character outside the landscape being viewed but compatible or complimentary to the character within.

VERY LOW : A scenic integrity level that refers to landscapes where the valued landscape character "appears heavily altered." Deviations may strongly dominate the valued landscape character. They may not borrow from valued attributes such as size, shape, edge effect and pattern of natural openings, vegetative type changes or architectural styles within or outside the landscape being viewed. However, deviations must be shaped and blended with the natural terrain so that elements such as unnatural edges, roads, landings, and structures do not dominate the composition.

UNACCEPTABLE LOW : A scenic integrity level that refers to landscapes where the valued landscape character being viewed appears extremely altered. Deviations are extremely dominant and borrow little if any line, form, color, texture, pattern or scale from the landscape character. Landscapes at this level of integrity need rehabilitation. This level should only be used to inventory existing integrity. It must not be used as a management objective.

Within the South Planning area, approximately 6% has a HIGH, 34% MODERATE, and 60% LOW SIO.

Existing Scenic Integrity

Existing Scenic Integrity represents the current status of a landscape. It is determined on the basis of 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 area is noted for dense conifer stands in gently rolling terrain, meadows that follow streams and intermittent streams, and small pockets of aspen and other hardwood trees. Forested areas are predominantly populated by Ponderosa Pine communities. Water features are limited to narrow, quiet, low-flow streams. Apparent human alterations in the form of roads have generally been accepted over time as part of the positive cultural landscape character attributes when they do not dominate the landscape in appearance or quantity. Vegetation alterations in the form of commercial thinning and seed tree cuts are scattered throughout the area.

The Ventling Draw Fire that took place in 1966 was a severe fire that appears to have killed much of tree vegetation within the fire area. As a result, today there are small pockets of trees scattered throughout the area, though the majority of the area is open grasslands. Seedlings are slowly working in from the outer edges. Sod may have formed in some areas after the fire and may be contributing to the slowness with which seedlings are becoming established.

The existing scenic integrity of the South area is generally Moderate. Past vegetation management activities have occurred, but the landscape appears slightly altered (Moderate SIO) throughout the area.

When viewed from Highway 16, the vegetation appears generally intact. This includes areas around Comanche Campground along Highway 16.

Environmental Consequences

ALTERNATIVE 1

Direct and Indirect Effects

Existing conditions and natural processes of trees growing and regenerating would continue. Wildland fire is an essential ecological process in this ecosystem, which

would continue to be extinguished quickly. This management would continue to limit the natural role of fire in the landscape. As a result, the forest would continue to become dense, reducing visible open space. Views into the forest would become limited, reducing visual diversity. Effort would be made to keep the fires small, which would continue to limit visual evidence of the effects of wildfires within the landscape. If fires spread beyond initial containment, such as in drought and / or high wind conditions, and spread onto hillsides of densely packed trees, a view of hillsides of fire-killed trees would be expected. As fire-killed trees fell, these areas would be more visible in the landscape as large openings. During periods when the ground is snow covered, these areas would be highly visible in the landscape. Burned areas may or may not be similar in shape and size (scale) to meadows, and other existing natural open areas in the landscape. Eventually new trees would sprout.

In areas with a High or Moderate SIO, if fires occurred or insect activity increased beyond endemic levels, the forested landscape would move away from the desired future scenic condition for more open, park-like pine sites. In areas where insect infestations dominated the landscape, large open areas (exceeding the size of openings normally found in this area) could be created, dramatically changing the appearance of the forest.

In areas where no disturbance occurred, the vegetation would grow into a dense forest, competing for light, water, and nutrients. Dense conifers would out-compete the hardwoods for these necessary components for plant growth. This dense vegetation would provide the greatest potential for disturbance (fire or insect) that could greatly change the visual appearance of the vegetation across the landscape. The dense vegetation may shade out shrubs, wildflowers and other low growing plants – reducing visual diversity.

ALTERNATIVE 2

Direct and Indirect Effects

This alternative treats approximately 73% of the planning area through commercial vegetation treatments. This alternative treats approximately 44% within the planning area through pre-commercial vegetation treatments.

Of these commercial treatments in this alternative, the OR and SC treatments would result in a more open condition on approx. 3,360 acres, or 8% of the planning area. Due to the rolling nature of the topography, these treatments would not be very visible from Sensitivity Level 1 or 2 roads. Panoramic views are not available within this project area. As a result, most treatments are viewed in a close-up foreground view, or limited middle-ground view. Roads are generally not evident in the landscape except in the immediate foreground view.

The remaining commercial and pre-commercial treatments would produce a natural appearing forest with fewer trees, as if fire had continued to play its natural role.

If beetle infestations stay small and scattered, and the beetle activity can be reduced as a product of these treatments, a less densely-forested landscape may be maintained where large trees will be highly evident. Roads and other activities that change the natural contours may be more evident with the removal / thinning of the vegetation on the landscape. A forested backdrop to private land could be maintained with a Moderate level of Scenic Integrity being maintained in the project area.

Alternative 2 would modify the vegetation across the landscape so that management activities would be more evident. The variety of treatments would also create a variety of textural patterns and improve opportunities to view hardwoods and wildlife. Overstory removal treatments generally would not meet the High or Moderate Scenic Integrity Objective, however the low rolling, flat-topped, ridges would reduce their visibility. Treatments to increase hardwoods and decrease potential for MPB activity would meet the assigned SIO. In addition, the prescribed fire, pile burning, and other fuel treatments would meet a Moderate to High Scenic Integrity two to four years after being completed (FP Obj. 10-02).

ALTERNATIVE 3

Direct and Indirect Effects

The acreage of commercial treatments under this alternative is within 2% of Alternative 2, essentially not discernible from a scenery perspective. However, the difference that would be apparent is the change in Basal Area being retained: from 40 BA (Alternative 2) to 60 BA (Alternative 3) on approximately 76% of the commercially thinned sites (approx. 9400 acres). This difference would appear as a less open forest than Alternative 2. Pre-commercial treatments would generally be the same except for Improvement Cuts that treat areas with past storm damage (2,350 more IC acres than Alternative 2). This additional treatment would improve the general appearance of the forest in these areas. Finally, this alternative would treat an additional 2,133 acres through prescribed fire. This treatment would reduce fuel levels to more natural conditions and from a scenery perspective would help maintain open-forest conditions that allow wildlife, wildflowers, hardwoods, and large trees to be easily viewed.

The increase in the level of prescribed fire would help maintain the natural Ponderosa pine fire-dependent ecosystem of this area, increasing the variety of shrubs and hardwoods that might not otherwise be apparent within the current dense forest.

Cumulative Effects

The boundary for analyzing cumulative effects is the project area. This area is the landscape that is evident in the foreground and middle ground from the main travel routes, approximately 60% of the project area.

The time boundary for this analysis extends from approximately 1980 to 2017, including known management activities and activities that are planned but have yet to be accomplished. Fire suppression over the past century played a role in the increased density of the vegetation on the forest. Likewise, much of the Forest was pre-commercially thinned by the Civilian Conservation Corp in the 1930's and 1940s. However, we do not know if that effort included any or all of this project area. From approximately 1980 to 1989, vegetation treatments were conducted on 7,172 acres, including patch clearcuts, shelterwood prep cut, shelterwood seedcut, overstory removal and commercial thinning. The areas where these treatments occurred do not stand out, but blend in with the surrounding vegetation so that most visitors would not be able to identify them.

ALTERNATIVE 1 – NO ACTION - There would be no adverse cumulative effects common to the No Action alternative. There would be no change from the existing condition. The scenic integrity would stay the same until a natural change (insect, disease, fire) occurred.

ALTERNATIVES 2 & 3 - Cumulative effects are similar. Alternative 3 would provide more naturally-appearing scenery than Alternative 2. The variety of treatments would move this landscape toward a visually more natural condition, and allow natural processes (insect, disease, fire) to occur without significant visually detrimental effects (ie – killing all the trees) occurring.

HERITAGE RESOURCES

Affected Environment

Level I and Level III cultural resource inventories were conducted in the South project area between 2003 and 2005 (Noisat 2005 and Smith et al. 2006). Tracts of private property within the analysis area were not inventoried.

A Level I inventory of previous projects and previously recorded sites within the project area was conducted prior to any potential fieldwork. A Level I inventory revealed that one hundred fifty one (151) previous adequate Level III cultural resource surveys were conducted within the proposed project area, covering all but 18,362 acres. Adequate Level III surveys are defined as 100 percent survey requiring a visual inspection of the project APE (Area of Potential Effect), with pedestrian transects no more than 30 meters (100 feet) apart [*Guidelines for Cultural Resource Surveys and Survey Reports in South Dakota (For Review and Compliance), 2005: 9*]. The State of South Dakota guidelines (Ibid 2005:9) also state that the survey report must explain survey methodology and rationale for their use to be considered adequate. Furthermore, the South Dakota State Historic Preservation Office (SHPO) "has determined that archaeological data, surveys, and reports completed within the

last twenty years are valid and may not require a new survey" (Ibid 2005: 9). Based on these criteria, two Level III inventories were conducted for the remaining 18,362 acres.

