United States
Department of
Agriculture

Forest
Service

May 2007

Final Environmental Impact Statement

Norwood

Hell Canyon Ranger District, Black Hills National Forest
Pennington County, South Dakota, and Weston and Crook Counties, Wyoming

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Norwood
Final
Environmental Impact Statement
Pennington County, South Dakota and Weston and Crook Counties, Wyoming

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Abstract: The Hell Canyon Ranger District of the Black Hills National Forest has prepared a Final Environmental Impact Statement in compliance with the National Environmental Policy Act and other relevant Federal and State laws and regulations. The Hell Canyon Ranger District proposes to implement multiple resource management actions within the Norwood project area, as guided by the Black Hills National Forest Land and Resource Management Plan (Forest Plan) as amended.

The focus of the actions proposed is to enhance vegetative diversity, reduce the risk of mountain pine beetle infestation and large-scale wildfire, provide for wildlife habitat needs and provide a sustainable supply of commercial timber consistent with Forest Plan direction, while providing for management and public access needs.

Four alternatives are considered in detail. Alternative 1 is the No Action Alternative. Alternative 2 is the proposed action and preferred action. Alternative 3 responds to public and internal concerns to further reduce MPB risk and further increase hardwoods in the project area. Alternative 4 responds to concerns that more moderately dense pine stands are needed for species which use that habitat. Fuels treatments are included to reduce the potential for high intensity, large scale wildfire, particularly around private land. Changes to the travel management system currently in place includes reducing overall open road density, and either converting or eliminating all undetermined roads. This Final EIS discloses the direct, indirect, and cumulative environmental impacts resulting from the proposed action and alternatives.

SUMMARY

The Black Hills National Forest proposes to implement multiple resource management actions in the Norwood project area. The Norwood project area covers approximately 42,252 acres of National Forest System land and about 4,206 acres of interspersed private land. The Norwood project area is located along approximately 22 miles of the Wyoming and South Dakota border in Pennington County, South Dakota and Weston and Crook Counties in Wyoming. The southernmost point of the project area is approximately 7 miles directly east of Newcastle, Wyoming (see map 1 in Appendix A of the EIS). Resource management actions apply to National Forest lands only.

The focus of the proposed actions is to manage vegetation, fuels and access to provide for enhanced vegetative diversity, reduced risk of mountain pine beetle infestation and large-scale wildfire, provide for wildlife habitat needs, and provide a sustainable supply of commercial timber consistent with Forest Plan direction. Vegetation and fuels treatments are proposed to meet the stated needs of diversity, wildlife habitat, reduced insect and fire risk and providing timber. Changes to the transportation system are proposed which will reduce unneeded roads and manage use on remaining roads necessary for management and public access needs.

Comments received during the scoping process were used to define significant issues, develop alternatives and analyze effects. Through review and analysis of the scoping comments and input, the Norwood Project Interdisciplinary Team identified three (3) significant issues related to the proposed activities. The three issues are; Aspen restoration, Ponderosa pine structural diversity and Mountain pine beetle risk.

These issues led the agency to develop two alternatives to the proposed action. The alternatives analyzed in detail in this EIS are briefly described below:

Alternative 1 – No Action: NEPA (National Environmental Policy Act) requires the study of the No Action Alternative and that it be used as a basis for comparing the 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 Norwood project area. This alternative represents no attempt to actively respond to the purpose and need for action or the issues raised during scoping. For example, there would be no effort to modify existing vegetation or related fuel conditions in the project area. However, such things as active timber sales, ongoing fire suppression efforts, noxious weed treatments and recurring road maintenance on Forest roads would continue.

Alternative 2 – Proposed Action: This alternative was developed to meet the Purpose and Need for Action described in Chapter 1. It represents the IDT's best recommendation prior to detailed analysis of the environmental effects and public scoping. This alternative proposes commercial and non-commercial vegetation treatments, understory fuel treatments, and various road related actions. Fuel treatments are concentrated around private lands.

Alternative 3: This alternative was developed to address Significant Issues #1 (aspen restoration) and #3 (mountain pine beetle risk). The elements of this alternative which differ from the Proposed Action, Alternative 2, are: 1) increased aspen restoration treatments, and

2) additional acres and more intensive commercial thinning to reduce mountain pine beetle risk.

Alternative 4: This alternative was developed to address Significant Issue #2 (pine structural diversity). The elements of this alternative differs from the Proposed Action by including a reduction in the amount of commercial thinning, POL thinning, and seedcut treatments in the project area.

The public and decision maker can make a relative comparison between the alternative effects on the key issues based on specific measurement indicators developed for each issue. Table 0-1 provides a comparative display of the alternative effects relative to the key issues in the Norwood project area.

Table 0-1: Effects to Key Issues by Alternative

Aspen Restoration *Management indicators*	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Acres of Aspen Stands	2,206	2,380	2,688	2,380
Percent increase in Aspen Stands	0	8%	22%	8%
Ponderosa Pine Structural Diversity* *Management indicators*	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Acres in SS1	402	402	402	402
Acres in SS2	124	1,532	1,532	1,532
Acres in SS3A	287	306	306	306
Acres in SS3B	1,441	1,467	1,456	1,456
Acres in SS3C	402	320	304	304
Acres in SS4A	16,866	18,838	24,181	17,504
Acres in SS4B	12,307	9,542	4,111	10,804
Acres in SS4C	2,773	2,009	1,816	2,108
Acres in SS5	40	40	40	40
Mountain Pine Beetle Risk* *Management indicators*	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Acres and % of Ponderosa Pine in a Low Risk condition for MPB Susceptibility	813 (2%)	2,241 (7%)	2,241 (7%)	2,241 (7%)
Acres and % of Ponderosa Pine in a Medium Risk condition for MPB Susceptibility	18,254 (53%)	21,015 (60%)	25,636 (75%)	18,959 (55%)
Acres and % of Ponderosa Pine in a High Risk condition for MPB Susceptibility	15,575 (45%)	11,200 (33%)	6,271 (18%)	13,256 (38%)

*total pine acreage differs by alternative due to differing acres of hardwood and meadow conversion.

The Norwood 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 Deciding Official (District Ranger) will review the proposed action, the issues identified during scoping, and the environmental consequences of implementing the proposal and alternatives. This forms the basis for the Deciding Official to make the following determinations:

- Whether or not the information in this analysis is sufficient to make an informed decision.
- Whether or not the vegetative treatments, fuels treatments, road related actions and resource improvement projects should be implemented, and if so, in what manner and in which locations.

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CHAPTER 1. PURPOSE OF AND NEED FOR ACTION

Document Structure

The Hell Canyon Ranger District of the Black Hills National Forest has 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 the proposed action and alternatives. The document is organized into four chapters:

Chapter 1. Purpose and Need for Action: The 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 details how the Forest Service informed the public of the proposal and how the public responded.

Chapter 2. Alternatives, including the Proposed Action: This chapter provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on significant issues raised by the public and other agencies. Finally, this section provides a summary table of the environmental consequences associated with each alternative.

Chapter 3. Affected Environment and Environmental Consequences: This chapter describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by [insert topic (i.e., resource area, significant issues, environmental component)].

Chapter 4. Index

Chapter 5. Bibliography and Literature Cited

Chapter 6. List of Preparers

Chapter 7. Final EIS Distribution List

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

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at the Hell Canyon Ranger District Office in Custer, South Dakota.

Background

The Norwood project area is a combination of the Sherwood and North projects, which were initiated in 2003, but never completed. Because these projects are physically adjacent, had similar preliminary issues, and were proposed for analysis during the same timeframe, it was decided to combine these projects. Some of the field surveys done for these projects will be utilized in Norwood. However, since that time, the Phase II Forest Plan Amendment has been signed and management direction has, therefore, changed.

In the Norwood project area, the Black Hills National Forest proposes vegetative treatments and modifications to the existing road system. These actions are designed to address the need to enhance vegetative diversity, reduce the risk of mountain pine beetle infestation and large-scale wildfire, provide for wildlife habitat needs, and provide a sustainable supply of

commercial timber consistent with Forest Plan direction, while providing for management and public access.

The Norwood project area is located along approximately 22 miles of the Wyoming and South Dakota border in Pennington County, South Dakota and Weston and Crook Counties in Wyoming. The southernmost point of the project area is approximately 7 miles directly east of Newcastle, Wyoming. The project area includes approximately 46,458 acres, 42,252 of which are National Forest System lands and the remaining 4,206 acres are private. The legal description of the project boundary is; T2S, R1E Sections 4-8, 18 and 19; T1S, R1E, Sections 4-9, 16-21, 28-33; T1N, R1E, Sections 3-11, 14-23, 28-33; T2N, R1E, Sections 3-24, 27-34; T3N, R1E, 28-34; T2N, R2E, Sections 7 and 18; T46N, R60W, Sections 32 and 33; T47N, R60W, Sections 3, 27 and 28; T48N, R60W, Sections 9, 10, 17, 20-22, 27-30, 32-34; T49N, R60W, Section 33; Black Hill Meridian.

There are several arterial roads, which access the project area including, NFSR (National Forest System Road) 110, 111, 117, 284, 301, 810, and 811. The Beaver Creek cross-country ski trail area is closed to all motorized vehicles, including snowmobiles during the winter months. Portions of the designated snowmobile trail system occur within the northern part of the project area.

Management Direction

Forest Plan Direction

The 1997 Revised Land and Resource Management Plan, as amended, (Forest Plan) provides direction for the management of the forest. The Forest Plan contains management Goals and Objectives, in addition to associated Standards and Guidelines, Management Area direction, and identifies desired future conditions for the forest. Resource specialists have reviewed the current condition of the project area and compared these conditions with the desired conditions identified in the Forest Plan, along with other goals and objectives, and have identified opportunities for improvement. The Decision document for the Phase II Forest Plan amendment was signed on October 31, 2005 and this direction 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 though 4 and Goal 10 address natural resource objectives for multiple-use management of the Forest. Goals 3 and 5 through 9 provide socioeconomic emphasis for management of the Forest. Goals and objectives, applicable to specific resource management issues needing resolution, provide the basic direction for defining the purpose and need and ultimately developing the proposed action (Alternative 2). Amended Forest Plan goals are discussed in Chapter 1 of the Forest Plan. Goals 1 through 4 and 10 provide management emphasis and direction for the Norwood project.

Associated with these Goals are specific resource objectives, as outlined in the Forest Plan. Some of these objectives are key to defining the purpose and need and developing the proposed action. Key objectives providing management emphasis for the project are discussed below and include a brief description of the existing condition and opportunities. Note that other Forest Plan goals and numerous objectives not mentioned below also provide guidance and are achieved to varying degrees.

Forest-wide Goals and Objectives

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

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

Objective 104: *Maintain or enhance watershed conditions to foster favorable soil relationships and water quality.*

a. *Implement projects to improve watershed conditions on an average of at least 300 acres annually over the Plan period.*
b. *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 the year.*

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

There is an estimated 154 miles of streams within the Norwood project area. One percent is intermittent, six percent are perennial, and 93 percent are ephemeral. The perennial streams include Beaver Creek, Parmlee Canyon, Bear Run, Thomson Canyon, Sherwood Canyon, and Cold Springs Creek. All streams within the project area are currently meeting their assigned beneficial uses. Sedimentation has occurred at one crossing on NFSR 268 and has occurred as a result of user created trails. Opportunities exist to reduce the potential for sedimentation and to sustain water flows through management of upland vegetation.

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

Objective 201: *Manage for a 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.*

National forest lands in the project area include approximately 2,206 acres of designated aspen sites. Aspen also occurs as a secondary species within ponderosa pine and white spruce stands. No bur oak occurs in the project area. An opportunity exists to maintain aspen stands by removing conifers that have encroached into them and to increase the acreages of designated hardwood sites by converting pine sites with aspen inclusions to aspen sites with the removal of the conifers.

Objective 202: *Conserve and manage existing mountain mahogany stands.*

There are 224 acres of mountain mahogany shrubland along the western edge of the project area in Wyoming. Mountain mahogany is present on rocky dry slopes generally at elevations between 3,800 and 4,900 feet. It is considered strongly dominant where it exists. It is often associated with rocky mountain juniper and ponderosa pine. Little opportunity exists to manage these stands as they are dominant where they occur and are in good condition.

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

There are four stands of paper birch in Norwood (40204-8, 79, 84 and 40301-94). They total approximately 26 acres and are usually associated with aspen. Paper birch also occurs as a secondary species within ponderosa pine and white spruce stands. An opportunity exists to maintain these stands by removing conifers to reduce competition and increase the acreage of birch sites (hardwood conversion).

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 2,126 acres of meadow. Meadows provide unique habitats not found elsewhere within the forested ecosystem. Some meadows are being encroached upon by ponderosa pine. Without treatment, meadow habitat will eventually decrease. There is an opportunity to conserve existing meadows by removing encroaching pine on 85 acres and to increase meadow acreage by restoring a historic meadow on 7 acres.

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

Snags per acre range from 0.58 to 2.36 across the project area. Acres containing spruce habitat generally have higher snag and downed woody material counts so that in those acres, snag clumping is common. Pine beetles and recent fires have created more snags and downed woody material in the last five years. One of the most recent fires was the Sheldon Fire which burned more than 350 acres in the project are in 2002. Opportunity exists to conserve existing snags by prohibiting cutting of standing dead trees.

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

Currently there are sufficient amounts of down woody debris throughout the Norwood project area. Mountain pine beetles and recent fires (i.e. the Sheldon fire of 2002) have created more snags and down wood in the last five years.

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

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

Objective 215: *Manage for at least 5 stream reaches in a rehabilitated condition during the plan period. Select reaches where the water table has receded and plant species composition has changed as a result of human activities. Coordinate planning and implementation with state game and fish agencies and downstream private landowners. Use Objective 215 a through d in designing the projects.*

a. Raise the water table to saturate historically inundated soils.

b. Convert drier-site vegetation to native wet-meadow species.

c. Reintroduce beaver into the drainage once suitable habitat is developed.

d. Design management to maintain wet-meadow conditions.

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

Objective 240-HAB: *Manage and/or install structures to provide water for livestock and to protect the aquatic, shoreline, and upland vegetation around ponds or water catchments containing leopard frogs.*

Riparian areas are associated with the perennial streams in the project area and support spruce trees, willows, and a variety of riparian vegetation. Numerous reservoirs have been created for livestock watering. Beaver Creek and Cold Springs Creek are fish bearing streams. There is an opportunity to maintain and improve riparian area habitat.

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

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.*

The bald eagle is the only federally listed species with potential habitat in the Norwood Project Area.

There are 7 animal species listed as Sensitive in Region 2, which have been documented in the project area. No sensitive plant species have been documented to occur in the project area although possible habitat exists. Habitats for other sensitive species and species of local concern exist in the project area. There is opportunity to conserve and enhance habitats for these species through vegetative treatments, fuels treatments, and modifications to the road system.

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

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

In the Norwood Analysis Area it is known that there is at least 750 acres of noxious weed infestations. Previous disturbances within the project area and current infestations put this area at high risk for continued invasion. Treatment, including biological control, will be required to achieve the desired condition as described in the above objectives. Timely treatment and constant monitoring (and re-treatment as needed) can reduce infestations of noxious weeds by 20 percent per year. Areas in the Norwood Analysis Area that are disturbed will need to be revegetated (as called for in Standard 1110) to meet Objectives 230 and 231 above.

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 species have been located in the Norwood Analysis Area. However, there may be habitat for two sensitive species in the open meadows. The species of local concern, pleated gentian (*Gentiana affinis*), has been located in the Norwood Analysis Area. There may also be habitat for another species of local concern in wet/riparian areas in the analysis area. Avoiding disturbance of those meadows and riparian areas, and therefore conserving the sensitive species and species of local concern habitat, can help meet Forest Plan direction. There is an opportunity to create or maintain moderate-to-low crown-fire hazard through fuels treatments and other vegetative management.