During the spring, summer and fall of 2005, two large-block Level III heritage resource inventories were conducted in the South project area (North Unit and the South Unit). A total of 390 cultural resources occur within the project area; 77 newly identified sites, and 313 previously recorded sites. In total, 47 sites are considered eligible to the National Register of Historic Places (NRHP). An additional 58 sites in the project area remain unevaluated. These unevaluated sites would be treated as eligible sites.

Environmental Consequences

ALTERNATIVE 1

Direct and Indirect Effects

If there is no federal action, then there is no undertaking, as defined in 36 CFR Part 800.16(y), for Section 106 of the National Historic Preservation Act (NHPA) (16 U.S.C. 470f). However, No Action may result in the destruction of cultural resources due to the increased fuel loading and tree mortality from overgrowth, both of which increase the risk of fire and subsequent ground disturbance and erosion. All the eligible sites in the South analysis area are eligible for listing on the National Register of Historic Places (NRHP) due to the presence of intact subsurface cultural deposits. As such, any processes that disturb the soil/sediment matrices of an archaeological site (including erosion) adversely impact the site's eligibility.

ALTERNATIVES 2 & 3

Direct and Indirect Effects

The purpose of and need for action in the South Project Area is to reduce the risk of and effects from large-scale wildfires on the At-Risk Communities (ARC) of Custer, Pringle and Argyle, South Dakota while providing for wildlife habitat needs, reducing risks of Mountain Pine Beetle infestation, providing a sustainable supply of commercial timber, and providing for management and public access needs. Two action alternatives have been proposed to meet this purpose and need. Alternative 2 meets the purpose and need by creating larger numbers of thinner stands, whereas Alternative 3 would involve slightly more prescribed burning. Vegetation management actions include using commercial treatments to reduce the risk of and hazards from wildfire while minimizing adverse effects to natural and cultural resources. Associated actions include noncommercial treatments to reduce the risk of wildfires, spread of insect infestations, and to increase vegetation diversity. Other

activities within the project area include landing construction, mechanical slash piling and burning, wildlife habitat improvements, and changes to travel routes.

Proposed Mountain Bike Route

Alternative 3 proposes the creation of a new mountain bike route in the South project area. This route uses primarily existing roads, but it would also include the construction of approximately 1.7 miles of new bike trail. This proposal does not affect any known cultural resources. However, as a new undertaking with the potential to affect cultural resources, it still requires consultation with affected parties under Section 106 of the NHPA.

Concurrence from the State Historic Preservation Officer (SHPO)

The Hell Canyon archaeologist submitted the sites eligible for the National Register of Historic Places (NHRP) and the NRHP unevaluated sites located throughout the South Project area. Pursuant to Section 106 of the National Historic Preservation Act of 1966 (as amended), in letters dated January 12, 2006, and May 8, 2006, the Office of the South Dakota State Historic Preservation Officer (SHPO) concurred with the determination of No Adverse Effects for the proposed undertaking on the non-renewable cultural resources of South Dakota. Concurrence does not relieve the federal agency from consulting with other appropriate parties as described in 36 CRF Part 800.2 (c).

All identified historic and prehistoric properties would be protected by following the heritage resource compliance process mandated by Section 106 of the National Historic Preservation Act (NHPA) and the recommendations outlined in the heritage resource report. The regulations governing Section 106 review are contained in 36 CFR Part 800.2(c), which describes the compliance process. All timber harvests, fuels treatments, and maintenance of roads are designed to protect eligible sites by avoidance or other site-specific design criteria identified by the District Archeologist. During implementation, the District Archeologist would be consulted about site locations and design criteria (see Appendix B) required to protect heritage resources.

Cumulative Effects

Archaeological resources are non-renewable. Due to both natural and human processes, the loss of archaeological resources has happened in the past and will happen in the future. One cumulative effect is that over time fewer archaeological resources would be available to learn about past human life-ways, to study changes in human behavior through time, and to interpret the past to the public. Recording and archiving basic information about archaeological sites in the proposed project area serves to partially mitigate potential cumulative effects to cultural resources.

No adverse cumulative effects are expected to occur as a result of this project provided that the site-specific recommendations are implemented (see design criteria in Appendix B). If, during the course of any ground disturbance related to this project, any bones, artifacts, foundations, or other indications of past human occupation of the area were discovered, work would stop and the district archaeologist would be contacted. The archaeologist would determine if additional consultation with the State Historic Preservation Office and applicable Native American Tribes would be required before work continued.

LANDS and SPECIAL USES

Affected Environment

There are many private parcels of land within the South project area encompassing 7,840 acres. These private lands are often long, continuous irregularly-shaped parcels of open pasture land that was settled as claims related to the Homestead Act. Some parcels are still active ranches, but more and more parcels are being subdivided for housing developments for single-family residences. Access to private parcels is provided through system and/or non-system forest roads, State highways or Custer County roads, for which the State or County holds easements. The remainder of the project area consists of 1,197 acres of State of South Dakota, Department of Game, Fish and Parks land; and 43,044 acres of Federal land administered by the Forest Service.

There are currently seven Federal Land Policy and Management Act (FLPMA) easements, 13 National Forest Road and Trail Act (FRTA) easements, and 1 Department of Transportation easement within the project area.

Environmental Consequences

ALTERNATIVE 1

Direct and Indirect Effects

This alternative would not have any short-term effect on the lands resource. There is a potential for untreated NFS lands to have an increased threat of wildfires due to higher stocking densities. This could pose a risk of fire spread to private property. There is also a possibility of an increase in insect infested trees and subsequent tree mortality. No additional rights-of-way would need to be acquired. Various applications would continue to be considered through the Lands and Special Uses programs: Small Tracts Act applications, special use permit applications, utility requests, easement applications and opportunities to acquire rights-of-way.

ALTERNATIVES 2 & 3

Direct and Indirect Effects

These alternatives would not have any long term effects on the lands resource. Current special uses and easements would not conflict with any action alternative providing roads are kept open for access to permit holders. Short term effects of proposed activities would include dust and noise from increased traffic during harvest operations. Increased log hauling traffic could impact roads that the public utilizes to access their private property. Smoke from prescribed burning and slash pile disposal operations may impact some adjacent landowners. Reduction in stand density could reduce fire intensities should a fire start on forest and endanger private property. Social impacts include private landowners' receptivity to more aggressive silvicultural prescriptions and its relationship to land values. No needs have been identified for acquiring rights-of-way for implementation of either action alternative.

Cumulative Effects

The South project area boundary was used to evaluate cumulative effects. Activities proposed under the action alternatives would not have any effect on the current lands and special uses, nor would they affect any foreseeable future lands and/or special uses proposals.

TRANSPORTATION

Affected Environment

The Forest Service System Roads (FSRs) within the project area are used for public access to Federal lands and for access to private property.

An analysis of roads within the South project area was conducted using a Roads Analysis Process (RAP). Only the following roads were identified as causing hydrology-related resource concerns: 445.1E, 715.3E and South 042, 044 and 046. Forest System Road (FSR) 445.1E is currently a closed road. FSR 715.3E has a legal easement for the Red Spar road district. The roads identified as South 042, 044 and 046 are unauthorized roads.

Some unauthorized roads were identified as causing resource concerns related to Heritage Resources and Wildlife.

Roads with legal easements and roads needed for various administrative access were identified during the RAP.

Roads with specific jurisdictions were identified. Table 3.54 displays the existing road classifications and road densities within the project area.

Table 3.54 South Roads: Jurisdiction and Existing Conditions

Road Jurisdiction	Miles
US Highway	7.4
Special Uses - Easements	5.7
Forest Service System Roads (FSR)	196.3
Unauthorized Roads	95.3
Roads on Private Land	39.4
Total:	**344.1**

Existing Conditions	Miles*
System Roads	
Open	118.7
Administrative Closure	24.7
Seasonal Closure	50.7
Storage	2.2
Total:	**196.3**
Open Road Density (May 15 – December 15) - (118.7+ 50.7+ 5.7+ 101.)/67.2	**4.1 miles/square mile**
Open Road Density (December 15 – May 15) - (118.7+ 5.7+ 101.)/67.2	**3.35 miles/square mile**
Total Road Density (FSR - open and closed) - (196.3+ 95.3+ 5.7+ 101.)/67.2	**5.92 miles/square mile**

*Does not include US Highway, State or private road miles

Environmental Consequences

ALTERNATIVE 1

Direct and Indirect Effects

Under the No Action Alternative there would be no direct effects on roads from the proposed action alternative activities. There would be no change in the current management of the transportation system. Scheduled annual and grid maintenance would continue. Road densities would remain the same.