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. Population monitoring will be discretionary as provided by 219.14.f.*

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

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

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 beaver, white-tailed deer, golden crowned kinglet, black-backed woodpecker, brown creeper, ruffed grouse, song sparrow, and mountain sucker, exists in the project area. There are opportunities to maintain or enhance habitat for these species. The project area does not provide habitat for grasshopper sparrow.

Objective 239: *Manage for 20,000 acres of spruce across the Forest using active management to achieve multiple-use objectives. Treat spruce within 200 feet of buildings where spruce has encroached into hardwoods and for emphasis species management.*

There are 3,023 acres identified as white spruce within the analysis area. The 2005 Forest Monitoring Report on page 12 states that 25,462 acres of white spruce currently exist on the BHNF. Most spruce stands are intermixed with ponderosa pine and a small amount of aspen. There is an opportunity to remove encroaching spruce within pine sites.

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

Objective 303: *Offer the following allowable sale quantity (ASQ) of timber on suitable and available timber lands in the next decade.*

Table 1.1 - Allowable Sale Quantity From Suitable Lands: (Decade Total)

Sawtimber	
Million Cubic Feet	181
(Million) Board Feet	838
Roundwood	
Million Cubic Feet	21
(Million) Board Feet	N/A
Total	
Million Cubic Feet	202
(Million) Board Feet	838

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

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 14 heritage sites in the project area that are eligible for listing on the National register. These sites will be protected from disturbance.

Objective 410: *Emphasize developed recreation opportunities not currently provided by the private sector. Coordinate with other recreation providers and businesses to offer the public a variety of recreation opportunities and services.*

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

Objective 419: *Provide for the annual designation and management of 350 miles of snowmobile trail by the States of Wyoming and South Dakota. Annual changes to the trail system should be limited.*

The project area provides developed and dispersed recreational opportunities. There are three outfitter or guide permits in the project area. Beaver Creek Cross-country ski trail and

designated snowmobile trails occur in the project area. There are opportunities to control motorized access to the Beaver Creek ski area by installing gates.

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.*

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.*

Fire regimes in the project area have been moderately to significantly altered from their historical range. The risk of losing key ecosystem components is high. Fire frequencies have departed from historical frequencies by multiple return intervals. The existing fire hazard in pine stands is concentrated in the Very High (48%) and High (23%) categories, with only 1 % in a low hazard rating. For spruce stands, the vast majority (80%) is in a Very High or High (19%) fire hazard condition. Some private lands, including a few structures, exist within the project boundaries but there are no major concerns with wildland urban interface at this time. Opportunities exist to reduce fuels and improve condition class in stands to reduce the fire risk 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.*

Currently, there are approximately 15,576 acres (45 percent) of ponderosa pine at high risk and 18,255 acres (53 percent) at a medium risk for mountain pine beetle infestation. Mountain pine beetle (MPB) is showing increased activity in the pine stands in the northern half of the analysis area. Patches of dead trees ranging from four or five to several dozens can be seen across the landscape in the northern locations. The project area is part of a large swath of MPB infestation in the Black Hills that extends from about 5 miles north of O'Neil Pass to Deerfield Reservoir, approximately 20 miles to the southeast. It includes many locations with small, intensely infected areas that are poised to expand and fuse (Schaupp,

Sept 2006). There is an opportunity to reduce potential MPB caused mortality by thinning dense timber stands and conducting sanitation harvests.

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

National Forest land in the Norwood project area is mainly (99 percent) within Management Area 5.1, Resource Production Emphasis (see Map 8 in Appendix A). 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.

The remaining portion (1 percent) of the project area is within Management Area 5.4, Big Game Winter Range (see Map 8 in Appendix A). 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. This small isolated portion is in Wyoming and currently no legal access is available.

Management Area 5.1

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

Objective 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 objective language for 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.

Table 1.2 – Percentages of Structural Stages for Ponderosa Pine in Management Area 5.1

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-successional characteristics.

Management Area 5.4

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

Objective 5.4-204. Improve forage on range areas.

Objective 5.4-206. See Objective 5.1-204 above.

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.

Purpose and Need for Action

The purpose and need for action in the Norwood project area is to enhance vegetative diversity, reduce risk of mountain pine beetle infestation and large-scale wildfire, provide for wildlife habitat needs, and provide a sustainable supply of commercial timber consistent with Forest Plan direction, while providing for management and public access needs.

Proposed Action

Following is a brief summary of the proposed action analyzed by the ID Team and documented in this EIS. This proposal and the alternatives are presented in more detail in Chapter 2.

The proposed action was developed to address the purpose and need for action as previously described. It includes vegetative treatments and modifications to the existing road system designed to address the Purpose and Need for Action. No change to the existing cross-country ski area or snowmobile trails is proposed. Specific actions include commercial and non-commercial tree thinning to reduce stand density, meadow restoration and pine encroachment treatments to preserve and increase meadows, hardwood release and conversion to preserve and increase hardwood stands, group selection, individual tree selection, overstory removal, seedcut and prepcut treatments, and sanitation treatments to remove beetle infested trees. Fuel treatments are proposed to reduce fire risk, particularly around private land. Changes to the road system include either converting or closing all non-system roads, administrative closures, year-long closures, and seasonal closures. System road mileage increases and overall road density decreases. Trail mileage increases.

Decision Framework

Given the purpose and need, the deciding official will review the proposed action, the issues identified during scoping, the other alternatives, the environmental consequences of implementing an alternative, and public comments received on the Draft EIS. After careful consideration of this information, the Decision Maker 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 and/or changes to the road system should be implemented and if so, in what manner and in which locations.

Public Involvement

The Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS) was published in the Federal Register on July 5, 2006. The NOI asked for public comment on the proposal within 30 days of publication of the notice.

In addition, as part of the public involvement process, a scoping letter was sent to approximately 140 individuals, agencies, groups, tribal representatives, and other governments in June, 2006. As a result of public involvement efforts, input was received from 14 individuals, tribal representatives, groups, or agencies. Using the input received, the interdisciplinary team developed a list of issues to address.

Issues

The ID Team separated the issues into two groups: significant (as directed by the Council on Environmental Quality (CEQ) regulations (40 CFR 1500.4(g) and 1501.7)) and non-significant issues. 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 reasons regarding their categorization as non-significant may be found in the project record.

The Forest Service identified the following significant issues. The numeric attachment is strictly an identifier and does not represent any priority or standing. The Alternatives to the Proposed Action were developed as a result of these significant issues.

Issue #1 – Aspen Restoration:

Management efforts should maximize the potential for converting mixed pine/aspen stands to aspen where conditions are appropriate. The northern portion of the project area supports aspen stands. Conifers have encroached into historic hardwood sites on the Forest as a result of fire suppression and management efforts that favor pine regeneration. Key indicators for this issue are:

- Acres of aspen stands
- Percent increase in aspen stands

Issue #2 – Ponderosa Pine Structural Diversity:

Creation of additional areas of open, mature pine stands (4A structural stage) should be minimized. The project area currently has an abundance of 4A pine stands. Structural diversity in pine stands is important for providing a variety of wildlife habitats across the landscape. Proposals to address fuels and insect concerns could change wildlife habitat features and impact species. Key indicators for this issue are:

- Acres of ponderosa pine in each structural stage

Issue #3 - Mountain Pine Beetle Risk:

Aggressive treatments of pine stands with a High or Medium risk rating for mountain pine beetle susceptibility may be necessary to limit beetle caused mortality in the project area. Mountain pine beetle activity in the project area has been steadily increasing and the majority of pine stands are in a High or Medium risk condition. Key indicators for this issue are:

- Acres and percentage of ponderosa pine in a High Risk condition for MPB
- Acres and percentage of ponderosa pine in a Medium Risk condition for MPB
- Acres and percentage of ponderosa pine in a Low Risk condition for MPB

CHAPTER 2. ALTERNATIVES, INCLUDING THE PROPOSED ACTION

Introduction

This chapter describes and compares the alternatives considered for the Norwood Project. It includes a detailed description of the Proposed Action (Alternative 2) and two alternatives to the Proposed Action (Alternative 3 and 4), as well as the No Action Alternative (Alternative 1). There is also a brief overview of alternatives that were considered by the ID Team but eliminated from detailed development and study. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public.

Alternatives Considered in Detail

The Forest Service developed four alternatives, including the No Action and Proposed Action alternatives, in response to the significant issues identified. The alternatives considered in detail by the IDT are discussed below. This section provides a summary of activities that are proposed to occur during implementation of any action alternative. The amount (e.g., acres, miles) of any particular activity in any alternative is approximate (based on inventory and survey estimates). Actual figures may change during preparation of a timber sale, prescribed burn, or other projects based on such things as topography, non-uniform stand structure or fuels, refinement of the amount or standard of road needed, etc.

Alternative 1

No Action

NEPA (National Environmental Policy Act) requires the study of the No Action Alternative and that it be used as a basis for comparing the 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 Norwood project area.

This alternative represents no attempt to actively respond to the purpose and need for action or the issues raised during scoping. There would be no effort to modify existing vegetation or related fuel conditions in the project area.

Features Common to All Action Alternatives

All of the following activities would occur on National Forest system lands in Management Area 5.1 only.

- Proposed road related elements of this project are the same for all Action Alternatives and include the following:

Table 2.1 – Proposed Road-Related Elements for All Action Alternatives

Road Miles – Total (in miles)	**233.7**
System Roads (includes 2.7 miles of new construction)	**232**
Undetermined Roads	**0**
US Highway	**1.7**
System Roads - Total (in miles)	**232**
System Roads Open Yearlong	**99**
System Roads Administrative Closure (gated-includes 0.8 miles of new construction)	**52**
System Roads Seasonal Closure	**51.2**
System Roads Physically Closed as Storage (gated-includes 1.9 miles of new construction)	**29.8**
Gates	**24**
Undetermined Roads - Total	**0**
Road Density - Total	**3.2 mi/sq mi**
Open Road Density *April 1 through December 14*	**2.1**
Open Road Density *December 15 through March 31*	**1.4***
Existing Trails	**9.9**

*Open road density is reduced during the winter months due to snowmobile and cross-country ski area seasonal closures.

- Proposed vegetation treatment elements of this project which are the same for all Action Alternatives include the following:
  - All proposed harvest units may contain inclusions of different cover types or condition. Each site has a single treatment type prescribed, however, inclusions within sites may be treated differently than the majority of the site.
  - Hardwood release would occur on a total of 1,544 acres, of which 1,521 acres are aspen and 23 acres are paper birch. This treatment would be accomplished by removal of all conifers within the site boundary.
  - Overstory removal would occur on 1,652 acres of mature ponderosa pine stands. In this treatment, mature pine are removed where adequate regeneration has occurred.
  - Prep cut is proposed in one site which is 23 acres in size. This treatment is proposed in stands that have reached maturity, but have not developed crowns large enough for adequate seed production. Residual trees are thinned to a 60 BA (basal area).
  - Group selection is proposed on 505 acres. Approximately 195 acres is a designated spruce site, while the remaining 310 acres occur in designated pine stands which contain a spruce component. Small openings are created over 25% of the site to regenerate the stand in an uneven-aged method.
  - Individual tree selection (ITS) is proposed in a mature pine stand which is 81 acres in size. This is an uneven-aged treatment which targets retention of a variety of size and age classes within the stand.
  - There are 317 acres proposed for a ‘Special Cut’ due to their Scenic Integrity Objective (SIO) of High. These stands are all pine stands visible from US highway 85. Therefore, the standard treatments of overstory removal and seedcut proposed for these sites would be implemented in such a way as to minimize the visual impact. Approximately half of this acreage would be a modified overstory removal and the other portion would be a modified seedcut.
  - A Sanitation treatment is proposed on 271 acres of pine sites in the northern portion of the project area where mountain pine beetle is most active. These particular stands have active beetle infestations occurring within them. This treatment would remove live trees with beetles in them.
  - Meadow restoration is proposed on 7 acres where a historic meadow site has been converted to pine. This treatment would remove all conifers and result in a type conversion from pine to meadow.
  - Removal of Pine encroachment from designated meadow sites is proposed on 85 acres total, of which 76 acres has a commercial tree component.
  - POL (Products Other than Logs) thinning is proposed as the focal commercial treatment on 92 acres.

- Fuels Treatments to reduce the threat of wildfire are proposed as follows for All Action Alternatives (refer to Map 5 in Appendix A:

    - **Mechanical Slash and Burn:** This option would treat only the existing slash; no cutting of trees is proposed. Mechanical treatment of existing slash and broadcast burning of slash on 952 acres could also include hand cutting of slash, piling, and burning.
    - **Mechanical Thin and Burn:** Mechanical thinning treatments would thin up to 9-inch dbh (diameter at breast height) trees to 16 to18 feet spacing, with broadcast burning of resultant slash on 1,404 acres. It could also include hand cutting, piling, and burning.
    - **Mechanical Thin in Wildland Urban Interface (WUI):** Adjacent to private land, mechanical and/or hand thinning and piling is proposed for 1,830 acres on trees up to 9-inch dbh to a 24 foot spacing. Piles would be burned. No broadcast burning would occur.
    - **Mechanical Thin in Non-WUI:** This treatment would thin trees up to a 9-inch dbh with 16 to 18 foot spacing on 1,392 acres. No broadcast burning would occur; however, the slash piles would be burned. This treatment may include hand cutting and piling.

Post-sale projects

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

- Approximately 85 acres is proposed for pre-commercial pine encroachment treatments. Burning and rehab of any resulting slash piles would be included.
- Pre-commercial TSI thinning is proposed on 2,233 acres. Burning of the resultant slash piles and rehab of piles would be included.
- As required, regeneration surveys would occur on all sites treated with an overstory removal or a regeneration treatment (seedcut, group selection and ITS).
- POL (products other than logs) thinning is proposed as a secondary treatment following commercial thinning on 7,576 acres for Alternative 2; 9,252 acres for Alternative 3; and 5,624 acres in Alternative 4. This treatment would also include burning of resultant slash piles and rehabilitation of those piles.
- Hardwood cleaning is the removal of pre-commercial sized conifers from hardwood stands and includes burning and rehabilitation of slash piles. Hardwood cleaning would occur in all stands proposed for Hardwood Conversion and Hardwood Release. In Alternatives 2 and 4 this amounts to 1,724 acres and in Alternative 3 it is 2,033 acres.
- Mechanical site preparation is proposed on 1,907 acres in Alternatives 2 and 3, and on 1,726 acres in Alternative 4. This treatment is designed to break up sod and prepare a seedbed for regeneration.

- The proposed creation of approximately 188 small handpiles to serve as small mammal den sites is discussed in each specific site's section.
- Approximately 5 acres of willow planting is proposed along Beaver Creek.
- Wire Exclosure fences would be constructed to protect spring sources and/or drainages at Beaver Creek, Stots Spring, Rudenvale Spring, Birch Seep, Thompson drainage, Sherwood Spring and Summit Spring.
- Buck and pole fences would be constructed to protect water sources at Cold Creek and Bacon Spring.
- Weed spraying would occur for five consecutive years on approximately 672 acres the first year and 538, 430, 344, and 275 acres in Years 2, 3, 4, and 5, respectively.
- Biological control of weeds would occur on a total of 15 acres around water sources and/or difficult access areas. This would include monitoring and signing of the areas.
- The Beaver Creek Spring Water Gap Rehabilitation project would eliminate a water gap at the spring that is used to water livestock. A fence would be moved and extended to encompass the entire spring/wet area. A hydraulic ram pump would be used to pump water up the canyon to a water tank. This would eliminate the sedimentation of Beaver Creek and draw livestock further up the canyon, away from the spring/riparian area.
- The Beaver Creek Campground Bank Stabilization project is designed to stabilize the stream bank at Campsite 2. The stream bank conditions consist of areas of exposed soil and roots and is eroding soil into the stream. The proposal is to terrace the bank with logs or retaining wall blocks with steps, along with gravelling the flat pads between the terraces.
- The Beaver Creek Headcut Stabilization project would build a rock cascade to prevent an existing headcut from proceeding further upstream and incising the channel.
- The Wet Parmlee Drift Fence proposed project consists of building a short drift fence to prevent livestock from going into Wet Parmlee Canyon and trampling the spring.
- The Stots Canyon Improvement/Rehabilitation of Crossings project is designed to reduce sediment being delivered to the stream at two crossings. The crossings would be hardened with concrete mats and water bars installed to divert water off of the road/trail instead of running into the creek. As an alternative, if the crossings are not needed, the stream banks could be hardened with logs to narrow the stream at the crossing, material backfilled behind the logs to rebuild the stream banks, and waterbars installed to divert the water from the road/trail before it reaches the stream.
- The installation of a well, pipeline, and three water tanks is proposed for the Dry Beaver Allotment in Section 19 of R1E, T2N. This project would include improvement signing. The water tanks should have "escape ramps."