Indirect effects of the No Action alternative would include foregoing the opportunity to provide additional maintenance of system roads, and reclassification or closure of unauthorized roads. Annual maintenance would continue on a five-year rotation on Forest system roads, therefore some roads would not receive grid maintenance for up to five years.

Unauthorized roads would remain on the landscape. Unauthorized roads, in most cases, have no drainage structures, often have poor alignment, can be located in drainage bottoms, meadows, and/or on steep slopes. This can result in soil compaction, loss of vegetation and other resource concerns such as erosion and wildlife disturbance. Additional unauthorized roads could continue to be created, therefore increasing road densities.

Current road closures in the project area range from effective to ineffective. Under this alternative, the ineffective closures would continue to allow motor vehicle travel. This would have the effect of encouraging motorized use in areas intended for closure to motorized travel to protect roads and other resources. Additional funding would be needed to reinforce existing closures.

ALTERNATIVES 2 & 3

Direct and Indirect Effects

The action alternatives propose additional maintenance of roads and potential road closures. Direct effects to roads from these proposed activities could be short-term vegetation loss, soil disturbance and compaction, an increase of mixed traffic, and traffic delays during project implementation. Short-term increases of noise and dust would occur.

All road work would comply with Best Management Practices and road design criteria. Safety issues would be addressed in the road design. Roads located in meadows would be armored with aggregate material if needed to prevent road indentation and to support the weight of commercial vehicles.

Unauthorized roads not needed for management or public access would be closed. Miles of Forest system roads would increase with the proposed reclassification of some unauthorized roads, but would not exceed the Forest's average road density. Once road closures were completed, long-term maintenance and deferred maintenance costs could decrease due to administrative closure of some Forest system roads. These road closures would have an indirect effect of allowing vegetation to become reestablished on the traveled way, which would reduce soil compaction and possible erosion. Seeding of soil disturbed by road-closure activities (gates, berms, etc.) would also aid in re-establishing vegetation and stabilizing the soil.

Positive driving experiences would increase due to repair and maintenance of the travelway. The road use pattern in the area would change as unauthorized roads were closed and closure devices were secured. Open road densities and total road densities would decrease with the closure of unauthorized roads.

For an illustration of existing roads and closures, and proposed roads and closures, see Maps 4,5,7 & 8 in Appendix A. One new gate is proposed in Alternative 2 on

FSR 681.1E. In Alternative 3, one new gates is proposed on each of the following routes: FSR 665, FSR 781, FSR 445, FSR 315.1U and two gates are proposed on 715.3D.

The transportation system under Alternative 2 proposes to maintain 118.7 miles and add 22.4 miles to the Forest road system by converting currently unauthorized roads to Forest System Roads (FSRs). Alternative 2 proposes to close 72.9 miles of unauthorized roads.

The transportation system under Alternative 3 proposes to maintain 118.7 miles, and add 13.9 miles to the Forest road system by converting currently unauthorized roads to Forest System Roads (FSRs). Alternative 3 proposes to close 81.4 miles of unauthorized roads.

The proposed transportation plan for Alternative 2 would maintain 141.1 miles of FSRs. Alternative 3 would maintain 132.6 miles of FSRs. Direct effects of ground disturbance and the cost of maintenance would be similar under both alternatives.

Table 3.55 Road Management- Open Motorized

	Alternative 1	Alternative 2	Alternative 3
	(Existing Condition)	(Proposed Action)	(Alternative 3)
FSRs - Open*	118.7	141.1	132.6
FSRs - Seasonally Closed	50.7	51.7	51.7
Square miles of Forest Land	67.2	67.2	67.2
Open Road Density (May 15 – December 15)	4.1	2.95	2.83
Open Road Density (December 15 – May 15)	3.35	2.18	2.1
Total Road Density** (open and closed)	5.92	3.43	3.43

*Additional miles of Open roads in Alternatives 2 and 3 would be from converting unauthorized roads to System roads.
** Total Road density does not include State, County, or Private road miles or State or private land acres.

Table 3.56 Road Management – Closed Motorized and Unauthorized

Miles	Alternative 1 (Existing Condition)	Alternative 2 (Proposed Action)	Alternative 3 (Alternative 3)
FSRs - Closed Yearlong*	24.7	32.5	41.1
FSRs - Seasonally Closed	50.7	51.7	51.7
Unauthorized Roads**	101	0	0

*Roads physically closed yearlong or gated/posted for Administrative or Special Use only.
** These roads may be used for temporary access and would be closed after project-related use. Approximately 5.7 miles of these roads currently have a legal easement and would remain open. Remaining unauthorized roads (95.3 miles) not needed for the proposed activities would be closed.

Cumulative Effects

Cumulative effects on roads under the No Action alternative would include possible continued use of unauthorized roads. Road densities could continue to increase, with possible resource damage incurred related to unmanaged motorized use. Forest system roads (FSRs) would not receive additional maintenance which, over time, could exacerbate road issues such as erosion.

Cumulative effects on roads from either action alternative would include a more efficient transportation system due to closure of unauthorized roads. Road repair and maintenance of FSRs during this project could lead to lower future general road maintenance costs and a reduction of road issues such as erosion. Road issues related to various resources, as identified in the "Affected Environment" section above, would be resolved.

ECONOMICS

The economic analysis for this project was generated using QUICKSILVER, a Forest Service economic analysis program customized for the Rocky Mountain Region and the Black Hills National Forest. The economic analysis only includes direct costs and revenues to the Forest Service that will occur over the next 5 to 10 years. The economic analysis does not include an estimate of non-monetary values for recreation, wildlife, and forage. The complete analysis including reports generated resides in the South project file on the Hell Canyon Ranger District.

The objective of the analysis is to provide a relative comparison of the costs and revenues associated with implementing the two alternatives being analyzed. There are costs and benefits associated with activities occurring in the South project area that are not included in this analysis. This analysis does not include activities such as recreation management, fire hazard reduction, or wildlife habitat changes because these values are difficult to quantify and compare. Therefore, the analysis focuses on the benefit of revenues generated from the volume of timber and Products Other than Logs (POL) harvested in each action alternative.

There are 2 action alternatives being analyzed for management of the South project area. Direct costs of implementing these alternatives are included, generally as per-acre figures. Costs for pre-commercial thinning, fuels treatments, and weed control are all based on planning costs used in recent timber sales. These costs include district administration and overhead. Though costs could be distributed in different ways over the analysis period, the important aspect is to keep assumptions consistent across alternatives to facilitate meaningful comparisons. In this analysis, the most important information is relative differences between alternatives. Scheduling of activities that follow the sale is based upon a 5-year sale length and current district experiences in the timing of activities.

All cost and benefit values were entered into the Quick Silver program. This program analyzes the costs and benefits for a variety of investments or operations in order to compare the economic performance (costs and revenues) associated with each alternative. The results of the analysis are displayed in the table below. The values shown are intended to show relative efficiency of each alternative and serve as a means of comparing alternatives. The values will fluctuate with changes in costs and stumpage values, and do not reflect actual costs and revenues.

Table 3.57 Financial Analysis Results by Alternative

Financial Measure	Alternative 1 - No Action	Alternative 2	Alternative 3
Present Value Costs	NA	-19,699,900	-22,880,800
Present Value Benefits	NA	1,488,000	1,462,700
Present Net Value	NA	-18,211,900	-21,418,100
Benefit/Cost Ratio	NA	.08	.06

Both action alternatives display a negative present net value. These negative values are the result of extensive non-commercial treatments proposed for fire hazard reduction and wildlife habitat improvement. Fuels treatments such as prescribed burning and fuelbreak construction are beneficial; however, these benefits are not easily quantified. Therefore, the cost associated with implementing these actions is not offset by any financial benefit in this analysis. Similarly with the wildlife habitat Improvement Cutting, hardwood release and pine encroachment removal from meadows. All of these treatments also provide benefits not easily quantified and not captured in this financial analysis.

Given these parameters, the cost of implementing Alternative 3 would be most negative due mainly to the increased acreages of both prescribed burning and Improvement Cutting compared with Alternative 2. In addition, Alternative 3 would generate less timber revenue than Alternative 2 and therefore less overall financial benefit.

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). As declared by the Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA, Section 101).

Please refer to the Silviculture and Soils sections in this chapter for discussions related to short-term uses and long-term productivity. The proposed actions in this project include design criteria to protect soil productivity. These short-term actions would generally not damage or diminish long-term resource productivity.

UNAVOIDABLE ADVERSE EFFECTS

The following is a description of adverse effects that are unavoidable with implementation of the action alternatives. Project design criteria is included (see Appendix B) which would reduce these effects. For further discussion of the effects on resources, see the respective resource topics.

Wildlife Habitat: Certain species of wildlife could be adversely affected to varying levels with implementation of the action alternatives.

Soils: It is possible that limited soil erosion or compaction may occur in localized areas.

Travel: During project implementation, there would be increased traffic on project area roads. Short-term increases in noise and dust levels would occur.