- The Sherwood Kinney Bog Hole of the Lower Beaver Allotment has water in it year-round, even in dry years. This project proposes to mechanically dig into the bog, put in a spring box, fence the seep area, and install a pipeline to a new water tank. The purpose would be to keep livestock out of the Moon area and off the road. It would also more effectively distribute livestock along the state line area. The project would also include improvement signing. The water tanks should have "escape ramps."

- At Bacon Spring within the Lower Beaver Allotment, this project proposes to mechanically install a spring box, construct a buck and rail fence around the spring, install new water tanks, and install a pipeline from the spring box to the water tanks. The objective is to keep livestock out of Moon area and off road. It would also result in better distribution of livestock. The project would also include improvement signing. The water tanks should have "escape ramps."

- This project proposes to move the existing tank and gravel pad at Upper Sherwood Spring and install improvement signing. The water tanks should have "escape ramps."

- At Lacey Reservoir, this project proposes to set collection box, water tank, pipeline, and improvement signing. The water tanks should have "escape ramps."

- At Summit Spring, this project proposes replacing an existing 2-inch pipe, installing a water tank, gravel pad, and improvement signing. The water tanks should have "escape ramps."

- A proposed project would be to move an existing water tank down the draw and install a pipeline to it from Lower Sherwood Spring. The project would also include improvement signing. The water tanks should have "escape ramps."

- At Beaver Creek Spring #2, the proposal is to move the Beaver Creek water tank away from the exclosure fence in order to keep livestock out of the corner. A pump system would be installed to deliver water via a new pipeline from the spring site, underneath culvert in road, and up the draw in Section 5 to a new water tank. This would keep livestock from utilizing the bottom of the meadow at the spring. The project would also include improvement signing. The water tanks should have "escape ramps."

- The project proposal includes constructing and placing bentonite in the pool area of the following reservoirs: Burn Reservoir, Dump Reservoir, Divide Reservoir, Section 5 Reservoir, Eyster Spring Reservoir, Driveway Reservoir, Jenks Well Reservoir, birch tree reservoir, Dry Parmlee Reservoir #1, EVA Reservoir, Bald Hills Spring Reservoir, Bald Hills Reservoir #2, Mudhole Reservoir, Steer Pasture Reservoir #1, Steer Pasture Reservoir #2, Claybank Reservoir, Thundermug Reservoir, Hole in the Wall Reservoir, Twin Springs Reservoirs, Nicolls Dam #2, Little Bear Run Reservoir, Fawcett Reservoir, Canyon Reservoir, Blacktail Reservoir, Crossroad Reservoir, Moon Reservoir, South Stots Spring Reservoir, and Spring Canyon Reservoir. The project would also include improvement signing.

- This project proposal includes constructing a buck and pole fence at Bear Springs Reservoir #2 to take grazing pressure off the surrounding area. Water for livestock would be piped to a water tank nearby. This project would also include improvement signing. The water tanks should have "escape ramps."

- New spring developments are proposed for Wet Parmlee Spring, Bear Canyon, Spring, and Kawklasier Spring. This would include developing spring sites, installing a fence around the area, putting in water pipes, and placing water tanks on gravel pads. This project would also include improvement signing. The water tanks should have "escape ramps."

- Proposed projects at West Camp Spring Unit A and Unit B include installing fencing, pipelines, a tank system, and improvement signing. The water tanks should have "escape ramps."

- This project proposal includes removing a cattle guard in the Beaver Creek Exclosure/Unit A fence line (SW corner of Section 5 (NFSR 109.4) and install it on the Bald Hills/Unit B fence line (NW corner of Section 32). The proposal also includes installing a pipe gate beside the cattle guard in the Bald Hills/Unit A fence line and improvement signing.
- It is proposed to clean out existing cattle guards where needed.
- It is proposed to install improvement signs at the following locations: Blacktail Spring, Gunlach Spring, Jakes Dam, North Jungle Spring, Rudenvale Spring, South Jungle Spring, Stots Reservoir, and Wolf Draw Spring.
- At McInerny Spring, the proposal is to install a solar pump, 1 mile of pipeline, two tanks, and a storage tank. The water tanks should have "escape ramps."
- At Stateline Spring, the proposal is to develop the spring and install ¼-mile of pipeline, two tanks, an exclosure, a pump, and a storage tank. The water tanks should have "escape ramps."
- Proposed projects at Deer Spring include installing a pump, 1 mile of pipe, a water tank, and storage tank. The water tanks should have "escape ramps."

Alternative 2

The Proposed Action

This alternative was developed to meet the Purpose and Need for Action described in Chapter 1. It represents the IDT's best recommendation prior to detailed analysis of the environmental effects and public scoping.

In addition to the management activities described under "Features Common to All Alternatives" and "Post-Sale Projects" above, this alternative includes the following treatments. Commercial thinning is by far the prime vegetative treatment proposed. Approximately 7,576 acres would be commercially thinned in this alternative to reduce stand density and promote forest health. The target density, measured as basal area (BA) in square feet per acre (sf/ac), varies from 50 to 70. The areas proposed for a BA of 50 (424 acres) are those that are at a high risk condition for mountain pine beetle (MPB) infestation and where MPB activity is in close proximity to the stand. Stands proposed for a BA of 60 (3,348 acres) are those which are at a high or medium risk for MPB infestation and where current MPB caused mortality is not adjacent to the stand. The remaining stands proposed for a basal area of 70 square feet per acre (3,804 acres) are in the southern portion of the project area where beetle activity is much lighter.

Other commercial treatments include seedcut regeneration harvest on 1,907 acres and hardwood conversion on 180 acres that are currently designated as pine (approximately 5 of these acres are birch and the remaining 175 acres are in aspen). Overall, this is an 8 percent increase in aspen and a 20 percent increase in birch stands in the project area. Hardwood conversion is proposed in mixed stands where ecological conditions would support a hardwood stand and a hardwood component persists under a conifer canopy.

This alternative would commercially harvest approximately 35.9 mmbf of sawtimber and 15,600 ccf of POL (products other than logs) from approximately 14,231 acres.

See Table 2.2 for a comparison of alternatives and Maps 2 and 5 in Appendix A for vegetative and fuels treatment prescriptions and travel management proposals.

Alternative 3

This alternative was developed to address Significant Issues #1 (aspen restoration) and #3 (mountain pine beetle risk). The elements of this alternative which differ from the Proposed Action, Alternative 2, are: 1) increased aspen restoration treatments, and 2) additional acres and more intensive commercial thinning to reduce mountain pine beetle risk.

As compared to the Proposed Action, this alternative would increase acres of pine converted to aspen by 309 acres to total 489 acres of pine stands converted to hardwoods (5 acres of which are birch). This amounts to a 22 percent increase in designated aspen stands in the project area.

Commercial thinning would occur on 9,252 acres, which is a 1,676 acre increase over the Proposed Action. In addition to the increase in acres, the target BA for this commercial thinning in concentrated in the 50 and 60 sf/ac range and therefore, will result in less dense stands on the landscape than in Alternative 2. The majority of this thinning is to a BA of 60 (8,200 acres); 962 acres would be thinned to a BA of 50 (more than double the acres in Alternative 2); and a relatively small amount (90 acres) would be thinned to a BA of 70.

The seedcut treatments proposed in the Proposed Action would also be included in Alternative 3.

Alternative 3 would commercially harvest approximately 40.7 mmbf of sawtimber and 17,900 ccf of POL from approximately 16,216 acres.

See Table 2.2 for a comparison of alternatives and Maps 3 and 5 in Appendix A for vegetative and fuels treatment prescriptions and travel management proposals.

Alternative 4

This alternative was developed to address Significant Issue #2 (pine structural diversity). The elements of this alternative differ from the Proposed Action by including a reduction in the amount of commercial thinning, POL thinning, and seedcut treatments in the project area.

All of the differences in treatments between Alternative 4 and the Proposed Action (Alternative 2) occur within pine stands. As compared to the Proposed Action, this alternative proposes 181 fewer acres of seedcut, which equates to a total of 1,726 acres of seedcut. In addition, commercial thinning would occur on 6,984 acres, which is 592 acres less than in the proposed action. Furthermore, of the commercially thinned areas, POL thinning would be deferred on approximately 1,360 acres for the purpose of maintaining a more dense stand condition.

Alternative 4 would commercially harvest approximately 33.6 mmbf of sawtimber and 13,900 ccf of POL from approximately 13,458 acres.

See Table 2.2 for a comparison of alternatives and Maps 4 and 5 in Appendix A for vegetative and fuels treatment prescriptions and travel management proposals.

Design Criteria Common to All Alternatives

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

Monitoring

The Hell Canyon Ranger District assumes responsibility for implementation monitoring of the selected actions. The District would ensure that EIS and Record of Decision (ROD) direction, including design criteria, are applied and carried out appropriately.

Project and contract administrators would perform much of the project monitoring during project implementation. Other resource specialists would 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 designate areas within the project area which are suitable for off-road travel: This Alternative was not considered in detail because it is outside the scope of this project. In addition, the entire project area is currently open to off-road motorized travel, with the exception of the Beaver Creek Ski Area during the winter months. The Forest-level travel management planning effort is in process and is due to be completed in 2009. This effort is expected to designate areas where motorized off-road travel will and will not be allowed on the Forest.
- An Alternative which treats mountain mahogany stands through controlled burns and removes pine encroachment to increase the quality and quantity of browse: This Alternative was not considered in detail because the mountain mahogany sites in the project area are located on a detached portion of Forest land which does not have legal access across private land. In addition, field review of the mountain mahogany sites revealed little pine encroachment and past attempts to prescribe burn mountain mahogany on this District have been unsuccessful due to a lack of ground fuels to carry the fire.
- An Alternative which would include additional acres of group selection and would increase the percentage of the stand in openings: This alternative was not considered in detail because the group selection treatments are specifically applied to stands which contain either a spruce component or an uneven-aged structure, currently and these particular stands are those proposed for group selection in the action alternatives. Furthermore, increasing the area of openings beyond 25 percent of the stand was not considered in detail because, with a rotation age of 100 years and 4 age classes, a 25% entry every 25 years is being used to achieve regulation. Groups are large enough to allow movement of equipment. Some skid trails will need to be cut.
- An Alternative designed to modify livestock grazing: Changing the current grazing system is outside the scope of this project and therefore, was not considered in detail.

Comparison of Alternatives

This section provides a summary of the Alternatives and of the effects of implementing each alternative. Refer to maps 2-7 in Appendix A for a visual display of where each activity is proposed.

Table 2.2 - Comparison of Vegetative Treatments by Alternative (in acres)

Commercial Treatment Acres	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Commercial Thinning 50sf/ac BA (CT50)	0	424	962	338
Commercial Thinning 60sf/ac BA (CT60)	0	3,348	8,200	1,547
Commercial Thin 60sf/ac BA without POL Thinning (CT60noPOL)	0	0	0	1,360
Commercial Thinning 70sf/ac BA (CT70)	0	3,804	90	3,739
Hardwood Conversion (HWRC)	0	180	489	180
Hardwood Release (HWR)	0	1,544	1,544	1,544
Overstory Removal (OR)	0	1,652	1,652	1,652
Seedcut (SC)	0	1,907	1,907	1,726
Prepcut (PC)	0	23	23	23
Group Selection (GS)	0	505	505	505
Individual Tree Selection (ITS)	0	81	81	81
Pine Encroachment (PE)	0	76	76	76
Special Cut	0	317	317	317
Sanitation	0	271	271	271
Meadow Restoration (MR)	0	7	7	7
POL Thinning	0	92	92	92
Total Acres	**0**	**14,231**	**16,216**	**13,458**
Total Volume	**0**	**35.9 mmbf**	**40.7 mmbf**	**33.6 mmbf**
Non-commercial Treatments (acres)				
Pine Encroachment	0	85	85	85
TSI Thinning	0	2,233	2,233	2,233
Aspen Cleaning	0	1,724	2,033	1,724
POL Thinning*	0	7,576	9,252	5,624
Fuels Treatments	0	5,578	5,578	5,578
Mechanical Slash and Burn		*952*	*952*	*952*
Mechanical Thin and Burn		*1,404*	*1,404*	*1,404*
Mech Thin WUI No Burn		*1,830*	*1,830*	*1,830*
Mech Thin Non-WUI No Burn		*1,392*	*1,392*	*1,392*

Table 2.3 – Comparison of Effects to Key Issues by Alternative

Aspen Restoration ***Management indicators***	**Alternative 1**	**Alternative 2**	**Alternative 3**	**Alternative 4**
Acres of Aspen Stands	2,206	2,380	2,688	2,380
Percent increase in Aspen Stands	0	8%	22%	8%
Ponderosa Pine Structural Diversity* ***Management indicators***	**Alternative 1**	**Alternative 2**	**Alternative 3**	**Alternative 4**
Acres and % in SS1	402	402	402	402
Acres and % in SS2	124	1,532	1,532	1,532
Acres and % in SS3A	287	306	306	306
Acres and % in SS3B	1,441	1,467	1,456	1,456
Acres and % in SS3C	402	320	304	304
Acres and % in SS4A	16,866	18,838	24,181	17,504
Acres and % in SS4B	12,307	9,542	4,111	10,804
Acres and % in SS4C	2,773	2,009	1,816	2,108
Acres and % in SS5	40	40	40	40
Mountain Pine Beetle Risk* ***Management indicators***	**Alternative 1**	**Alternative 2**	**Alternative 3**	**Alternative 4**
Acres and % of Ponderosa Pine in a Low Risk condition for MPB Susceptibility	813 (2%)	2,241 (7%)	2,241 (7%)	2,241 (7%)
Acres and % of Ponderosa Pine in a Medium Risk condition for MPB Susceptibility	18,254 (53%)	21,015 (60%)	25,636 (75%)	18,959 (55%)
Acres and % of Ponderosa Pine in a High Risk condition for MPB Susceptibility	15,575 (45%)	11,200 (33%)	6,271 (18%)	13,256 (38%)

*Total pine acreage differs by alternative due to differing acres of hardwood and meadow conversion.

CHAPTER 3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

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

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

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 Norwood cumulative effects analysis. The area analyzed for cumulative effects is the project area for all resources.

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 more recent.

Present activities are those currently occurring in the project area. These activities include snowmobile use (on and off designated trails), cross-country skiing, livestock grazing, dispersed recreation including hunting and off highway vehicle use, timber harvest, fuelwood gathering, wildfire suppression, noxious weed treatment, and gathering of other products such as Christmas trees or boughs. Refer to Appendix E for a summary listing.

Reasonably foreseeable 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.

A comprehensive listing of the past, present, and reasonably foreseeable future actions that were considered by the IDT is available in the project file.

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 downslope 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, geology, soils, slope, connected disturbed areas (CDAs), watershed condition, streams and lakes, floodplains, wetlands, beneficial uses, water quality and quantity, private land, and roads. This report discusses each component as it relates to the Norwood project area. See the Watershed Specialist Report in the project file for detailed information on each component..

Watershed Boundary

The Norwood project area boundary was developed from the HUC (Hydrological Unit Code) 6 watershed boundaries and modified by the district boundary which generally coincides with the Wyoming/South Dakota State Line. There are parcels in the project area that are in Wyoming.

The project area is within parts of five HUC 6 watersheds. HUC 6 watersheds are generally 10,000 to 50,000 acres in size. Table 3.1 displays the acreage and percent of each watershed within the project area. Refer to Map 9 in Appendix A.

Table 3.1 – HUC 6 Watersheds in the Norwood Project Area

HUC 6 Watershed Number	Watershed Name	Total Watershed Acres	% Within Project Area
101201070203	Upper Oil Creek	41,421	<1%
101201070401	Upper Stockade Beaver Creek	44,686	48%
101201070402	Lower Stockade Beaver Creek	36,718	27%
101202010801	Soldier Creek	40,152	5%
101202030201	Cold Springs Creek	45,044	29%
Total		208,021	

(Black Hills National Forest, 2001)

The project area is within parts of thirteen 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 9 in Appendix A.

Table 3.2 – HUC 7 Watersheds in the Norwood Project Area

HUC 7 Watershed Number	Watershed Name	Total Watershed Acres	% Within Project Area
10120107020301	Canyon Springs Prairie	5,432	1%
10120107040101	Dry Beaver Creek	6,664	93%
10120107040102	Beaver Creek	6,586	99%
10120107040103	Parmlee Canyon	9,769	44%
10120107040104	Bear Run	10,481	43%
10120107040201	Thomson Canyon	10,371	48%
10120107040202	Kinney Canyon	6,218	43%
10120107040203	Sherwood Canyon	5,889	34%
10120107040204	Sheldon Canyon	9,368	3%
10120201080101	Upper Soldier Creek	5,016	39%
10120203020101	Upper Cold Springs Creek	5,630	100%
10120203020102	Middle Cold Springs Creek	8,540	83%
10120203020103	Lower Cold Springs Creek	6,251	2%
Total		96,215	

(Black Hills National Forest, 2001)

Precipitation and Climate

The Norwood project area elevation ranges from approximately 5,000 feet in Thompson Canyon in Wyoming to approximately 7,130 feet on an unnamed peak on the northeastern edge of the project area. The climate is semi-arid 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 ranges from 17 to 24 inches, increasing from south to north (Driscoll, Carter, Williamson and Putnam, 2002). 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 44 percent of the annual precipitation occurs May, June and July and approximately 65 percent 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 Norwood project area has three different hydrogeologic units, Alluvium, Madison Limestone, and Minnelusa Formation. These are further grouped into broader categories. Alluvium is in the unconsolidated unit and Minnelusa Formation and Madison Limestone are aquifers. The percentage of each unit with the project area is displayed in Table 3.3.

Table 3.3 – Geology in the Norwood Project Area

Description	% of Planning Area
Alluvium	<1%
Madison Limestone	55%
Minnelusa Formation	45%

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

Soils

There are 28 different soil map units within the project area. The majority of these soil map units have small areas within the project area. Six units, SEE, SGF, SybC, SycE, VcE and VoG, comprise 87 percent of the total project area and the rest of the different soil percent of the project area. A map of the soil map units within the project area and their characteristics are available in the Watershed Specialist Affected Environment Report in the Norwood project file.

Approximately 16 percent of the project area (9 soil map units) contains soils with a very high EHR (Erosion Hazard Rating). See Map 11 in Appendix A. Three of these soil map units, comprising approximately 2 percent of the project area, also have a high mass movement potential. Approximately 63 percent of the project area contains soils which are subject to compaction when wet and 16 percent contains soils which have areas with low topsoil organic matter.

Soils within meadows are often unique and different from soils that support timber stands. Soil map units 28, 29, 62, BsB, CvB, CxC, JhD, MhA and ReC, occupy approximately 6 percent of the project area, generally support native grass and forb species and represent meadow soils within the project area.

Current conditions of the soils were observed when five soil map units were visited in an on-site review in the field. They were units SybC, SycE, TuG, VoG and VcE. These units represent 73 percent of the project area. The goal was to find old landings and skid trails to see if there are any residual effects from past activities. Seven sites were observed. Most of the sites lacked trees and the vegetation that is present was grazed heavily by cattle. There is good ground cover on all sites. If cattle were not present, the vegetation is expected to have been tall and vigorous. There does not appear to be lasting affects from the past activities. Photos taken during the field review are available in the project file.

Soil map units are comprised of different individual soil types. A further break down to the soil map units, it is estimated there are seven soils that occur over 84 percent of the project area. They are Stovho, 37 percent; Trebor, 22 percent; Vanocker, 11 percent; Lail, 5 percent; Citadel, 3 percent; Rock Outcrop, 3 percent and Sawdust, 3 percent. Table 3.4 below gives a detailed description of these soils.

Table 3.4 – Soil Descriptions in the Norwood Project Area

Soil Type	Percent of Project Area	Description
Stovho	37%	This soil is formed in material weathered from limestone and calcareous sandstone. It is deep, well drained, strongly sloping to steep at the higher elevations on the Limestone Plateau. The Stovho soil is generally on the mid and lower side slopes and on foot slopes. Typically there is one inch of forest litter on the surface and the soil is a silt loam to a silt clay loam. Depth to bedrock is over 60 inches. The available water capacity is high, permeability is slow, shrink-swell potential is high, and runoff is medium. When the soil is wet, activities involving heavy equipment can cause surface compaction and the formation of ruts. Erosion can be controlled by reseeding disturbed areas and by installing water bars and culverts. Mass soil movement may occur in steep areas if the surface is disturbed.
Trebor	22%	This soil is formed in material weathered from limestone and calcareous sandstone. It is deep, well drained, strongly sloping to steep at the higher elevations on the Limestone Plateau. The Trebor soil is generally on the upper side slopes and on ridges. Typically there is one inch of forest litter on the surface and the soil is a channery silt loam to a calcareous very flaggy loam. Depth to bedrock is 30 inches while some areas can be 20 to 40 inches. The available water capacity is low, permeability is moderately slow, shrink-swell potential is moderate, and runoff is medium. Erosion can be controlled by reseeding disturbed areas and by installing water bars and culverts. Mass soil movement can occur in steep areas if the surface is disturbed.
Vanocker	11%	This soil is formed in material weathered from limestone and calcareous sandstone. It is deep, well drained, strongly sloping to steep at the lower elevation on the Limestone Plateau. The Vanocker soil is generally on the high parts of the landscape and can be located on north slopes. Typically there is one inch of forest litter on the surface and the soil is a channery loam to a channery clay 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. Mass soil movement can occur in steep areas if the surface is disturbed.
Lail	5%	This soil is formed in material weathered from limestone and calcareous sandstone. It is deep, well drained, gently sloping to strongly sloping at the higher elevations on the Limestone Plateau. The Lail soil is generally on side slopes and on foot slopes. Typically there is one inch of forest litter on the surface and the soil

Soil Type	Percent of Project Area	Description
		is a silt loam to a calcareous clay loam. Depth to bedrock is 60 inches while some areas can be 20 to 40 inches. The available water capacity is high, permeability is slow, shrink-swell potential is high, and runoff is medium. When the soil is wet, activities involving heavy equipment can cause surface compaction and the formation of ruts.
Sawdust	3%	This soil is formed in material weathered from limestone and calcareous sandstone. It is deep, well drained, and very steep at the lower elevation on the Limestone Plateau. The Sawdust soil is generally on side of mountains and canyons. Typically there is one inch of forest litter on the surface and the soil is a calcareous channery loam to a calcareous extremely channery sandy 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 rapid. Erosion can be controlled by reseeding disturbed areas and by installing water bars on skid trails and providing culverts and rolling dips for roads. Mass soil movement may occur in or above disturbed areas.
Citadel	3%	This soil is formed in material weathered from limestone and calcareous sandstone. It is deep, well drained, strongly sloping to steep at the lower elevation on the Limestone Plateau. The Citadel soil is on low side slopes and in coves. Typically there is one inch of forest litter on the surface and the soil is a loam to a calcareous gravelly clay loam. Depth to bedrock is 60 inches. The available water capacity is high, permeability is slow, shrink-swell potential is high, and runoff is medium. When the soil is wet, activities involving heavy equipment can cause surface compaction and the formation of ruts. Erosion can be controlled by reseeding disturbed areas and by installing water bars and culverts. Mass soil movement can occur in steep areas if the surface is disturbed.
Rock Outcrop	3%	This is hard, fractured limestone and hard sandstone. It occurs as large, discontinuous ledges or blocks. In some areas weathering has caused rock slides below the rock outcrop.

Slope

The Norwood project area has a variety of slopes and as a whole, generally contains gentle slopes. Ninety-one percent of the Norwood project area has slopes of 30 percent or less and 96 percent of the project area has slopes of 40 percent or less. However, there is approximately 1 percent of the area with slopes above 60 percent. These steep slopes are concentrated in the canyon areas along the Wyoming and South Dakota stateline. See Map 10 in Appendix A.

Connected Disturbed Area (CDA)

CDAs are identified 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, or mine spoils.

Disturbed areas near ephemeral drainages are generally not CDAs. This is because there is vegetation in the drainages that generally act as a filter for sediment that has been generated. This sediment does not generally contribute to the degradation of the physical function of the stream or degrade water quality.

During the field inventory of the Norwood project area in the summers of 2002, 2003 and 2004, five CDAs were identified. Two of these are water crossings on undetermined roads which are being impacted by cattle and OHV use. The three other CDAs are variable in cause and location; one is a water gap at a riparian exclosure on Beaver Creek, one is headcut at a Beaver Creek campground site where the stream bank show exposed soil and roots, and the third is a non-functional culvert on Forest Road 268. See Table 3.5 for a summary and location of each CDA.

Table 3.5 – Connected Disturbed Areas in the Norwood Project Area

Site #	Location	HUC 7 #	Description
1	T1S R1E Sec. 17	10120107040201	Water crossing with cattle trail/two track. Sediment impacts. Impacted by cattle and OHV. Water running down two-track has begun to erode trail/road. Does not have a road number, it is not identified within roads layer.
2	T1S R1E Sec. 17	10120107040201	Water crossing with cattle trail/two track. Sediment impacts. Impacted by cattle and ATV. Water running down two-track has begun to erode trail/road. Does not have a road number, it is not identified within road layer.
3	T1N R1E Sec. 8	10120107040102	Water gap upper end of riparian exclosure needs to be eliminated. It is contributing a large amount of sediment to Beaver Creek. Best thing to do is to pump water back up the canyon away from the spring.
4	T1N R1E Sec. 6	10120107040102	Beaver Creek Campground. At site 2 there is a raw bank with exposed roots. Just below campground there is an 18 inch headcut that should be repaired/stabilized to prevent it from marching up stream during an event.
5	T2N R1E Sec.26	10120203020102	Culvert has deep holes above it on roadway due to water piping around culvert. Road runs water to crossing. Road is NFSR 268.

In addition to the 5 CDAs, there are other areas that were identified as causing impact to the watershed. These areas are not near streams and therefore, are not considered CDAs. One is road related and nine were cattle related. See Table3.6 below for location and description.

Table 3.6 – Non-CDA Areas of Impact to Watershed in Norwood Project Area

	Location	HUC 7 #	Description
Road-Related			
	T2S R1E Sec. 6	10120107040202	Unauthorized road connecting two system roads is very steep and has no drainage. Needs to be closed and rehabilitated. Trail connects FSR 117.5E with FSR 265.1A.
Cattle-Related			
	T1S R1E Sec. 17	10120107040201	Stots Spring. Traveled by cattle and cattle are trampling the riparian area.
	T1S R1E Sec. 20	10120107040201	Thompson Spring. Area trampled by cattle.
	T1S R1E Sec. 29	10120107040201	Below Thompson Reservoir. Signs of cattle impact.
	T1S R1E Sec. 30	10120107040201	Spring. Cattle impact all the way up the hill has turned the area into a bog/grass-lined area.
	T2S R1E Sec. 8	10120107040203	Summit spring. Signs of cattle impact when area is wet. Area grazed.
	T1N R1E Sec. 18	10120107040103	Drift fence needed to keep cattle from going down canyon and trampling spring.
	T2S R1E Sec. 5	10120107040203	Sherwood Spring. Area grazed.
	T1S R1E Sec. 30	10120107040201	Cows trampling perennial section and is hurting the stream more than the adjacent road is.
	T1N R1E Sec. 8	10120107040102	Grazing too many cows for to long of a period, nothing left.

Watershed Condition

A WCA (Watershed Condition Assessment) was completed for each sixth level watershed in the process of developing the 1997 LRMP. The WCA was based on the watershed sensitivity, known impacts, and available monitoring data. Since the LRMP has been completed, a new watershed layer was completed and the WCAs that were done do not match up with the new watershed layer. New Natural Watershed Sensitivity Index (NWSI) and Impact Indexes were recalculated on the 7th level watershed as part of this project analysis.

The NWSI is used to assess watershed sensitivity to see how sensitive the watersheds are and how they 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 percent
- Moderate Sensitivity, 30-65 percent
- High Sensitivity, 66-100 percent

Impact Indexes accounts 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. These areas 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 3.7 indicates the Sensitivity and Impact Index for each of the HUC 7 watersheds.

Table 3.7 – Watershed Conditions in the Norwood Project Area

HUC 7 Number	Watershed Name	Sensitivity Index %	Impact Index %
10120107020301	Canyon Springs Prairie*	0%	0%
10120107040101	Dry Beaver Creek	10%	0%
10120107040102	Beaver Creek	15%	1%
10120107040103	Parmlee Canyon*	33%	0%
10120107040104	Bear Run*	32%	0%
10120107040201	Thomson Canyon*	20%	1%
10120107040202	Kinney Canyon*	24%	0%
10120107040203	Sherwood Canyon*	14%	0%
10120107040204	Sheldon Canyon*	0%	0%
10120201080101	Upper Soldier Creek*	23%	9%
10120203020101	Upper Cold Springs Creek	1%	24%
10120203020102	Middle Cold Springs Creek	5%	13%
10120203020103	Lower Cold Springs Creek*	4%	14%
Average		13%	2%

*Indexes are based on watersheds acres within the National Forest Boundary. Information is lacking for areas outside the National Forest Boundary.

Sensitivity Index – Eleven of the thirteen watersheds have a Low Sensitivity Index while the other two have a Moderate Sensitivity Index. Average of all watersheds is 13 percent (Low sensitivity index). Those watersheds with very low percentages are those with a small percentage of the watershed within the project area or with no intermittent or perennial

streams. Watersheds with higher percentages can be attributed to presence of soils with a High erosion hazard rating. There are not very many slopes greater than 60 percent within the watersheds and not a lot of area in the streamside management zones.

Impact Index – The majority of the watersheds have a minor impact index, while three watersheds have indexes that are considered beyond minor. Upper Colds Springs Creek has the highest index because many of the roads follow drainages. This is not a concern since the drainages are ephemeral and generally do not flow water. For two watersheds, the index is elevated slightly over what is considered minor because the roads tend to follow the ephemeral drainages. Seven watersheds have an index of 0. The reason for the low ratings is because there are not many roads near streams and there are not many intermittent and perennial streams in the project area.

Streams and Lakes

There are no lakes in the Norwood project area. Of the estimated 154 miles of stream within the project area, 6 percent are perennial, 1 percent is intermittent, and 93 percent are ephemeral. Ephemeral streams are those with a generally grassy lined valley bottom with no defined channel. Intermittent streams have a defined channel with evidence of flow, but not yearlong flow. Perennial streams have a defined channel with water flowing yearlong. (Black Hills National Forest, 2000b).