Recreation: Short-term displacement of users of Comanche Campground and dispersed recreation users would occur during implementation.

Visual Quality: Visual qualities would be adversely affected for some observers by the various levels of vegetation treatment and other actions planned.

Heritage Resources: Resources could be disturbed or destroyed where human or natural activities take place.

Fire/Fuels Hazard: Hazards would be increased during the short-term in some areas as a result of slash created from vegetation treatment. After slash disposal treatment, this hazard would be reduced. Alternative 1 (No Action) would have a higher long-term potential for large scale, high intensity wildfire than the Action Alternatives.

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 right-of-way or a road. For further discussion of the effects on resources, see the respective resource topics.

Irreversible Commitments: There are no irreversible commitments of resources under any alternative.

Irretrievable Commitments: These include the timber harvested, loss of future growth on that harvested timber, as well as snags removed.

CUMULATIVE EFFECTS

Cumulative effects are addressed in environmental consequences 'topic' discussions earlier in this Chapter.

OTHER REQUIRED DISCLOSURES

NEPA at 40 CFR1502.25(a) directs "to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with …other environmental review laws and executive orders."

The project does not involve impounding or diverting water, or adverse impacts to threatened or endangered species, therefore, formal consultation with the Fish and Wildlife Service under the Fish and Wildlife Coordination Act is not required.

No ground disturbing actions would occur in known eligible historical places. Section 106 of the National Historic Preservation Act has been conducted as required and the State Historic Preservation Officer has concurred with a finding of no impact to eligible historic or prehistoric sites.

A specific consideration of equity and fairness in resource decision-making is encompassed in the issue of environmental justice. Executive Order 12898 provides that "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority population and low-income populations". No adverse effects from the proposed actions to minorities or low-income populations are known.

This page intentionally left blank

CHAPTER 4. INDEX

B

Beetle 44, 45, 74, 76
Best Management Practices
BMP 23, 42

C

CFR ii, 17, 24, 198, 199
Cumulative effecs 199
Cumulative effects 199

D

District Ranger ii

E

Effects 42, 59, 68, 75, 87, 94, 100, 101, 102, 104, 107, 110, 113, 117, 120, 122, 124, 126, 127, 128, 130, 132, 133, 135, 138, 143, 146, 150, 151, 154, 157, 158, 161, 165, 166, 167, 169, 178, 183, 186, 190, 191, 198, 199
Environmental Impact Statement
EIS 1, i, 16, 139
Erosion 49, 51, 52, 54, 59, 61, 63

F

Fire regime 13
Fire Regime Condition Class
FRCC 27, 89
Fuel treatment 119
Fuels 22, 198

H

Habitat 99, 103, 131, 133, 134, 137, 139, 147, 149, 198
Hardwood 21, 22, 26

L

Landscape 179, 181
Late succession 100

M

Monitoring 10, 11, 23

N

National Environmental Policy Act
NEPA i, ii, 19
Notice of Intent 16

O

Overstory 26, 100

R

Ranger District 1, i, 23, 59
Risk 76, 92, 94
Road i, ii

S

Sanitation 26
Silviculture 198
Stand 102
State Historic Preservation Officer
SHPO 199
Structural stage 70, 73, 74, 108

T

Thinning 26
Timber 143
Trail 191

U

Understory 71, 75, 119

V

Value 92, 197

W

Watershed 29, 34, 42, 59
Wildfire 44, 45
Wildlife habitat 93

This page intentionally left blank

CHAPTER 5. LITERATURE CITED

Common References

USDA Forest Service. 2007. Black Hills National Forest, FY2006 Monitoring and Evaluation Report. May 2007. Available on-line at: http://www.fs.fed.us/r2/blackhills/projects/planning/fy2006_report.pdf

USDA-Forest Service. 2006. 1997 Revised Land and Resource Management Plan for the Black Hills National Forest, As Amended by the Phase II Amendment. US Department of Agriculture-Forest Service, Black Hills National Forest. Custer, South Dakota. March, 2006. *(Phase II)*. Available on-line at <http://www.fs.fed.us/r2/blackhills/projects/planning/index.shtml>

USDA-Forest Service. 2005. Final Environmental Impact Statement for the Phase II Amendment to the 1997 Revised Land and Resource Management Plan for the Black Hills National Forest. US Department of Agriculture-Forest Service, Black Hills National Forest. Custer, South Dakota. October, 2005. *(Phase II FEIS)* Available on-line at <http://www.fs.fed.us/r2/blackhills/projects/planning/index.shtml>

USDA-Forest Service. 2005. Record of Decision for the Phase II Amendment to the 1997 Revised Land and Resource Management Plan for the Black Hills National Forest. US Department of Agriculture-Forest Service, Black Hills National Forest. Custer, South Dakota. October, 2005. *(Phase II ROD)* Available on-line at http://www.fs.fed.us/r2/blackhills/projects/planning/index.shtml

USDA Forest Service. 2005. Black Hills National Forest Phase II Amendment Environmental Impact Statement; Appendix C Biological Assessment/Biological Evaluation. Custer, South Dakota: USDA Forest Service.

USDA Forest Service. 1997. Black Hills National Forest Land and Resource Management Plan; Appendix H Biological Assessment/Biological Evaluation. Rev 1996. Custer, South Dakota: USDA Forest Service

USDA-Forest Service. 1996. Final Environmental Impact Statement for the Revised Land and Resource Management Plan for the Black Hills National Forest. US Department of Agriculture-Forest Service, Black Hills National Forest. Custer, South Dakota. December, 1996. Available on-line at http://www.fs.fed.us/r2/blackhills/projects/planning/index.shtml

Botany

Farrar, Don. 2004. Personal communication with Deanna Reyher. Professor of Botany, Iowa State University, expert in *Botrychium* systematics. January 20, 2004.

Marriot, H., and D. Faber-Langendoen. 2000. The Black Hills community inventory, Vol. 2: plant community descriptions. The Nature Conservancy, Midwest Conservation Science Center and Association for Biodiversity Information. Minneapolis, Minnesota. 326 p.

Fire/Fuels

Graham, Russell T., McCaffrey, Sarah and Jain, Theresa B. 2004. Science Basis for Changing Forest Structure to Modify Wildfire Behavior and Severity. General Technical Report RMRS-GTR-120. USDA, Forest Service, Rocky Mountain Research Station. 43 pp.

Hann, Wendel, Havlina, Doug, Shlisky, Ayn, et al. 2003. Interagency and The Nature Conservancy fire regime condition class website. USDA Forest Service, US Department of the Interior, The Nature Conservancy, and Systems for Environmental Management [frcc.gov].

Hunter, M.E.; Shepperd, W.D.; Lentile, J.E.; Lundquist, J.E.; Andreu, M.G.; Butler, J.L.; Smith, F.W. 2007 A comprehensive guide to fuels treatment practices for ponderosa pine in the Black Hills, Colorado Front Range, and Southwest.Gen. Tech.Rep. RMRS-GTR-198. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Heritage

Noisat, Bradley A.
2005 *North Unit of the South Analysis Area: Heritage Resource Inventory, Monitoring and Evaluation. Black Hills National Forest, Hell Canyon Ranger District, Custer and Pennington Counties.* CRI # R2005020300115

Smith, Rusty, William Harding, Jeffry Shelton, and Shane Hope
2006 *Archaeological Investigations of the South Analysis Unit, Black Hills National Forest, Custer County, South Dakota.* CRI# R2004020300052.

South Dakota State Historical Society
Guidelines for Cultural Resource Surveys and Survey Reports in South Dakota (For Review and Compliance).

Hydrology

Black Hills Forest Resource Association & South Dakota Department of Environment and Natural Resources. 2004. 2004 Field Audit Report: Implementation Monitoring and Evaluation of South Dakota Forestry Best Management Practices. Rapid City & Pierre, SD.

Black Hills National Forest. 1995. Soil Map Unit Descriptions and Interpretations and Soil Inventory Notebook. Harney Ranger District. Custer and Pennington Counties Soil Survey. Compiled by D. Hoeft.

Driscoll, Daniel G., Carter, Janet M., Williamson, Joyce E., and Putnam, Larry D. 2002. Hydrology of the Black Hills Area, SD. Water Resources Investigation Report 02-4094. USDI, US Geological Survey. 150 pp.

Environmental Laboratory. 1987. "Corps of Engineers Wetlands Delineation Manual". Technical Report Y-87-1. US Army Engineer Waterways Experiment Station. Vicksburg, MS.

Fact Sheet Team. 2001. Fact Sheet 043-99. USDI, US Geological Survey. 6 pp. http://water.usgs.gov/pubs/FS/FS-043-99/.

FEMA Flood Plain Coverage GIS Layer. 1996. fsfiles/ref/library/gis/forest/blkh/pysical /q3flood.