Streams within the project area are identified in Table 3.8 and shown on Map 12 in Appendix A. Perennial and intermittent streams have a 100-foot WIZ (Watershed Influence Zone) along them. The WIZ distance is from the high water mark and is on each side of the stream for a total of a least 200 feet.

Table3.8 – Streams within the Norwood Project Area

HUC 7 Number	Watershed Name	Stream Miles					
		Ephemeral		Intermittent		Perennial	
		Total	Private	Total	Private	Total	Private
10120107020301	Canyon Springs Prairie	0.00	0.00	0.00	0.00	0.00	0.00
10120107040101	Dry Beaver Creek	20.96	3.35	0.00	0.00	0.00	0.00
10120107040102	Beaver Creek	13.54	4.48	0.67	0.43	2.64	0.02
10120107040103	Parmlee Canyon	10.12	0.00	0.00	0.00	0.77	0.00
10120107040104	Bear Run	15.51	0.00	0.09	0.00	0.82	0.00
10120107040201	Thomson Canyon	18.19	0.62	0.41	0.00	1.62	0.34
10120107040202	Kinney Canyon	11.17	1.74	0.00	0.00	0.00	0.00
10120107040203	Sherwood Canyon	6.93	0.00	0.00	0.00	0.06	0.00
10120107040204	Sheldon Canyon	0.00	0.00	0.00	0.00	0.00	0.00
10120201080101	Upper Soldier Creek	6.03	0.00	0.00	0.00	0.00	0.00
10120203020101	Upper Cold Springs Creek	15.04	8.45	0.34	0.00	0.00	0.00
10120203020102	Middle Cold Springs Creek	25.34	5.04	0.53	0.39	2.97	2.95
10120203020103	Lower Cold Springs Creek	0.73	0.00	0.00	0.00	0.00	0.00
Total		143.56	23.68	2.04	0.82	8.88	3.31
Grand Total						154.48	27.81

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, 2006c), is an indicator of water quality. Streams and stream health within the project area are discussed below.

Cold Springs Creek – This creek is on private land. There were a lot of stream banks with exposed soil and roots, contributing sediment to the stream. It appears that the area may be overgrazed. Stream health rating would be either at-risk or diminished. This rating was based on professional judgment from a distance.

Beaver Creek – This creek is in excellent shape. Past efforts to protect the stream from cattle grazing was evident and the stream and stream banks are in great shape. Evidence of past impact were still apparent but were recovering nicely. The stream health rating for this stream would be robust.

Wet Parmlee – This stream is in the bottom of a canyon with difficult access and is in excellent shape. There is a beautiful riparian area with downed logs, limestone caves and moss everywhere. This stream health rating would be robust.

Bear Run – This stream is in the bottom of a canyon with difficult access and is in excellent shape. The stream and riparian area is in great shape. This stream health rating would be robust.

Thompson Canyon – This stream is the result of a spring that runs for a ways and then disappears. Cattle are currently trampling the stream and there is a road adjacent to the stream. The road did not appear to be affecting the stream. Stream health on this stream would be at-risk.

Floodplains

Floodplains are mapped by FEMA (Federal Emergency Management Agency). A floodplain is any area susceptible to inundation by floodwaters. The 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.

There are 201 acres of mapped 100-year floodplains within the project area. These acres occur within the Upper Cold Springs Creek (89 acres) and the Middle Cold Springs Creek (112 acres) watersheds (FEMA Flood Plain Coverage GIS Layer, 1996).
Much of the project area is within tributary watersheds. These have small order drainages with relatively small contributing or watershed area. This results in streams not having large enough drainage areas to have mapped 100-year floodplains. There will be 100-year floodplains downstream of the project area located in Wyoming on Stockade Beaver Creek and Soldier Creek.

Wetlands

There are 35 acres of mapped wetland polygons and 47 miles of mapped linear wetlands within the project area. See Map 13 in Appendix A. They are classified as both Palustrine and Riverine. Palustrine systems include any inland wetland, which lacks flowing water and contains ocean derived salts in concentrations of less than .05 percent. Riverine refers to any habitat fed by water flowing through a channel. Riverine wetland habitat includes riverbanks, streams, freshwater marshes, and freshwater aquatic beds.

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 (National Wetland Inventory) 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 nonwetland."

A determination has not been made as to whether or not the mapped areas within the project area are true jurisdictional wetlands. However, comparing the miles of perennial stream with the miles of linear wetlands, it is estimated that no more than a fifth of the mapped wetlands could be actual wetlands. Mapped wetlands associated with ephemeral streams are least likely to be true jurisdictional wetlands. In order for a wetland to be jurisdictional, they need to have three elements: vegetation, soils, and hydrology.

Beneficial Uses

The South Dakota DENR (Department of Environment and Natural Resources) assigns water quality standards based on the beneficial uses of each water body. All streams in South Dakota are assigned the beneficial uses of irrigation, wildlife propagation, and stock watering. Table 3.9 displays the streams within the Norwood project area which have additional designated beneficial uses.

Table 3.9 – Beneficial Uses of Streams in the Norwood Project Area

Water Body	South Dakota Beneficial Uses		
	Coldwater Permanent Fish Life Propagation	Coldwater Marginal Fish Life Propagation	Limited Contact Recreation
Cold Springs Creek	X		X
Cold Creek		X	X
Beaver Creek	X		X

(SD DENR, 1999)

Water Quality and Quantity

No streams or waterbodies within the project area are listed in the South Dakota 303(d) Waterbody List (SD DENR, 2006). This list identifies waterbodies that need the development of TMDLs (Total Maximum Daily Loads) because they do not meet water

quality standards. TMDLs are a tool for the management of water quality. All streams within the Norwood project area are currently meeting their assigned beneficial uses.

The following statements were taken from the 'The 2006 South Dakota Integrated Report for Surface Water Quality Assessment' which refers to the Black Hills as a whole but also applies to the limited streams within the Norwood 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 that the highly erosive and leachable marine shales and badlands on the surrounding plains" (SD DENR, 2006).

Streamflows throughout the Black Hills have been reduced over the last century. This is partly a result of fire suppression which has resulted in an increase of woody biomass. Higher leaf areas from increased woody biomass will increase evapotranspiration and interception, resulting in lower streamflows and the drying of springs (USDA Forest Service, 2003).

Peak flows on Beaver Creek and area streams can occur any month from March to October. From the USGS (United States Geological Survey) streamflow records on Beaver Creek at Mallo Camp, the month with the most peaks flows is April followed by May and June (USGS Surface Water for USA, 2005). In the 21 years that records of peak flows were recorded, there were only three years with peak flows over 50 cfs (cubic feet per second).

Peak flows on Cold Springs Creek and contributing streams can occur any month from March to August. From the limited USGS streamflow records for Cold Springs Creek at Buckhorn, WY, the month with the most annual peak flows is April (Surface Water for USA, 2003). Peak flows do not show much variability from year to year.

Direct runoff is very uncommon from the project area because of the outcrops of Madison Limestone and Minnelusa Formation that encompasses 99 percent of the area (Driscoll, Carter, Williamson and Putnam, 2002).

The Black Hills is prone to flash flooding because of steep stream gradients and intense thunderstorms. An extreme flood in 1972 on Rapid Creek and in adjacent drainages caused 237 deaths (Fact Sheet Team, 2001).

Stream health is an indicator of water quality. As stated above under 'Streams and Lakes,' Cold Springs Creek, the majority of which is on private land, is in an at-risk or diminished condition; Beaver Creek, Wet Parmlee, and Bear Run creeks on National Forest are in a robust condition; and Thompson Creek on National Forest is in an at-risk condition.

Private Land

Land ownership patterns are part of the watersheds and could potentially affect conditions. There are 4,206 acres of private land within the project area. An additional 42,178 acres of

private land occur outside the project area but within the watersheds. Table 3.10 shows the distribution of National Forest and private land in the watersheds within the Norwood project area.

Table 3.10 – Private Land in the Norwood Project Area

HUC 7 Number	Watershed Name	National Forest Acres in Project Area	% of Project Area on National Forest	Private Land Acres in Project Area	% of Project Area on Private Land	Private Land Acres Outside Project Area	% Private Land Outside Project Area
10120107020301	Canyon Springs Prairie	46	1%	0	0%	5,386	99%
10120107040101	Dry Beaver Creek	5,358	80%	855	13%	451	7%
10120107040102	Beaver Creek	5,317	81%	1,188	18%	82	1%
10120107040103	Parmlee Canyon	4,271	44%	0	0%	5,499	56%
10120107040104	Bear Run	4,512	43%	0	0%	5,969	57%
10120107040201	Thomson Canyon	4,954	48%	53	1%	5,365	52%
10120107040202	Kinney Canyon	2,296	37%	405	6%	3,518	57%
10120107040203	Sherwood Canyon	1,997	34%	2	<1%	3,891	66%
10120107040204	Sheldon Canyon	272	3%	0	0%	9,096	97%
10120201080101	Upper Soldier Creek	1,946	39%	0	0%	3,070	61%
10120203020101	Upper Cold Springs Cr.	4,619	82%	1,012	18%	0	0%
10120203020102	Middle Cold Springs Cr.	6,442	75%	689	8%	1,410	17%
10120203020103	Lower Cold Springs Cr.	149	2%	0	0%	6,102	98%
Total		42,178	44%	4,202	4%	49,840	52%

(Black Hills National Forest, 2002a)

The private land in the project area is primarily homestead claims and is scattered across the landscape. These private lands do not occupy a very large percentage of the area within the watersheds. The largest is 18 percent. The private lands outside the National Forest boundary can occupy a large percentage of the watershed. Of the thirteen watersheds, percentages for three are under 10 percent, percentage for one is near 20 percent, there are four in the 50 percent range, two in the 60 percent range, and three are almost 100 percent of the watershed. There are homes scattered through out the private land. Most of them are original ranches and others are summer homes. Currently there is not a large development of homes in this area.

Roads

Three hundred thirty-one (331) of the 334 road segments within the project area, as identified during the Watershed Road Analysis, have a Composite Watershed Rating of moderate or less. Only three have a high rating and none have an extreme rating. Roads that have a rating of extreme or high have a potential for eroding and causing sedimentation. This means that 99 percent of the roads within the project area have a low or moderate potential to erode and cause sedimentation. Increased sediment can have a negative impact to water quality and aquatic life. The composite score is obtained by adding up the scores for Severe Erosion and Mass Wasting Soils Combined, Roads within 50 feet of Stream, and Road and Stream Crossings. See the Hydrology report in the Norwood project file for the watershed composite score and rating for each road, recommendation 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 includes 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, 3, and 4 can be found in Appendix A (Maps 2, 3, and 4, respectively). The cumulative effects analysis considered past, present, and future activities summarized in Appendix E.

Direct and Indirect Effects

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 Norwood 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, 1996b). 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, 2006c) 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 Norwood project area will be 100 feet either side of the stream or 200 feet total width. Based on field observation and experience, this is by far 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 lush vegetation to filter out the sediment. Currently there is 4.3 miles of road within WIZ.

Activities which create minimal or no ground disturbance, are not of concern relating to sediment. Non-commercial timber activities, fuel treatments, weed treatments, range, wildlife, and watershed projects are activities proposed in this project that would not be of concern for producing sediment. Disturbance from non-commercial timber activities and fuels treatments would result in no or minimal ground disturbance. 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 no sediment would be produced.

Weed treatments are not a concern because there would be no ground disturbance occurring. Range projects involve fencing and water developments. Fencing is not a concern for sedimentation and would protect streams and wetlands. Water developments could potentially generate sediment during construction, but the overall long-term benefit out weighs the short-term impact as animals are watered off of and away from the streams.

The wildlife projects are not a concern because there are no large areas of ground disturbance. Projects involve riparian fencing, hardwood release, willow planting, and wildlife piles. Fencing is not a concern for sedimentation and would protect streams and wetlands. Hardwood release, willow planting, and wildlife piles are all handwork that does not involve machinery and would not disturb the organic layer.

The watershed projects are designed to eliminate a water gap, stabilize a raw streambank in a campground, stabilize a small headcut, build a drift fence to protect a riparian area, and rehabilitate some stream crossings. These would eliminate several CDAs. There may be short-term impacts from sediment but the long-term gain would out weigh short-term impact.

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 can and usually does expose bare mineral soil. This is not a concern related to sediment being delivered to a stream because the design criteria “No mechanical site preparation will be allowed within the WIZ” will be applied across the project area. This will provide a large distance between disturbed areas from mechanical site preparation and intermittent and perennial streams, and any erosion coming off of these areas will not reach an intermittent or perennial stream.

Sediment is not a big concern within the Norwood project area, but it cannot be ignored. There are 11 miles of perennial and intermittent stream of which 4 miles are on private land. There are 5 CDAs, which were identified within the Norwood project area. All of the CDAs would continue to contribute sediment. There are 8 road/stream crossings on perennial and intermittent streams. Six are on Forest Service roads and 2 are on private roads. Currently there are 4.3 miles of road within WIZ.

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, 1996b)

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, 1996b).

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. It seems that 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 with dense biomass on the landscape, landscape changes can take place by killing live trees over large areas. This would make more water available for streamflow 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 streamflow 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. 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 streamflow. 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.

ALTERNATIVE 1 – NO ACTION

Sediment: This alternative would not have any new activities occur within the project area although 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 and 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 Norwood project area, the Mountain Pine Beetle is expected 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 one were to occur, flow regimes would be positively affected by killing more trees and making water available for streamflow and ground water recharge.

ALTERNATIVE 2 – Proposed Action

Sediment: Commercial timber harvest would be used to treat up to 14,231 acres with this Alternative. Of these acres, only 18 acres are located in the WIZ. The prescriptions for these commercial harvest acres within the WIZ include commercial thin, hardwood release, seed cut, sanitation and pine encroachment. The potential to generate sediment would be very low, especially given the small amount of acres being treated within the WIZ.

Miles of road within the WIZ would be reduced to 4.1 miles in this Alternative. Stream crossings would be reduced to seven. It is extremely difficult to quantify how much sediment would be produced, so the amount of activity within the WIZ would be used as a comparison for the alternatives.

All the road/trail related CDAs identified would be corrected over time with post harvest or watershed projects thus reducing potential sediment to the streams. The risk of large-scale, high intensity wildfire would be reduced from existing conditions.

Minimal sediment may be generated from the commercial activities or maintenance and temporary use of roads within the WIZ and at stream crossings, but implementing the Forest Plan Standards and Guidelines (FPS&G), which include WCPs and BMPs, such as minimizing skid trails in the WIZ, would result in very little sediment generation, if any, and should not have an impact on the aquatics.

Overall the impacts to sediment with this alternative would be reduced potential for sedimentation over existing conditions if no wildfires occur. There would be a slight potential increase in sediment in the short-term (less than 5 years) in some categories (harvesting, road use, and used stream crossings) and potential decrease in sediment in the long-term (more than 5 years) in other categories (CDAs) in the project area with this alternative.

Bed and Bank Stability

This alternative includes commercial and non-commercial vegetation management, fuel treatments, weeds treatments, range, wildlife, and watershed improvement projects. The proposed activities would have no impact on bed and bank stability within the project area as all projects would be away from the bed and banks of the streams.

Flow Regime

The commercial timber harvest of 14,231 acres in this alternative would have a positive effect on flow regime by the removal of live vegetation from the landscape. The second most biomass would be removed with this alternative which would result in the second greatest reduction in evapotranspiration losses. This would move the flow regime back toward where it was prior to the era of fire suppression, but not entirely back to pre-settlement conditions. The non-commercial timber activities would have a short-term positive effect on flow regime, treating another 2,233 acres. The effect would be short-term because the remaining adjacent trees would soon grow to take up the space that was occupied by the removed trees. This alternative does the second best of all alternatives to restore flow regimes.

ALTERNATIVE 3

Sediment: Commercial timber harvest would be used to treat up to 16,216 acres with this Alternative. Alternative 3 would harvest the most acres of any Alternative. As a result, Mountain Pine Beetle risk and the risk of a large-scale, high intensity wildfire would be the lowest of any Alternative.

As with Alternative 2, this Alternative would harvest 18 acres in the WIZ, reduce miles of road in the WIZ to 4.1 miles, reduce stream crossings to 7 and correct all CDAs through post-harvest improvement projects. Therefore, the potential for sediment in this Alternative would be comparable to Alternative 2, with the notable difference of a lower potential for large-scale high intensity wildfire.

Bed and Bank Stability

Same as Alternative 2.

Flow Regime

Alternative 3 would result in the greatest improvement in flow regime of all alternatives, due to the fact that the most acres are proposed for harvest. As biomass mass is removed from the landscape, less evapotranspiration would occur. This would move the flow regime back toward where it was prior to the era of fire suppression, but not entirely back to pre-settlement conditions. The non-commercial timber activities would have a short-term positive effect on flow regime, treating another 2,233 acres. The effect would be short-term because the remaining adjacent trees would soon grow to take up the space that was occupied by the removed trees. This alternative does the best of all alternatives to restore flow regimes.

ALTERNATIVE 4

Sediment: Commercial timber harvest would be used to treat up to 13,458 acres with this alternative. Of these acres, only 11 acres are located in the WIZ, which is 7 acres fewer than Alternative 2 or 3. Therefore, the potential to generate sediment from the WIZ would be somewhat less than the other action Alternatives. The prescriptions for these commercial

harvest acres within the WIZ include commercial thin, hardwood release, seed cut, sanitation and pine encroachment. The potential to generate sediment would be very low, especially with the small amount of acres proposed for treatment within the WIZ.

The proposed activities in Alternative 4 would reduce the risk of a large-scale, high intensity wildfire in the project area, but to a lesser degree than the other action alternatives, based on acres treated. Therefore, this alternative would have a slightly higher potential for sediment resulting from wildfire than Alternatives 2 or 3, but a reduced potential over Alternative 1.

Road related potential for sedimentation would be the same as discussed under Alternative 2, above. With the implementation of the FPS&Gs, which include WCPs and BMPs, the amount would be minimal and should not have an impact on the aquatics.

Overall the potential for sediment with this alternative would be reduced over existing conditions if no wildfires occur. There would be a slight potential increase in sediment in the short-term (less than 5 years) in some categories (harvesting, road use, and used stream crossings) and potential decrease in sediment in the long-term (more than 5 years) in other categories (CDAs) in the project area with this alternative.

Bed and Bank Stability

Same as Alternative 2.

Flow Regime: Alternative 4 would result in the least improvement in flow regime of the action alternatives, due to the fact that the fewest acres are proposed for harvest. As biomass mass is removed from the landscape, less evapotranspiration would occur. This would move the flow regime back towards where it was prior to the era of fire suppression, but not entirely back to pre-settlement conditions. The non-commercial timber activities would have a short-term positive effect on flow regime, treating another 2,233 acres. The effect would be short-term because the remaining adjacent trees would soon grow to take up the space that was occupied by the removed trees. This alternative does the least of all action alternatives to restore flow regimes, but would improve flow regime over existing conditions.

Aquatic Ecosystems (Chemical)

“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, 1996b).

“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, 1996b).

ALTERNATIVE 1 – NO ACTION

Temperature/Oxygen: No new activities would occur under this alternative. As the biomass continued to increase, stream temperature/oxygen could be effected as less water is 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 project area because of the Mountain Pine Beetle or wildfire. If there is less live biomass within the watershed due to the Mountain Pine Beetle mortality or wildfire, there will be less evapotranspiration and more water available for streamflow or ground water recharge to help maintain the current water temperature and oxygen regime. The results or changes of this alternative would be widely variable, and generally less dramatic than the other alternative.

Water Purity: This alternative would not have any new activities within the project area, so water purity would not be affected and would remain unchanged from where it is at present.

ALTERNATIVE 2 – PROPOSED ACTION

Temperature/Oxygen: Reducing the stand density on 43 percent of the project area for Alternative 2 with commercial and non-commercial timber activities and 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. This alternative would have the second greatest positive effect on water temperature and oxygen and would be much better than Alternative 1.

Water Purity: This alternative includes commercial and non-commercial vegetation management, fuel treatments, weeds treatments, range, wildlife, and watershed projects. None of these activities, including weed treatments, would involve placing concentrated pollutant sources near water bodies or applying harmful chemicals near water bodies. The weed treatments include using harmful chemicals, but precautions would be taken to maintain and protect water purity. In the Forest Plan Management Requirements (FPMR) in Appendix A, Standard 1211 addresses this concern and requires vehicle service and fuel areas to be done on gentle upland sites.

ALTERNATIVE 3

Temperature/Oxygen: This alternative would reduce stand density on 48 percent of the project area with commercial and non-commercial timber activities and 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. This alternative would have a positive effect on water temperature, making it the best of all action alternatives and far better than Alternative 1.

Water Purity: This alternative includes commercial and non-commercial vegetation management, fuel treatments, weeds treatments, range, wildlife, and watershed projects. None of these activities, including weed treatments, would involve placing concentrated pollutant sources near water bodies or applying harmful chemicals near water bodies. The weed treatments include using harmful chemicals, but precautions would be taken to

maintain and protect water purity. In the Forest Plan Management Requirements (FPMR) in Appendix A, Standard 1211 addresses this concern and requires vehicle service and fuel areas to be done on gentle upland sites.

ALTERNATIVE 4

Temperature/Oxygen: This alternative would reduce stand density on 42 percent of the project area with commercial and non-commercial timber activities would therefore, 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. This alternative would have the third highest positive effect on water temperature and oxygen and would be much better than Alternative 1.

Water Purity: This alternative includes commercial and non-commercial vegetation management, fuel treatments, weeds treatments, range, wildlife, and watershed projects. None of these activities, including weed treatments, would involve placing concentrated pollutant sources near water bodies or applying harmful chemicals near water bodies. The weed treatments include using harmful chemicals, but precautions would be taken to maintain and protect water purity. In the Forest Plan Management Requirements (FPMR) in Appendix A, Standard 1211 addresses this concern and requires vehicle service and fuel areas to be done on gentle upland sites.

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, 1996b).

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 above. The items that will be discussed in this section will be migration barriers and riparian damage.

ALTERNATIVE 1 – NO ACTION

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.

ALTERNATIVE 2 – PROPOSED ACTION

This alternative includes commercial and non-commercial vegetation management, fuel treatments, weeds treatments, and range, wildlife, and watershed projects. Potential indirect impacts to aquatic life relates to the amount of activity within the WIZ. There are 18 acres of possible activity in the WIZ for this alternative. No effects would occur to aquatic life.

This alternative would not increase or decrease any migration barriers and no riparian damage would occur. The range, wildlife, and watershed projects would improve riparian areas by improving the stream/riparian habitat.

ALTERNATIVE 3

Alternative 3 proposes the same amount of treatment within the WIZ as Alternative 2 and the same post-harvest improvement projects. Therefore, the potential impacts to aquatic life would be the same as described in Alternative 2.

ALTERNATIVE 4

As with the other action alternatives, this alternative includes commercial and non-commercial vegetation management, fuel treatments, weeds treatments, range, wildlife, and watershed projects. However, the amount of proposed activity within a WIZ would be reduced to 11 acres for this alternative. No effects would occur to aquatic life.

This alternative would not increase or decrease any migration barriers and no riparian damage would occur. The range, wildlife, and watershed projects would improve riparian areas by improving the stream/riparian habitat. All action alternatives would be similar.

Soil Productivity

The long-term maintenance of site productivity is a goal of the 1997 Black Hills National Forest, Land and Resource Management Plan (LRMP) 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).

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, 1996b).

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

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 be expected to prevent or limit the extent or intensity of these conditions. These would include allowing activities only when the soils are dry or frozen, operating with low impact equipment, or operating equipment on slash. Mechanical site preparation will only occur when soils are dry. This would minimize the overall impacts as the result of the activities. Refer to table 3.4 for more information on soils which are subject to compaction.

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, 1996b).

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, 1996b).

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

Forest Plan Consistency for Soils

All alternatives would be consistent with Forest Plan standards 1101, 1102, 1103, 1105, 1106, 1107, 1109, 1110, 1112, 1113, 1114, and 1116. Forest Plan standard 1107 does not apply to this project because no oil or gas drilling or mineral exploration is proposed. 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 – NO ACTION

Soil Erosion: This alternative would not have any new activities within the project area so soil erosion would generally not be affected and remain unchanged. Problems where erosion is currently occurring would continue to occur. Erosion problems are generally road related and there are approximately 13.9 miles of open road on soils with a very high erosion rating with slopes greater than 20 percent. The roads on high erosion rating soils are not known to cause any problems currently but the potential is there.

Soil Compaction: This alternative would not have any new activities occur within the project area so soil compaction would not be affected and remain unchanged.

Nutrient Removal: This alternative would not have any new activities within the project area so nutrient removal is not a concern and would not be affected and 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 affect to the soil from soil heating, would have 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 hazards would not be affected with this alternative.

ALTERNATIVE 2 – PROPOSED ACTION

Soil Erosion: This alternative includes commercial and non-commercial vegetation management, fuel treatments, weeds treatments, range, wildlife, and watershed projects. Commercial timber harvest would be used to treat up to 14,231 acres in this alternative. Of these acres, an estimated 664 acres or 5 percent of the treated acres would be located on soils with a very high erosion hazard rating with slopes greater than 20 percent. One hundred sixty-six of these acres would be on slopes greater than 40 percent. These commercial units would have a variety of treatments. Mechanical site preparation on slopes greater than 20% may occur on 107 acres. Twenty-seven of these acres are on slopes greater than 40%.Minimal soil erosion may occur from the commercial activities and mechanical site preparation, but by implementing the FPS&G, which includes WCPs and BMPs, and the design criteria "On soils with severe erosion potential and slopes between 20 and 40 percent, 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 severe erosion potential and slopes steeper than 40 percent, ground skidding and mechanical site preparationmust be avoided"), there would be very little soil erosion occurring for short distances. Erosion problems related to roads would be corrected through maintenance or reconstruction in conjunction with the timber harvest. There would be approximately 6.9 miles of open road on soils with a very high erosion rating. These roads on high erosion rating soils are not known to cause any problems currently.

Of all the alternatives, this alternative would have the second greatest potential for soil erosion, because of the amount of acres of activity on soils with a very high erosion hazard rating. Implementing the FPS&G and the design criteria would prevent or minimize erosion from occurring on these soils and no erosion would be expected.

Refer also to the Soil Erosion discussion under 'Cumulative Effects to Watershed, Geology and Soils' presented later in this section.

Soil Compaction: Commercial timber harvest would be used to treat up to 14,231 acres in this alternative. Of these acres, approximately 8,721 acres or 61 percent of the treated acres are located on soils subject to compaction. Mechanical site preparation may occur on 576 acres. 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, dry for site preparation, there would be very little soil compaction occurring for a possible short-term impact and if it did occur, it would disappear over time meaning no long-term effects. This alternative would have the second greatest potential to impact soils by compaction because it would have the second most acres 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.

Refer also to the Soil Compaction discussion under 'Cumulative Effects to Watershed, Geology and Soils' presented later in this section.

Nutrient Removal: It is estimated that 18 percent of the acres proposed for treatment in this alternative are located on soils that could potentially have low organic matter. Treatment prescriptions in these stands would be commercial thinning, group selection, hardwood

restoration, hardwood conversion, over-story removal, POL (products other than logs), sanitation, or seed cut. These prescriptions would leave enough residual material in the stand so no special design criteria would be needed. There would be no effects on soil nutrients with any of the action alternatives.

Soil Heating: Broadcast burning is proposed as part of the fuel treatments on 2,350 acres with all action alternatives. There would be the potential that soil heating would occur from the action alternatives. However, by 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'), it would minimize the effects to the soil from soil heating. Indirect effects would include reducing the potential for a large, high intensity wildfire to occur within the project area.

Regeneration Hazards: Regeneration of acres harvested, if desired, would not be a problem. Ponderosa Pine tends to reproduce well in the Black Hills (Orr, 1975). These alternatives would not have an affect on regeneration hazard as there are no soils with regeneration hazards.

ALTERNATIVE 3

Soil Erosion: This alternative includes commercial and non-commercial vegetation management, fuel treatments, weeds treatments, range, wildlife, and watershed projects. Commercial timber harvest would be used to treat up to 16,216 acres in this alternative. Of these acres, an estimated 742 acres or 5 percent of the treated acres would be located on soils with a very high erosion hazard rating with slopes greater than 20 percent. One hundred eighty-eight of these acres are on slopes greater than 40 percent. These commercial units would have a variety of treatments. Mechanical site preparation on slopes greater than 20% may occur on 107 acres. Twenty-seven of these acres are on slopes greater than 40%. Minimal soil erosion may occur from the commercial activities and mechanical site preparation, but implementing the FPS&G, which includes WCPs and BMPs, and the design criteria ("On soils with severe erosion potential and slopes between 20 and 40 percent, 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 severe erosion potential and slopes steeper than 40 percent, ground skidding and mechanical site preparation must be avoided), there would be very little soil erosion occurring for short distances and the potential would be slightly more but similar to Alternative 2. Erosion problems related to roads would be corrected through maintenance or reconstruction in conjunction with the timber harvest. There would be approximately 6.9 miles of open road on soils with a very high erosion rating. These roads on high erosion rating soils are not known to cause any problems currently.

This alternative would have the greatest potential for soil erosion, slightly ahead of Alternative 2, because of the amount of acres of activity on soils with a very high erosion hazard rating. Implementing the FPS&G would prevent or minimize erosion from occurring on these soils and no erosion is expected. Implementing the FPS&G and the design criteria would make Alternatives 2 and 3 similar.

Soil Compaction: Commercial timber harvest would be used to treat up to 16,216 acres in this alternative. Of these acres, approximately 9,914 acres or 61 percent of the treated acres would be located on soils subject to compaction. Mechanical site preparation may occur on 576 acres. Minimal soil compaction may occur from the commercial activities, but by implementing by the FPS&G, which include WCPs and BMPs, and the design criteria of operating on dry or frozen ground, dry for site preparation, there would be very little soil compaction occurring for a possible short-term impact and if it does it would disappear over time meaning no long-term effect. This alternative would have the greatest potential to impact soils by compaction because it would have the most acres being treated. Effects of this alternative would be similar to Alternative 2 because the acres would be similar and with the implementation of FPS&G, it would level out the alternatives so there would be no difference as it relates to Soil Compaction.

Nutrient Removal: It is estimated that 19 percent of the acres proposed for treatment in this alternative are located on soils that could potentially have low organic matter. Treatment prescriptions in these stands would be commercial thinning, group selection, hardwood restoration, hardwood conversion, over-story removal, POL (products other than logs), sanitation, or seed cut. These prescriptions would leave enough residual material in the stand so no special design criteria would be needed. There would be no effects on soil nutrients with any of the action alternatives.

Soil Heating and Regeneration Hazards: The potential effects would be the same as described under Alternative 2.