Gove, Philip B. 1966. Webster's Third New International Dictionary of the English Language, Unabridged. G. & C. Merriam Company. Springfield Massachusetts

Graham, Russell T., McCaffrey, Sarah and Jain, Theresa B. 2004. Science Basis for Changing Forest Structure to Modify Wildfire Behavior and Severity. General Technical Report RMRS-GTR-120. USDA, Forest Service, Rocky Mountain Research Station. 43 pp.

IFPC (Idaho Forest Products Commission). 2003. Best Management Practices Index. Boise, ID. http://www. idahoforests.org/bmp.htm.

Orr, Howard K. 1975. Watershed management in the Black Hills: The status of our knowledge. USDA Forest Service Research Paper RM-141. Rocky Mountain Forest and Range Experiment Station. 12 pp.

Schumann, Martha. 2005. Fuels Management in Ponderosa Pine Forests: Impacts on Water Yield, A Literature Review. Forest Guild Research Center Working Paper.

SD DENR. 2006. The 2006 SD Integrated Report for Surface Water Quality Assessment. Steven M Pirner, Secretary. Pierre, SD.

SD DENR. 1999. Article 74:51. The Administrative Rules of SD (ARSD 74:51:01, :02, and :03). South Dakota's Surface Water Quality Standards.

SD State University, SD Cooperative Extension Service, U.S. Environmental Protection Agency, SD DENR and SD Department of Agriculture. 2003. Forestry Best Management Practices for South Dakota. 26pp.

Shepperd, W.D., and M.A.Battaglia. 2002. Ecology, silviculture, and management of Black Hills ponderosa pine. Gen. Tech. Rep. RMRS-GTR-97. USDA Forest Service, Rocky Mountain Research Station, Fort Collins, CO; U.S.

Sherbinin, Alex de and Dompka, Victoria. 1996. Water and Population Dynamics: Case Studies and Policy Implications. American Association for the Advancement of Science (AAAS). http://www.aaas.org/international/ehn/waterpop/gloss.htm.

Strobel, Michael, Jarrell, Gregory, Sawyer, J. Foster, Schleicher, John and Fahrenbach, Mark. 1999. Distribution of Hydrogeologic Units in the Black Hills Area, SD. Hydrological Investigation Atlas, HA-743. U.S. Geological Survey. Rapid City, SD. http://water.usgs.gov/lookup/getspatial?ofr00471_hydrogeo

Suttle, K.B., M.E. Power, J.M. Levine, and C. McNeely. 2004. How fine sediment in riverbeds impairs growth and survival of juvenile salmonids. Ecological Applications 14(4) pp 969-974.

Thomas, Stephanie. 2008. Best Management Practices and Watershed Conservation Practice, Hell Canyon Ranger District, Summary Report 2002-2007.

USDA Forest Service. 2006b. FSH 2509.25 – Watershed Conservation Practices Handbook. Rocky Mountain Region (R-2), Denver, CO. 58 pp.

USDA Forest Service. 2003. Effects of Fire Exclusion in Rocky Mountain Ecosystems. RMR Science. Rocky Mountain Research Station. http://www.fs.fed.us/rm/main/rmrs_reports/rmrscience_03_03.pdf

USDA Forest Service. 2003b. Black Hill National Forest, Forest Plan Best Management Practices Evaluation. Custer, SD.

USDA Soil Conservation Service. 1990. Soil Survey of Custer and Pennington Counties, Black Hills Parts, SD. US Department of Agriculture.

USDI Fish and Wildlife Service. 1995. National Wetlands Inventory.

Watershed Definition. 2003. What is a Watershed. http://www.co.yamhill.or.us/ybc/defnWS.htm.

Wortmann, C.S. and P.J. Jasa. 2003. Management to Minimize and Reduce Soil Compaction. Nebraska Cooperative Extension G89-896. 8 pp.

Wyoming Timber Industry Association. 2001. Wyoming Silviculture Best Management Practices Field Audit: Implementation, Monitoring, and Evaluation. Wyoming Timber Industry Association. Saratoga, Wyoming.

Minerals

DeWitt, E., Redden, J.A., Wilson, A.B., and Busher, D., 1986, Mineral resource potential of the Black Hills National Forest, South Dakota and Wyoming with a section on salable commodities by J.S. Dersch: U.S. Geological Survey Bulletin 1580, 135 p.

Gersic, J., Peterson, E.K., and Schreiner, R.A., 1990, Appraisal of Selected Mineral Resources of the Black Hills National Forest, South Dakota and Wyoming, U.S. Bureau of Mines, Mineral Land Assessment open file report 5-90.

Gulden, R., 2003, World long cave list, www.pipeline.com/%7Ecaverbob/wlong.htm

Silviculture

Allen, Kurt K. ,2006. *Evaluation of MPB Activity on the Black Hills National Forest.* Forest Health Evaluation R2-04-02. Rapid City Service Center, Rapid City, SD.

Shepperd, Wayne D., 2004. Techniques to Restore Aspen Forests in the Western U.S., U.S. Forest Service, Rocky Mountain Research Station, 240 W. Prospect, Ft. Collins, CO, USA 80526; Transactions of the Western Section of the Wildlife Society, 40:52-60.

Visual Quality/Scenery

USDA Forest Service, Agricultural Handbook 701. (1995) *Landscape Aesthetics; A Handbook for Scenery Management*, and (2000) *Landscape Aesthetics Handbook Revision*. Washington, DC: U.S. Government Printing Office. Available on-line at <http://www.esf.edu/es/via/>

Wildlife

Anderson, T. 2004. Callused vertigo (Vertigo authuri): A technical conservation assessment. USDA Forest Service, Rocky Mountain Region. http://www.fs.fed.us/r2/projects/scp/assessments/callusedvertigo.pdf.

Anderson, T. 2003. Conservation assessment of woodpeckers in the Black Hills

National Forest. US Department of Agriculture, Forest Service, Black Hills National Forest, Custer, South Dakota. 176 pp. http://www.fs.fed.us/r2/blackhills/projects/planning/assessments/woodpeckers.pdf.

Anderson, T. 2002. Conservation assessment of woodpeckers in the Black Hills National Forest. U.S. Department of Agriculture, Forest Service, Black Hills National Forest, Custer, South Dakota. 176 p.

Barbour, Roger W., Wayne H. Davis. 1969. Bats of America. University Press of Kentucky.

Beason, J., K. Hutton, A. Panjabi, R. Sparks, and D, Hanni. 2006. Monitoring the Birds of the Black Hills: 2005 Field Season Report. Tech. Rep. M-MBBH05-01. Rocky Mountain Bird Observatory, Brighton, CO. 113pp.

Bildstein, K. L., and K. Meyer. 2000. Sharp-shinned hawk (Accipiter striatus). No.482, In: The Birds of North America A. Poole and F. Gill, eds. The Birds of North America, Inc., Philadelphia, Pennsylvania.

Bonnott, T. W. 2006. Nesting ecology of black-backed woodpeckers in mountain pine beetle infestations in the Black Hills, South Dakota. Masters Thesis, University of Missouri, Columbia, Missouri. 78 pp.

Bosakowski, T., and D. G. Smith. 2002. Raptors of the Pacific Northwest. Frank Amato Publications, Inc. Portland, Oregon.

Cannings, R. J. 1993. Northern saw-whet owl (Aegolius acadicus). In: The Birds of North America, No. 42. A. Poole and F. Gill, eds. The Birds of North America, Inc., Philadelphia.

Cotton, C. L., and K. L. Parker. 2000. Winter habitat and nest trees used by northern flying squirrels in subboreal forests. Journal of Mammalogy 81(4):1071-1086.

Cryan, P., M. Bogan, and G. Yanega. 2001. Roosting habits of four bat species in the Black Hills of South Dakota. Acta Chiropterologica 3:43-52.

DeGraaf, R. M., V. E. Scott, R. H. Hamre, L. Ernst, and S. H. Anderson. 1991. Forest and rangeland birds of the United States, natural history and habitat use. U.S.Department of Agriculture, Forest Service Agriculture Handbook 688. 625 p.

DePerno, C. S., J. A. Jenks, S. L. Griffin, and L. A. Rice and K. F. Higgens. 2002. White-tailed deer habitats in the central Black Hills. Journal of Range Management 55:242-252.

Duckwitz, J. J. 2001. Small mammal survey of Wind Cave National Park. Masters Thesis, South Dakota State University, Brookings. 95 p.

Frest, T. J. and E. J. Johannes. 2002. Land snail survey of the Black Hills National Forest, South Dakota and Wyoming, Summary Rep., 1991 – 2001. Final Rep. U.S. Department of Agriculture, Forest Service, Black Hills National Forest, Custer, South Dakota. 127 p.

Ghalambor, C. 2003. Conservation assessment of the pygmy nuthatch in the Black Hills National Forest, South Dakota and Wyoming. USDA, Forest Service, Rocky Mountain Region, Black Hills National Forest. Custer, South Dakota. http://www.fs.fed.us/r2/blackhills/projects/planning/assessments/pygmy_nuthatch.pdf

Giroir, G., C. White, and R.Sparks. 2007. Monitoring the Birds of the Black Hills, 2007 Field Season Report. Tech. Rep. M-MBBH07-01. Rocky Mountain Bird Observatory. Brighton, CO. 81pp.

Griebel, Randall. 2005-2006. Hell Canyon District Wildlife Biologist, Burrowing Owl Observations Report. Black Hills NF, Hell Canyon Ranger District.

Griffin, S. L., L. A. Rice, C. S. DePerno, and J. A. Jenks. 1999. Seasonal movements and home ranges of white-tailed deer in the central Black Hills, South Dakota and Wyoming, 1993-97. South Dakota Department of Game, Fish and Parks, Pittman-Robertson Game Rep., W-75-R-34, Pierre, South Dakota.

Hejl, S. J., K. R. Newton, M. E. McFadzen, J. S. Young, and C. K. Ghalambor. 2002. Brown creeper (Certhia americana). In: The Birds of North America, No. 669. A. Poole and F. Gill, eds. The Birds of North America, Inc., Philadelphia, Pennsylvania.

Higgins, K. F., E. D. Stukel, J. M. Goulet, and D. C. Backlund. 2000. Wild mammals of South Dakota. South Dakota Department of Game, Fish and Parks, Pierre, South Dakota. 278 p.

Hutton K., J. Beason, G. Girior, A. Panjabi, R. Sparks, D. Hanni. 2007. Monitoring Birds of the Black Hills: 2006 Field Season Report. Tech. Rep. M-MBBH06-01. Rocky Mountain Bird Observatory, Brighton, CO. 71 pp.

Hutton, K., J. Beason, G. Girior, A. Panjabi, R. Sparks, and D. Hanni. 2007. Monitoring Birds of the Black Hills: 2006 Field Season Report. Tech. Rep. M-MBBH06-01. Rocky Mountain Bird Observatory. Brighton, CO. 71pp.

Huxoll, C. 2006. Big game harvest projections. 2005 Annual Report. South Dakota game report, no. 2006-04. South Dakota Game, Fish and Parks, Pierre, South Dakota. 68 p. http://www.sdgfp.info/Wildlife/hunting/Harvest/2005BGSummary.pdf.

Isaak, D. J., W. A. Hubert, and C. R. Berry, Jr. 2003. Conservation assessment for lake chub, mountain sucker, and finescale dace in the Black Hills National Forest,

South Dakota and Wyoming. U.S. Department of Agriculture, Forest Service, Black Hills National Forest, Custer, South Dakota. 64 p.

Johnsgard, P. A. 1990. Hawks, eagles and falcons of North America. Smithsonian Institute Press, Washington D.C. 403 p.

Johnson, A. S., and S. H. Anderson. 2003. Conservation assessment for the northern saw-whet owl in the Black Hills National Forest, South Dakota and Wyoming. USDA, Forest Service, Rocky Mountain Region, Black Hills National Forest. Custer, South Dakota. 27pp. http://www.fs.fed.us/r2/blackhills/projects/planning/assessments/northern_saw_whet_owl.pdf.

Johnson, D. H., and L. D. Igl. 2001. Area requirements of grassland birds: a regional perspective. Auk 118:24-34.

Joy, S. M. 1990. Feeding ecology of sharp-shinned hawks and nest-site characteristics of accipiters in Colorado. Masters Thesis, Colorado State University, Fort Collins.

Keinath, Douglas K. 2004. Fringed Myotis (Myotis thyandodes): a technical Conservation Assessment. USDA, Forest Service Rocky Mountain Region Species Conservation Project. http://www.fs.fed.us/r2/projects/scp/assessments/fringedmyotis.pdf

Kingery, H. E., and C. K. Ghalambor. 2001. Pygmy nuthatch (Sitta pygmaea). In:thebirds of North America, No. 567. A. Poole and F. Gill, eds. The Birds of North America, Inc., Philadelphia, Pennsylvania.

Lehman, C. P. 2005. Ecology of Merriam's turkeys in the southern Black Hills, South Dakota. Ph.D. dissertation, South Dakota State University, Brookings, South Dakota.

Luce, B., A. Cerovski, B. Oakleaf, J. Priday, and L.Van Fleet. 1999. Atlas of birds, mammals, reptiles, and amphibians in Wyoming. Wyoming Game and Fish Department, Wildlife Division, Biological Services Section, Lander, Wyoming

Marriot, H., and D. Faber-Langendoen. 2000. The Black Hills community inventory, Vol. 2: plant community descriptions. The Nature Conservancy, Midwest Conservation Science Center and Association for Biodiversity Information. Minneapolis, Minnesota. 326 p.

Marrone, G. M. 2006. A Butterfly Survey of the Southern Black Hills and Adjacent Areas with Emphasis on Species Monitored by the South Dakota Natural Heritage Program. SDGF&P Report. Pierre, SD.

Marrone, G. M. 2002. Field guide to butterflies of South Dakota. South Dakota Department of Game, Fish and Parks, Pierre, South Dakota. 478 p.

McCallum, Archibald, D. 1994. Flammulated Owl (Otus flammeolus). The Birds of North America, Number 93. A. Poole and F. Gill, editors. The Academy of Natural Sciences of Philadelphia, PA and The American Ornithologists' Union, Washington, D.C.

McDonald, David, Nicole M. Korfanta, Sarah J. Lanz. 2004. The Burrowing Owl (Athene cunicularia): A Techincal Conservation Assessment. USDA, Forest Service, RockyMountain Region, Species Conservation Project. http://www.fs.fed.us/r2/projects/scp/assessments/burrowingowl.pdf

Mohren, S. 2002. Habitat evaluation and density estimates for the black-backed woodpecker (Picoides arcticus) and northern three-toed woodpecker (Picoide tridactylus) in the Black Hills National Forest. M.Sc. Thesis, University of Wyoming, Laramie, Wyoming. 110pp.

NatureServe. 2006. NatureServe Explorer: An online encyclopedia of life [web application]. Version 3.0. Arlington, Virginia. http://www.natureserve.org/explorer.Accessed 30 January 2006). RE: Glaucomys sabrinus - Northern Flying Squirrel.

NatureServe. 2004. NatureServe Explorer: An online encyclopedia of life [web Application]. Version 1.8. NatureServe, Arlington, Virginia. http://www.natureserve.org/explorer.

Nekola, J. C. 2003. Large-scale terrestrial gastropod community composition patterns in the Great Lakes region of North America. Diversity and Distributions 9: 55-71.

Panjabi, Arvind. 2001. Monitoring birds of the Black Hills: Year 1. Final Report. Rocky Mountain Bird Observatory, Fort Collins, Colorado. 96 pp.

_____. 2003. Monitoring birds of the Black Hills: year 2. Annual Report Submitted to the BHNF. Rocky Mountain Bird Observatory, Fort Collins, Colorado. 125pp.

_____. 2004. Monitoring birds of the Black Hills: year 3. Annual Report Submitted to the BHNF. Rocky Mountain Bird Observatory, Fort Collins, Colorado. 58pp.

_____. 2005. Monitoring birds of the Black Hills: year 4. Annual Report Submitted to the BHNF. Rocky Mountain Bird Observatory, Fort Collins, Colorado. 67pp.

Peterson, R. A. 1995. The South Dakota breeding bird atlas. South Dakota Ornithologists' Union, Jamestown, North Dakota. Northern Prairie Wildlife Research Center Home Page,

http://www.npwrc.usgs.gov/resource/distr/birds/sdatlas/sdatlas.htm (Version 06JUL2000).

Pierson, E. D., M.C. Wackenhut, J.S. Altenbach, P. Bradley, P. Call, D.L. Genter, C.E. Harris, B.L. Keller, B. Lengus, L. Lewis, B. Luce, K.W. Navo, J.M. Perkins, S. Smith, and L. Welch. 1999. Species conservation assessment and strategy for Townsend's big-eared bat (Corynorhinus townsendii townsendii and Corynorhinus townsendii pallescens) Idaho Conservation effort, Idaho Department of Fish and Game, Boise, Idaho.

Platt, J. B. 1976. Sharp-shinned hawk nesting and nest site selection in Utah. Condor. 78:102-103.

Rabe, M., T. Morrell, H. Green, J. DeVos Jr., and C. Miller. 1998. Characteristics of Ponderosa pine snag roosts used by reproductive bats in Northern Arizona. Journal of Wildlife Management. 62(2):612-621.

Reynolds, R. T. 1983. Management of western coniferous forest habitat for nesting accipiter hawks. General Technical Report RM-102. USDA, Forest Service, Rocky Mountain Forest and Range Experiment Station.

Reynolds, R. T., E. C. Meslow, and H. M. Wight. 1982. Nesting habitat of coexisting accipiter in Oregon. Journal of Wildlife Management. 46:124-138.