ALTERNATIVE 4

Soil Erosion: This alternative would include commercial and non-commercial vegetation management, fuel treatments, weeds treatments, range, wildlife, and watershed projects. Commercial timber harvest would be used to treat up to 13,458 acres in this alternative. Of these acres, an estimated 560 acres or 4 percent of the treated acres would be located on soils with a very high erosion hazard rating with slopes greater than 20 percent. One hundred eight of these acres would be on slopes greater than 40 percent. These commercial units would have a variety of treatments. Mechanical site preparation on slopes greater than 20% may occur on 85 acres. Twenty-seven of these acres are on slopes greater than 40%. Minimal soil erosion may occur from the commercial activities and mechanical site preparation, but implementing the FPS&G, which would include WCPs and BMPs, and the design criteria ("On soils with severe erosion potential and slopes between 20 and 40 percent, machinery operations must be restricted to dry or frozen soil conditions" and "On soils with severe erosion potential and slopes steeper than 40 percent, ground skidding must be avoided"), there would be very little soil erosion occurring for short distances and the potential would be slightly less than but similar to Alternatives 2 and 3. Erosion problems related to roads would be corrected through maintenance or reconstruction in conjunction with the timber harvest. There would be approximately 6.9 miles of open road on soils with a very high erosion rating. These roads on high erosion rating soils are not known to cause any problems currently.

This alternative would have the least potential for soil erosion, of all the action alternatives, but not much different from Alternatives 2 and 3, because of the amount of acres of activity

on soils with a very high erosion hazard rating. Implementing the FPS&G would prevent or minimize erosion from occurring on these soils and no erosion would be expected. Implementing the FPS&G would make Alternatives 2, 3, and 4 similar.

Soil Compaction: Commercial timber harvest would be used to treat up to 13,458 acres in this alternative. Of these acres, approximately 8,182 acres or 61 percent of the treated acres would be located on soils subject to compaction. Mechanical site preparation may occur on 484 acres. Minimal soil compaction may occur from the commercial activities, but by implementing by the FPS&G, which would include WCPs and BMPs, and the design criteria of operating on dry or frozen ground, dry for site preparation, there would be very little soil compaction occurring for a possible short-term impact and if it does, it would disappear over time meaning no long-term effect. This alternative would have the least potential to impact soils by compaction because it would have the least amount of acres being treated. Effects of this alternative would be similar to Alternatives 2 and 3 because the acres would be similar and with the implementation of FPS&G, it would level out the alternatives so there would be no difference as it relates to Soil Compaction.

Nutrient Removal: It is estimated that 12 percent of the acres proposed for treatment in this alternative would be located on soils that could potentially have low organic matter. Treatment prescriptions in these stands would be commercial thinning, group selection, hardwood restoration, hardwood conversion, over-story removal, POL (products other than logs), sanitation, or seed cut. These prescriptions would leave enough residual material in the stand so no special design criteria would be needed. There would be no effects on soil nutrients 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, debris avalanches and flows, slumps, and earthflows 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, 1996b).

“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, 1996b).

“Earthquake hazards can be increased if facilities are located in seismically-active areas. Areas of greatest potential are near the Colorado Front Range and in northwestern Wyoming,” (USDA Forest Service, 1996b). Earthquakes are not a concern in the Black Hills and not a concern within the project area. None of these activities or lack of activities would have an affect on the earthquake risk.

ALTERNATIVE 1 – NO ACTION

Landslides: This alternative would not have any new activities within the project area, so landslides would not be affected and the present risk would remain unchanged from where it is now.

Soil Failures: Soil failures would not be a concern within the Norwood project area. None of the proposed activities or lack of activities would have an affect on soil failures.

ALTERNATIVE 2 – PROPOSED ACTION

Landslides: This alternative would include commercial and non-commercial vegetation management, fuel treatments, weeds treatments, range, wildlife, and watershed projects. Commercial timber harvest would be used to treat up to 14,231 acres in this alternative. Of these acres, approximately 31 acres are on slopes greater than 20 percent on soils with mass wasting potential. There would be no proposed treatments on slopes greater than 40 percent. Design criteria of the project would restrict activities to dry or frozen condition on slopes 20 to 40 percent. Activities on these soils would follow the design criteria to reduce the risk of landslides and will meet the FPS&G.

Of all the alternatives, this alternative would have the second greatest potential to cause landslides because it would treat the most acres on soils with risk for landslides. However implementing the design standards would minimize or eliminate the risk of landslides.

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

ALTERNATIVE 3

Landslides: This alternative would include commercial and non-commercial vegetation management, fuel treatments, weeds treatments, range, wildlife, and watershed projects. Commercial timber harvest would be used to treat up to 16,216 acres in this alternative. Activities that could have a potential affect on landslides would be commercial timber actions. Of the up to 8,100 acres proposed to treat, approximately 33 acres would be on slopes greater than 20 percent on soils with mass wasting potential and there would be no proposed treatments on slopes greater than 40 percent. Design criteria of the project would restrict activities to dry or frozen condition on slopes 20 to 40 percent. Activities on these soils would follow the design criteria to reduce the risk of landslides and would meet the FPS&G.

This alternative would have the greatest potential to cause landslides but would be very similar to Alternative 2, because it treats a similar number of acres on soils with risk for landslides. Implementing the design standards would minimize or eliminate the risk of landslides.

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

ALTERNATIVE 4

Landslides: This alternative would include commercial and non-commercial vegetation management, fuel treatments, weeds treatments, range, wildlife, and watershed projects. Commercial timber harvest would be used to treat up to 13,458 acres in this alternative. Activities that could have a potential affect on landslides would be commercial timber actions. Of the up to 8,100 acres proposed to treat, approximately 24 acres would be on slopes greater than 20 percent on soils with mass wasting potential and there would be no proposed treatments on slopes greater than 40 percent. Design criteria of the project would be restrict activities to dry or frozen condition on slopes 20 to 40 percent. Activities on these soils would follow the design criteria to reduce the risk of landslides and would meet the FPS&G.

This alternative would have the least potential to cause landslides but it would not be much different than Alternatives 2 and 3, because it would treat a similar number of acres on soils with risk for landslides. Implementing the design standards would minimize or eliminate the risk of landslides.

Soil Failures: Soil failures would not be a concern within the 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, 1996b).

Wetlands: "Wetlands control runoff and water quality, recharge 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, 1996b).

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

ALTERNATIVE 1 – NO ACTION

Riparian Areas: This alternative would not have any new activities within the project area so there would be no impact or affect on riparian ecosystems.

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

Floodplains: This alternative would not have any new activities within the project area so there would be no impact or affect on floodplains.

ALTERNATIVE 2 (PROPOSED ACTION) - ALTERNATIVE 3 AND 4

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

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, wildlife, and watershed projects would improve the riparian areas with their proposed projects of riparian habitat improvement and fencing of springs in association with water developments.

Wetlands: The projects that have the potential to affect the wetlands would be roads related to timber activities. There would be 1.9 miles of new road construction. No wetlands would be affected by this activity as the location of the new road construction would be away from mapped wetlands and would be reviewed on the ground during the route review prior to implementation. The range, wildlife, and watershed projects would improve the wetlands with their proposed projects of riparian habitat improvement and fencing of wetlands in association with water developments.

Floodplains: These alternatives would include commercial and non-commercial vegetation management, fuel treatments, weeds treatments, range, wildlife, and watershed projects. There will be 1.9 miles of new road building that would occur. The new road would not cross any mapped floodplains, therefore, there would be no effect to the floodplains.

Cumulative Effects to Watershed, Geology and Soils

The Norwood project area is located within 13 HUC 7 watersheds. Ten of the watersheds have sizeable areas located inside of the project area. The cumulative effect analysis was completed on these ten HUC 7 watersheds. The cumulative effects boundary is the ten individual HUC 7 watersheds. Each watershed can stand alone in the analysis. 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 activities effects depend on what parameter you are looking at. Sediment or soil erosion, the effects are very short-term, usually less than 3 years. 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). Ten years will be used in this analysis.

Past, present, and future land uses and events within these watersheds include timber harvest, wildfire and prescribed fire, grazing, private land ownership, road building, OHV use, etc. A complete listing of these activities is available in Appendix E. All of these activities or events individually have an impact on the watershed and were analyzed as to whether they would result in an adverse cumulative impact.

Soil Erosion

Cumulative impacts to the soils from soil erosion would not be a concern within the Norwood project area, with the implementation of WCPs and BMPs. BMP monitoring results from 2005, 2004, 2003, and 2002 (Thomas, 2002a, 2002b, 2004a, 2004b, 2004c, 2005, 2006a, and 2006b) for sales near Norwood on the Hell Canyon and Mystic Ranger Districts, 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 activities do not have any residual effect and the proposed actions would not add to the impacts with implementation of BMPs.

Roads can be a source or cause of soil erosion. They can concentrate water and cause soil erosion. Four problem areas were identified within the project area. Two are associated with low water crossings on unclassified roads, another is water piping around a culvert and water draining down to the road the road crossing, and the other is a user defined road connecting two roads on a steep slope. These would be corrected as part of this project.

Mechanical site preparation can be a cause for soil erosion. The sod is disturbed to expose the soils so the regeneration of trees can occur.

Soil Compaction

Impacts to the soils from soil compaction can occur any time vehicles travels across the soil surface. The degree of effects can change depending on conditions and the amount of trips made over an area. For example, vehicles traveling on dry soils will have less effect than vehicles traveling on wet soils. Also, vehicles traveling on slash versus bare ground will have fewer impacts. One trip will have less impact than two trips over the same area.

Soil compaction monitoring has been done on the forest (Ensz, 2003, 2002, 2001, 2000, 1999 and 1998). Some years have collected baseline data for areas that are planned for future timber harvest and those years did not produce any conclusions. In 2003, seven timber sales were sampled forest wide. The results showed that four sales had no change in soil compaction following harvest, two sales had a decrease in mean bulk density or soil compaction and one sale had a slight (3.9 percent) increase in compaction. In 2000, four sites on three timber sales were sampled. Two sites or sales had no impact when comparing pre- and post-harvest conditions. On the other sale, one site had a 3 percent increase in compaction and one had a 23 percent increase. The site that had the 23 percent increase in soil compaction, was sampled again the following year and the compaction was reduced to 6 percent The author Ed Ensz stated, “The recovery of the compacted, sloping, area was fairly impressive given another year’s time” (Ensz, 2001). This information shows that if soil compaction occurs, is not permanent and with time will return towards to what it was before it was impacted. Soil compaction, if it occurs, is expected to be reduced with the freeze-thaw cycle, cycles of wetting and drying, and plant growth that occurs in the Black Hills.

Within the project area, with the passage of time, areas that have been impacted previously, from timber harvest, do not have or have minimal residual impacts from soil compaction, because soil compaction impacts recover with time. Field site visits of seven different sites

and several soil types generally showed no residual impacts. With the implementation of the BMPs, no soil compaction impacts would be anticipated, but if they were to occur, it would only occur temporarily and diminish over time.

Mechanical site preparation can be a cause of soil compaction. The sod is disturbed to expose the soils so the regeneration of trees can occur. Generally this is not a concern because it usually involves one pass over the area generally not causing a compaction concern. However, if the conditions and soils are right, compaction could occur. Cumulative effects to the soils in the watershed are minimal because generally speaking a very small percentage of the watersheds have site preparation occur within them. Most of the watersheds have 1% or less that would be affected. Two watersheds would have 4%; one watershed would have 6% and one watershed would have 12% affected.

Summary

All timber harvest proposed under the action alternatives would take place in stands previously harvested and use existing landing and skid trails whenever possible to minimize soil erosion and compaction to previously disturbed areas. None of the alternatives would cause significant cumulative effects on the soil resource. With application of Forest Plan direction, WCPs and BMPs, any change would be within acceptable limits.

The cumulative effects analysis done for this project has determined that there would be no adverse cumulative effects to watershed, geology, or to the soils resource of any 7th level watershed analyzed. A summary of the analysis is presented below, by alternative. Additional information on the analysis is available in the project file.

ALTERNATIVE 1 – NO ACTION

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, landslides, soil failures, riparian areas, floodplains, and wetlands. Therefore, no cumulative effects would occur to these elements.

Sediment: There would be continued cumulative impacts from sediment in the project area with this alternative. The CDAs would continue to produce sediment and stream crossings would be present. If a large wildfire were to occur, sediment would increase and the cumulative impacts from sediment would be there.

Flow Regime and Temperature/Oxygen: There would be no reduction of water for streamflow or ground water recharge due to the lack of active treatment. However, predicted tree mortality due to mountain pine beetle activity would result in improved flow regimes which would also help maintain or improve stream temperature and oxygen. If a large-scale wildfire were to occur, which would be most likely under this alternative, the loss of biomass would also improve flow regime and temperature/oxygen. Therefore, no adverse cumulative effects would be expected.

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. These are generally road related, where water has been concentrated. There are no known areas of severe erosion or detrimentally compacted areas. There would be no cumulative impacts on soil erosion with this alternative because no new activities would occur.

- **Soil Heating:** Past events that could affect soil heating are large wildfires. Large wildfires generally occur when things are dry and result in soil heating that causes the problems listed above. There has been one wildfire in the past on the south end of the project area. It occurred in 2002 and covered 360 acres. Any impacts that may have occurred are well on their way to recovery. There would be no cumulative impacts from soil heating in the project area with this alternative because no activities would be planned. However, there could be cumulative impacts from soil heating, if a wildfire were to occur.

ALTERNATIVES 2, 3 AND 4

The results of the cumulative effects analysis for each of these alternatives are essentially the same. 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 cumulative effect to these resource elements.

Sediment: No or very minimal sediment would be produced as a result of any action alternative. There would not be a cumulative impact from sediment as a result of implementing these alternatives because the implementation of BMPs and WCPs would reduce or eliminate any sediment potential. If a large-scale, high intensity wildfire were to occur, there would likely be adverse cumulative impacts from sediment.

Flow Regime and Temperature/Oxygen: There would be no adverse cumulative impacts by the reduction of water available for streamflow or ground water recharge. The action alternatives would help restore the flow regimes by removing biomass that uses water.

Water Purity: Activities in these alternatives would not result in adverse cumulative impacts to water purity within the project area 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 as a result of these alternatives. The elements of soil productivity are discussed below.

- **Soil Erosion and Compaction:** There would be no cumulative impacts from soil erosion or compaction in the project area from the proposed harvest units because no erosion or detrimentally compacted areas would be expected with the implementation of the Forest Plan Standards and Guidelines as well as project design criteria. If erosion or detrimental compaction were to occur it would be minimal and within the

acceptable limits stated in Forest Plan Standard 1103. Residual areas of compaction or erosion resulting from past activities would improve while this project is implemented.

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

- **Soil Heating:** There would be no 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 fire, would provide minimal impacts the soil.

Geologic Hazards: Past activities within the project area have not caused problems with landslides or soil failures. There would be no cumulative impacts to landslides or soil failures in the project area.

Riparian Areas and Wetlands: There would be no cumulative impacts to riparian ecosystems or wetlands 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, wildlife, and watershed projects.

Floodplains:
There would be no cumulative impacts to floodplains within the project area with these alternatives because no new road construction would be planned within floodplains.

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 will meet the requirement of the Clean Water Act (CWA) and protect water quality.

"BMPs are developed by the State of South Dakota and Wyoming… to ensure compliance with federal and state water-quality standards," (USDA Forest Service, 2006a). They provide good guidance but are fairly general. WCPs are practices to protect soil, aquatic, and riparian systems. USDA Forest Service, Region 2, developed them. They are more specific with design criteria. "If used properly, they meet or exceed State BMPs" (USDA Forest Service, 2006c). BMPs and WCPs are incorporated into the Forest Plan standards and guidelines and provide more specific direction. Meeting Forest Plan standards and guidelines when implementing a project insures both the WCPs and BMPs are being 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 Best Management Practices Evaluation (USDA Forest Service, 2003). Chapter four cites two studies done on the Black Hills National Forest by the Black Hills Forest Resource Association, 2001, and Wyoming Timber Industry Association, 2001. The conclusion is "These results highlight the consistent

application and effectiveness of BMPs in the Black Hills and other National Forests" (USDA Forest Service, 2003). 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, 2003). This evaluation shows that BMPs are effective.