Royer, R. A., and G. M. Marrone. 1992. Conservation status of the regal fritillary (Speyeria idalia) in North and South Dakota. Rep. to the U.S. Department of Interior, Fish and Wildlife Service, Denver, Colorado. 44 p.

Rumble, M. A., B. F. Wakeling, and L. D. Flake. 2003. Factors affecting survival and recruitment in female Merriam's turkeys. Intermountain Journal of Science 9(1):26-37.

Rumble, M. A., and S. H. Anderson. 1996. Feeding ecology of Merriam's turkeys (Meleagris gallopavo merriami) in the Black Hills, South Dakota. American Midland Naturalist 136:157-171.

Rumble, M. A., and S. H. Anderson. 1993. Macrohabitat associations of Merriam's turkeys in the Black Hills, South Dakota. Northwest Science 67:238-245.

SAIC. Science Application International Corporation. 2003. Memorandum. A framework for revising deer and elk strategic management direction on the Black Hills National Forest. SAIC project number 01-0209-04-4456-106.

Saab, V.A., W. Block, Robin Russell, John Lehmkuhl, Lisa Bate, and Rachel White. 2007. Birds and Burns of the Interior West: Descriptions, Habitats, and management in Western Forests. Gen. Tech. Rep. PNW-GTR-712. Portland, OR: USDA, Forest Service, Pacific Northwest Research Station.

Saab, V. A., and J. G. Dudley. 1998. Responses of cavity-nesting birds to stand replacement fire and salvage logging ponderosa pine/Douglas-fir forest of southwestern Idaho. Forest Service Research Paper, RMRS-RP-11. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Ogden, Utah. 17 p.

Sauer, J. R., J. E. Hines, and J. Fallon. 2005. The North American breeding bird survey, results and analysis 1966–2005. Version 6.2.2006. US Geological Survey, PatuxentWildlife Research Center, Laurel, Maryland. http://www.mbr-pwrc.usgs.gov/bbs/bbs.html.

Schmidt, C. A. 2003a. Conservation assessment for the fringed bat in the Black Hills National Forest, South Dakota and Wyoming. U.S. Department of Agriculture, Forest Service, Black Hills National Forest, Custer, South Dakota. 29 p.

Schmidt, C. A. 2003b. Conservation assessment for the long-eared myotis in the Black Hills National Forest, South Dakota and Wyoming. USDA, Forest Service, Rocky Mountain Region, Black Hills National Forest. Custer, South Dakota.http://www.fs.fed.us/r2/blackhills/projects/planning/assessments

Schmidt, C. A. 2003c. Conservation assessment for the small-footed myotis in the Black Hills National Forest, South Dakota and Wyoming. USDA, Forest Service, Rocky Mountain Region, Black Hills National Forest. Custer, South Dakota.http://www.fs.fed.us/r2/blackhills/projects/planning/assessments

Schmidt, C. A. 2003d. Conservation assessment for the long-legged myotis in the Black Hills National Forest, South Dakota and Wyoming. USDA, Forest Service, RockyMountain Region, Black Hills National Forest. Custer, South Dakota.http://www.fs.fed.us/r2/blackhills/projects/planning/assessments/long_legged_bat.pdf

Slater, G.L. 2004. Grasshopper sparrow (Ammodramus savannarum): a technical conservation assessment. [online]. USDA, Forest Service, Rocky Mountain Region. Available: http://www.fs.fed.us/r2/projects/scp/assessments/grasshoppersparrow.pdf

Smith, Brian E., Nathan T. Stephens. 2003. Conservation assessment for the Black Hills redbelly snake in the Black Hills National Forest South Dakota and Wyoming. USDA Forest Service, Rocky Mountain Region, Black Hills National Forest. http://www.fs.fed.us/r2/blackhills/projects/planning/assessments/redbelly_snake.pdf

Stefanich, M. R. 2001. Draft conservation assessment for the tawny crescent in the Black Hills National Forest of South Dakota and Wyoming. Black Hills National Forest, Northern Hills District, Spearfish, SD.

Stefanich, M. R. 1995. Movements and habitat use of whitetail deer in the northwestern Black Hills of Wyoming and South Dakota. Masters thesis, University of Wyoming, Laramie.

Stephens, R. M. and S. H. Anderson. 2002. Conservation assessment for the Cooper's hawk and Sharp-shinned hawk in the Black Hills National Forest, South Dakota and Wyoming. USDA, Forest Service, Rocky Mountain Region, Black Hills National Forest. Custer, South Dakota. http://www.fs.fed.us/r2/blackhills/projects/assessments/coopers_ss_hawk.pdf.

Tallman, D. A., D. L. Swanson, and J. S. Palmer. 2002. Birds of South Dakota. Third edition. Midstates/Quality Quick Print, Aberdeen, South Dakota. 441 p.

Tigner, Joel and Eileen Dowd-Stukel. 2003. Bats of the Black Hills- A Description of Status and Conservation Needs. South Dakota Game, Fish, and Parks Dept. Wildlife Division Report 2003-05.

Turner, R. W. 1974. Mammals of the Black Hills of South Dakota and Wyoming. University of Kansas, Lawrence. 178 p.

Uresk, D. W., and K. E. Severson. 1998. Response of understory species to changes in ponderosa pine stocking levels in the Black Hills. Great Basin Naturalist 58:312-327.

USDA, Forest Service. 2006b. Black Hills National Forest, FY2005 monitoring and evaluation report. US Department of Agriculture, Forest Service, Black Hills National Forest, Custer, South Dakota.

USDA, Forest Service. 2005c. Forest Service Manual, Black Hills National Forest. FSM 2600 – wildife, fish and sensitive plant habitat management. Chapter 20 – habitat planning and evaluation. Supplement number: r2_bh_2600-2005-7. http://fsweb/directives/fsm/2600/bh_supp_2600-2005-1.doc.

USDA, Forest Service. 2005a. Black Hills National Forest, FY2004 monitoring and evaluation report. US Department of Agriculture, Forest Service, Black Hills National Forest, Custer, South Dakota.

USDA, Forest Service. 2004a. Black Hills National Forest 2002 monitoring and five-year evaluation report. US Department of Agriculture, Forest Service, Black Hills National Forest, Custer, South Dakota.

USDA, Forest Service. 2000. Expert Interview Summary for the Black Hills National Forest Land and Resource Management Plan Amendment. Unpublished Rep. US Department of Agriculture, Forest Service, Black Hills National Forest, Custer, SouthDakota. http://fsweb.blackhills.r2.fs.fed.us/int_dir/00_10_25_ExpertInterviewSum.pdf.

US Fish and Wildlife Service. 2006. Federal endangered and threatened species list by county for South Dakota. US Fish and Wildlife Service, South Dakota Ecological Services Field Office Home Page. http://southdakotafieldoffice.fws.gov/endsppbycounty.htm.

US Fish and Wildlife Service. 2002. Birds of Conservation Concern 2002. Division of Migratory Bird Management, Arlington, Virginia. 99pp. http://migratorybirds.fws.gov/reports/bcc2002.pdf.

US Fish and Wildlife Service, Utah Field Office. 2002. Utah Field Office Guidelines for Raptor Protection from Human and Land Use Disturbances. Prepared by Laura A. Romin and James A. Muck. Salt Lake City, UT.

Vierling, K. 2004. Report on woodpecker breeding in the Jasper fire. Submitted to the USDA, Forest Service, February 19, 2004. South Dakota School of Mines and Technology, Rapid City. 11 p.

Vonhof, M. J., and R. M. Barclay. 1997. Use of tree stumps as roosts by the western long-eared bat. Journal of Wildlife Management. 61(3):674-684.

Wells-Gosling, N., and L. R. Heaney. 1984. Glaucomys sabrinus. Mammalian species no. 229, The American Society of Mammalogists.

Wiggins, D. A. 2005. Brown Creeper (Certhia americana): a technical conservation assessment. [Online]. USDA, Forest Service, Rocky Mountain Region. http://www.fs.fed.us/r2/projects/scp/assessments/browncreeper.pdf.

This page intentionally left blank

CHAPTER 6. LIST OF PREPARERS

Interdisciplinary Team (IDT)	
Michael Lloyd	District Ranger - Bachelor of Science, Outdoor Recreation, Colorado State University, 1973; minors in soil science and forestry. Twenty-three years of Forest Service experience as a District Ranger on the Shoshone, Arapahoe-Roosevelt, and Black Hills National Forests. Two years experience as a field soil scientist with the Soil Conservation Service. Two years experience with the Forest Service as a Forest Soil Scientist and four years experience as District Staff.
Betsy Koncerak	IDT Leader – Associate of Science in Wildlife Technology, Pennsylvania State University, 1986; Bachelor of Arts, Environmental Studies/Geography with a minor in Biology, Edinboro University of Pennsylvania, 1989. Continuing education in Fisheries Management, Lewis and Clark College, Lewiston, Idaho, 1999. Forest Service experience in three regions: Region 1, Kootenai and Nez Perce NFs, Region 6, Siskiyou NF, and Region 2, Black Hills NF. Thirteen years service at the District level: nine as a biological technician (wildlife, botany and fisheries), two as a fisheries biologist, and two as NEPA planner. Fisheries technician for Colorado Division of Wildlife, 1997 and for Idaho Fish & Game, 1998-1999.
Kelly Honors	District NEPA Coordinator – Bachelor of Science, Forestry, State University of New York, College of Environmental Science and Forestry, 1985. Bachelor of Science, Environmental Science and Forestry, Syracuse University, 1985. Twenty one years of Forest Service experience at the district level in timber and planning; eighteen of those years on the Black Hills National Forest. Eighteen years experience in writing NEPA documents.
Don Boone	Silviculturist – Bachelor of Science, Forest Science, University of Wisconsin-Madison, 1979. Twenty-five years of Forest Service experience as a Forestry Technician, Pre-Sale Forester and Silviculturist on the Routt and Black Hills National Forests. Six years experience with the South Dakota Division of Forestry and two years experience with Custer State Park, South Dakota.
Brad Phillips	Wildlife Biologist – Bachelor of Science, Wildlife Management, Humboldt State University, 1980. Twenty years of Forest Service experience at the district level, eighteen years of that on the Black Hills National Forest. Rocky Mountain Region contact for issues relating to bats.
Gwen Lipp	Fuels Planner - Bachelor of Science, Environmental Engineering, South Dakota School of Mines and Technology, 2004. Nine years of Forest Service experience at the district level in timber, fire and fuels on the Rio Grande and Black Hills National Forests.
Les Gonyer	Hydrologist – Bachelor of Science, Forestry minor in Hydrology, University of Minnesota, 1977. Thirty-one years of Forest Service experience at the district and forest levels in Utah, New Mexico, Oregon, Idaho, Wyoming, California, and South Dakota in watershed, timber, special uses, minerals, fire, engineering and environmental analysis. Red carded firefighter, FFT2. BAER (Burned Area Emergency Rehabilitation) and RAT (Rapid Assessment Team) team experience.
Cynthia Engelbert	Rangeland Management Specialist – BS in Range Science from SD State University, 1985; Qualified for OPM 430 series (Botany) in 2003; Twelve years of Forest Service experience as a Rangeland Management Specialist on the Nebraska, Toiyabe and Black Hills National Forests; Five years experience conducting plant surveys and sensitive plant surveys on the Black Hills National Forest
Tony King	Archaeologist—Master of Arts, Anthropology, University of Denver, 2006; Bachelor of Arts, Anthropology, Colorado College, 2004; Associate of Arts, English, Pikes Peak Community College, 2002. Five years of Forest Service Experience as an Archaeologist at the District and Regional Levels, and as part of an enterprise team in Colorado, California, Nebraska, New Mexico, Kansas, Wyoming, and South Dakota.
Gail Mayer	Civil Engineering Technician- Bachelor of Arts in Outdoor Recreation From Chadron State College, Chadron NE 1992. Six years of experience with the National Forest Service in Surveying, GPS, road design and package layout. Two years experience with Federal

Highway Administration in road construction inspection, and materials testing. One year experience with the Wyoming Department of Transportation in surveying and materials testing.

David Pickford

Recreation - Bachelor of Arts in Outdoor Recreation from Eastern Washington University, 1984. Eighteen years of Forest Service experience at the District level in timber, firefighting, trails, recreation and wilderness on the Ottawa and Black Hills National Forests. USFS, NPS and USFWS field experience in Washington, Idaho, Wyoming, Colorado, UP Michigan as well as NH State Parks. Former USAF Survival Specialist and USAF (civilian) Outdoor Adventure Program Staff.

Meagan Buehler

Lands Specialist-Bachelor of Science, Forestry, minor in Wildlife & Fisheries Biology, University of Massachusetts-Amherst, 1997. Eleven years experience with the Forest Service at the district level for the Black Hills National Forest , currently as District Lands Specialist and including, 5 years in fire as an engine captain, 4 years as harvest inspector, and seasonally in trails/recreation. One season experience with the BLM in Oregon as a forester-stand exams and timber sale preparation.

Stephen Keegan

Landscape Architect - Bachelor of Science, Landscape Architecture & Environmental Studies, State University of New York (SUNY) - College of Environmental Science and Forestry (ESF), 1980; Bachelor of Science, (dual degree with ESF), Syracuse University 1980; Associates of Arts, Humanities, SUNY - Onondaga Community College, 1978. Twenty-five years of Forest Service experience at the forest and zone level on the Helena, Clearwater, Malheur & Black Hills National Forests. Of which twenty years have been as a Landscape Architect conducting Scenic Resource Assessments for: vegetation and fuels management, watershed analyses, recreation construction and reconstruction, wild & scenic rivers, and burned area emergency rehab. Fire experience in Type 1-4 incidents with USFS; experience as chief and assistant fire chief for city and rural fire departments in Oregon and South Dakota.

Margaret Farrell

GIS/Database Management Specialist – Bachelor of Science, Geology, University of Wyoming, 1985. Eighteen years of Forest Service experience in database management, including fourteen years experience in ESRI GIS products.

Phil Greer

Minerals Specialist - Master of Science, Geology, University of Wyoming, 1985, Bachelor of Arts, Philosophy, Macalester College, 1967. Eight months of Forest Service experience as a Minerals Specialist . Nine years experience as an Environmental Scientist with South Dakota DENR and Utah DEQ. Twelve years of experience as a geologist with Wyoming and North Dakota Geological Surveys.

CHAPTER 7. FINAL EIS DISTRIBUTION LIST

All recipients were sent a hardcopy of the FEIS unless noted otherwise.

Native American Tribes:

President, Rosebud Sioux Tribe
Tribal Chairman, Northern Arapaho Business Council
Tribal Chairman, Cheyenne River Sioux Tribe
Tribal Chairman, Yankton Sioux Tribe
Cultural Preservation Office, Three Affiliated Tribes
Tribal Historic Preservation Officer, Rosebud Sioux Tribe
Tribal Historic Preservation Officer, Northern Cheyenne Tribe
Chairman, Cheyenne/Arapaho Tribes of Oklahoma
Tribal Chairman, Standing Rock Sioux Tribe
Tribal Chairman, Lower Brule Sioux Tribe
Cultural Resource Office, Lower Brule Sioux Tribe
President, Northern Cheyenne Tribe
Tribal Planner/Director, Northern Cheyenne Tribe
Spirit Lake Sioux Tribe
Tribal Historic Preservation Office, Standing Rock Sioux Tribe
Tribal Chairwoman, Spirit Lake Sioux Tribe
Tribal Historic Preservation Office, Cheyenne River Sioux Tribe
Tribal Chairman, Eastern Shoshone Tribe
Grey Eagle Society
Tribal Chairman, Sisseton-Wahpeton Sioux Tribe
President, Oglala Sioux Tribe
Chairman, Crow Creek Sioux Tribe
Tribal Chairman, Santee Sioux Nation
Kiowa Ethnographic Endeavor for Preservation
Tribal Chairman, Mandan Hidatsa & Arikara Tribes
Tribal Chairman, Flandreau Santee Sioux Tribe
Tribal Historic Preservation Officer, Northern Arapaho Tribe
Tribal Historic Preservation Officer, THPO Oglala Sioux Tribe
Cultural & Heritage Program, Cheyenne-Arapaho Tribes of Oklahoma
Rosebud Sioux Tribe, Sicangu Lakota Treaty Council Office

Federal Agencies:

USDA National Agricultural Library
USDI, Office of Environmental Policy and Compliance
US Environmental Protection Agency, Office of Federal Activities
US Environmental Protection Agency, Region VIII EIS Review Coordinator
Bureau of Land Management, South Dakota Field Office

Federal Agencies sent written notice of the FEIS availability on the World Wide Web:

Deputy Director, USDA APHIS PPD/EAD
Director, Office of NEPA Policy and Compliance, US Dept. of Energy
Director, Planning and Review, Advisory Council on Historic Preservation
Federal Aviation Administration, Regional Director, Great Lakes Region
Federal Aviation Administration, Regional Director, Northwestern Mountain Region
Federal Highway Administration, Division Administrator, South Dakota (HAD-SD)
National Environmental Coordinator, USDA Natural Resources Conservation Service
US Army Engineer, Northwest Division
US Coast Guard, Environmental Management

State, Local and County Agencies:

South Dakota Game, Fish and Parks, Pierre, SD
Black Hills Power, Rapid City, SD

Individuals:

Jim & Michell Rodoni
Joyce Urroz
Troy Hall, Off-Road Riders Association
Carson Engelskirger, Black Hills Forest Resource Association
Eric Molvar, Biodiversity Conservation Alliance