BMP audits conducted in 2004 on the South Dakota portion of the Black Hills, averaged across timber sales on State, private and federal lands, revealed that the BMP standards for application were met or exceeded on 92% of the total rated items (Black Hills Forest Resource Association, 2005). Ratings for BMP effectiveness confirmed adequate or improved protection of soil and water resources on 95% of the total rated items. This study showed an increase in effectiveness and application of BMPs over the 2001 study.

Additional BMP/WCP monitoring was completed on the Hell Canyon Ranger District, for 2002, 2003, 2004, and 2005. These reports show that the BMP/WCP are being implemented and are effective and states, "Logging practices on the Hell Canyon Ranger District have not had any negative impact on the watershed and streams and comply with the requirements of the Clean Water Act" (Thomas, 2006a,b, 2005, 2004a,b,c and 2002a,b).

The Norwood project area would have Forest Plan Management Requirements, WCPs, and BMPs prescribed and implemented. This would protect the water quality of the streams and creeks in the project area and the activities that are planned would meet the requirements of the Clean Water Act.

MINERALS

Affected Environment

Minerals can be divided into three categories on National Forest System lands. This includes locatable, leasable, and saleable minerals. Locatable minerals are those such as gold, copper, silver and other metals, which can be claimed under the mining laws. A person or company files a mining claim when they have found something of value and must get approval from the Forest Service before conducting any surface disturbing activities. Leasable minerals include deposits such as oil and gas or coal. Leases are awarded at the discretion of the government for these types of minerals. Saleable minerals include such things as sand and gravel and building stone.

The mineral potential of the area was evaluated by the US Geological Survey. DeWitt (DeWitt, 1986) classified the project area with a moderate potential for discovery of large oil and gas deposits exceeding 20 million barrels in size. Oil is currently being produced south and west of the project area. There is some potential for locatable and salable limestone deposits in the northern portion of the project area, although development of these limestone deposits is unlikely.

No mineral production is occurring within the Norwood project area. No information is available to suggest any prospecting or exploration activities are underway within the Norwood project area. No active mining claims were identified within the project area based

on a mining claim search using the BLM LR2000 database. In addition, the Forest Service has not received either a Notice of Intent to conduct exploration activities in the area or a proposed Plan of Operations.

Environmental Consequences

Direct/Indirect/Cumulative Effects

The Norwood area would remain open to future oil and gas exploration. No additional motorized area closures would occur. Total road mileage would be reduced by the action alternatives, however, ample road access would continue to be available and the potential to respond to future access needs would be maintained. There should be no negative direct, indirect, or cumulative effects to the mineral resource or to mining claimants from any of the alternatives.

SILVICULTURE

Affected Environment

The vegetation in the Norwood area is dominated by ponderosa pine *(Pinus ponderosa)* (82 percent) along the ridges, slopes, and canyons (see Table 3.11 below). A few white spruce *(Picea glauca)* stands (7 percent) grow on the steeper north and east facing slopes within the northern end of the analysis area. Spruce stands are often mixed with ponderosa pine and a small amount of aspen. Aspen *(Populus tremuloides)* and paper birch *(Betula papyrifera)* stands (5 percent combined) are mainly found in the northern half of the analysis area. There are many age classes and diameter size classes within the forested sites (see Table 3.12 below). Less than half the stands are two-storied and about one-third are multi-storied. Most multi-storied stands are spruce sites or stands with multiple species or pine sites that have regenerated that give the stands multiple layers within the canopy. Less than one percent of the area is in shrubland, consisting of mountain mahogany *(Cercocarpus montanus)* within Thompson Canyon. Several canyon bottoms contain hardwoods of birch, box elder *(Acer negundo)*, aspen, and choke cherry *(Prunus virginiana)*. Slopes in the project area range from level ground to 60 to 80 percent in the canyons. Approximately 76 percent of the area has a slope between 0 and 25 percent.

Table 3.11 - Existing Cover Types in the Project Area.

Cover Type	Acreage/Percentage
Meadow	2,126 / 5%
Aspen	2,206 / 5%
Ponderosa Pine	34,642 / 82%
White Spruce	3,023 / 7%
Paper Birch	26 / <1%
Mountain Mahogany	224 / <1%
Non-Forest Admin Site	5 / <1%

Table 3. 12 - Structural Stages by Cover Type in Norwood

Structural Stage	Ponderosa Pine	Spruce	Aspen	Paper Birch	Meadow	Shrub	Non-Forest	Total
Non-Forest							5	5
Meadow					2,126			2,126
SS1	402	8	74					484
SS2	124	5	352	3		224		708
SS3A	287		467	6				760
SS3B	1,441	72	453	7				1973
SS3C	402		71					473
SS4A	16,866	509	641					18,016
SS4B	12,307	1,675	148	10				14,140
SS4C	2,773	754						3,527
SS5*	40							40
TOTAL	34,642	3,023	2,206	26	2,126	224	5	42,252

* Structural stage 5 is the only structural stage that is not computed from stand data. The criteria is for pine stands to become structural stage 5 is the stand must be at least 160 years old and to have a tree size class of V, trees 16-inches in DBH or greater.

The majority of the project area (99 percent) is in Management area 5.1, Resource Production Emphasis. The remaining 1 percent is in Management area 5.4, Big Game Winter Range. There currently is no legal access to the 5.4 management area portion of this project area. Existing cover types and percentages for each management area are shown in the following tables.

Table 3.13 - Cover Types of National Forest Land in MA 5.1

Cover Type	Acreage/Percentage
Meadow	2,126 / 5%
Aspen	2,206 / 5%
Ponderosa Pine	34,268 / 82%
White Spruce	3,023 / 7%
Paper Birch	26 / <1%
Mountain Mahogany	0 / 0%
Non-Forest Admin Site	5 / <1%

Table3.14 - Cover Types of National Forest Land in MA 5.4

Cover Type	Acreage/Percentage
Ponderosa Pine	374 / 63%
Mountain Mahogany	224 / 37%

Meadows

There are 2,126 acres of meadows in the Norwood project area. Large meadows in the northern end dominate the wide drainage bottoms with stringers running up the draws dividing the conifer stands. In the southern end the meadows are found in the narrow bottoms surrounded by pine stands. Pine encroachment does not occur as frequently in the northern locations as it does in the southern locations due mainly to differing soil types. In the southern locations pine encroachment removal has been accomplished often in the post sale activities of past timber sales. Five of these meadow sites have been invaded by conifers and one historic meadow (7 acres) has been completely encroached by pine.

Hardwoods

There are 2,206 acres of designated aspen stands within the analysis area. These stands are located in the northern portion of the analysis area and all of the stands are north of the Bald Hills Road (NFSR 113). Hardwoods, mainly aspen, can also be found growing as inclusions within many conifer stands in the northern portion of the project area. Fifty-five percent of the pine sites and 75 percent of the spruce sites have aspen included within the conifer stands. Over the past two decades, aspen clones within the project area have received treatment to release and regenerate aspen. Between 1995 and 2002 there has been a +5.5 percent change in RMRIS *hardwood* acres reported, forest-wide (USDA Forest Service, 2005a).

In addition to aspen stands, there are four designated stands of paper birch in Norwood that total approximately 26 acres. Paper birch is usually associated with aspen and is found growing in 12 percent of the aspen stands but individual trees are also found growing in 6 percent of the pine stands and 5 percent of the spruce stands.

There is no bur oak or other hardwood stands in the analysis area.

Many of the existing hardwood stands contain conifers of all sizes growing within the stand boundaries. Two-thirds of the aspen stands and three of the four birch stands have large conifers that are out-competing the hardwoods. Of the existing aspen stands, 91 percent contain ponderosa pine and 63 percent contain white spruce individuals. Aspen is out competed by intruding conifers and aspen numbers could decrease by the reduction in the amount of light they receive. Cattle, elk, and deer browse continually on the aspen regeneration causing the young aspen to remain short and shrub-like. Aspen need to get above the browse height so browse species can no longer impact the regeneration.
It was observed that some aspen stands do not seem to be healthy in the Norwood analysis area. Leaves appeared to be faded in some clones and the foliage in the center of one stand was thinning in a circular pattern. There are many possible causes for the apparent symptoms, including infection by leaf fungi, defoliation by leaf-feeding insects, stem and root diseases, old age, and drought, acting alone or in combination (Schaupp, Sept 2006).

Rocky Mountain Juniper

Rocky Mountain juniper is common in the southern locations (40901, 40902, 40904) with 25 to 35 percent of pine sites within these locations containing some juniper. The Rocky Mountain juniper becomes scarce to non-existent in the northern locations.

Mountain Mahogany

Two hundred and twenty-four acres of mountain mahogany *(Cercocarpus montanus)* shrublands occur in Thompson Canyon (south end of location 40304). These sites have a very small overstory of ponderosa pine and Rocky Mountain juniper. The mountain mahogany is 3 to 4 feet in height and averages 45 to 55 percent canopy cover.

Understory Vegetation

Other shrubs, forbs, and grasses are plentiful in the forest understory. Common juniper (*Juniperus communis*) is the most widespread shrub found in most conifer sites except for the most southern location (40902) where it occurs less frequently. Common juniper reaches a height of approximately three feet in the northern locations and two feet in the southern locations. Oregon grape *(Berberis repens)* and kinnikinnik *(Arctostaphylos uva-ursi)* are also common shrubs found in most sites, while snowberry *(Symphoricarpos albus)* is found in greater numbers in the southern locations. Grouseberry *(Vaccinium scoparium)* is found on north slopes and is usually associated with white spruce sites. Other shrubs include mountain mahogany and russet buffalo berry *(Shepherdia canadensis)* in the southern locations and shrubby cinquefoil *(Potentilla fruticosa)* in the northern locations. There are a large variety of forbs and grasses in the analysis area.

White Spruce

There are 3,023 acres identified as white spruce within the analysis area. Most of these stands are in the northern half of the analysis area, north of the Bald Hills Road (NFSR 113). Spruce stands line the steep hills along the north and east side of Stockade-Beaver Creek, a few north slopes of Wet and Dry Parmlee Canyons, Bear Canyon, Bear Run, and on the cooler north slopes of smaller drainages. Individual white spruce trees can be found in pine stands (34 percent) throughout the northern locations but the south their occurrence is less frequent. One spruce stand of 8 acres is in location 40904 to the south of the Bald Hills Road (NFSR 113). Most spruce stands are intermixed with ponderosa pine and a small amount of aspen. White spruce stands are younger than the pine stands with an average stand age for spruce 8-inch trees and larger at 67 years old. There are a few spruce stands that are over 100 years of age and some as young as 42 years of age.

Spruce stands are preferred habitat for American marten (a Region 2 sensitive species) and provide for marten connectivity habitat, for Cooper's mountain snail (a Region 2 sensitive species), and possible sensitive plant habitat. Both the snail and sensitive plants are found primarily on the north slopes of spruce sites.

The FEIS for the Phase II Amendment to the Black Hills Forest Plan provides guidance on estimating fire hazard and insect risk ratings by linking them to structural stages. The Existing condition for both of these risk factors is displayed in the table below.

Table 3.15 - Existing Fire Hazard and Insect Ratings for Spruce Stands in the Norwood Project Area

Structural Stage	Acres (approx)	Fire Hazard	Insect Hazard	Percentage
1	8	Low	Low	<1
2	5	Medium	Low	<1
3A	0	Medium	Low	0
3B	72	High	Medium	2
3C	0	Very High	High	0
4A	509	High	Low	17
4B	1,675	Very High	Medium	55
4C	754	Very High	High	25
5	0	Very High	High	0
Total	3,023			100

Ponderosa Pine

Ponderosa pine dominates the Norwood analysis area with 34,642 acres, 82 percent of the area. In the cool northern locations (40103, 40201, 40202, 40203, 40204, 40301, and the northern half of 040304, 40501, 40502, 40703) pine is associated with white spruce and quaking aspen, while in the warmer southern locations (southern half of 040304, 40901, 40902, 40904) pine is associated with Rocky Mountain juniper *(Juniperus scopulorum)*. Location 40903 appears to be a transition zone between the moister northern locations and the drier southern locations. The overall average stand age for ponderosa pine stands 8-inch trees and larger is 90 years old. While some pine stands are well over 150 years old, some younger stands are approximately 30 to 35 years old. Many pine stands were pre-commercially thinned in the 1970s and 1980s. Table 3.16 displays the existing structural stages of pine in the entire project area.

Table 3.16 - Existing Structural Stages in the Entire Norwood Project Area – Ponderosa Pine Only

Existing Structural Stage in Ponderosa Pine stands	Existing Acres (percentage)
1	402 (1%)
2	124 (<1%)
3A	287 (<1%)
3B	1,441 (4%)
3C	402 (1%)
4A	16,866 (49%)
4B	12,307 (36%)
4C	2,773 (8%)
5*	40 (<1%)
Total	34,642

* Structural stage 5 is the only structural stage that is not computed from stand data. The criteria is for pine stands to become structural stage 5 is the stand must be at least 160 years old and to have a tree size class of V, trees 16-inches in DBH or greater.

The project area contributes to the Forestwide percentages of pine structural stages for both Management Area (MA) 5.1 and MA 5.4. Currently, 12 percent of the pine stands within MA 5.1 and 9 percent of the pine stands within MA 5.4 are in the Very Large size class. The following tables display the existing percentages of the individual pine structural stages occurring within management areas 5.1 and 5.4, Forestwide. Values used in this analysis are from the 2005 Forest Monitoring Report (USDA, Forest Service, 2006b).

Table 3.17- Existing Pine Structural Stages in Forestwide MA 5.1

Structural Stage	Forest Plan Objective	Existing Acres (percentage)	Existing Percentages
1	5%	61,938	13%
2	5%	10,324	2%
3A	10%	18,833	4%
3B	15%	27,966	6%
3C	5%	12,934	3%
4A	25%	172,401	36%
4B	25%	126,491	27%
4C	5%	44,721	9%
5*	5%	442	<1%
Total		476,050	

* Structural stage 5 is the only structural stage that is not computed from stand data. The criteria is for pine stands to become structural stage 5 is the stand must be at least 160 years old and to have a tree size class of V, trees 16-inches in DBH or greater.

Table 3.18 - Existing Pine Structural Stages in MA 5.4

Structural Stage	Forest Plan Objective	Existing Acres (percentage)	Existing Percentages
1	5%	74,055	22%
2	5%	6,669	2%
3A	10%	24,107	7%
3B	15%	29,822	9%
3C	5%	21,159	6%
4A	25%	78,077	23%
4B	25%	69,604	20%
4C	5%	37,221	11%
5*	5%	507	<1%
Total		341,221	

* Structural stage 5 is the only structural stage that is not computed from stand data. The criteria is for pine stands to become structural stage 5 is the stand must be at least 160 years old and to have a tree size class of V, trees 16-inches in DBH or greater.

Mountain Pine Beetle

An aerial survey of forest pest conditions on the Black Hills was conducted in August of 2006. The result of this survey is that mountain pine beetle epidemics have continued to intensify and expand on the Black Hills in 2006 and that 60% more trees were killed across 102% more acres than in 2005 (Schaupp, 2006). Five areas with high levels of mountain pine beetle caused mortality have been identified on the Forest and the northern portion of the Norwood project area is within one of those areas. This particular area extends from about 5 miles north of O'Neil Pass, southeast for about 20 miles to Deerfield Reservoir (Schaupp, Sept 2006). Many intense small spots of mortality were noted which are poised to grow and fuse.

Ponderosa pine is the only mountain pine beetle host in the project area. Many of the pine stands thinned in the 1980s are currently at a high risk for Mountain Pine Beetle (MPB) infestation. The MPB is currently showing increased activity in the pine stands and in spruce stands where the individual pine trees are also being attacked. Patches of dead trees ranging from two or three to several large patches of dozens of infected trees can be seen across the landscape. The most noticeable area of infestation is in the northern locations. A potentially expanding area in Norwood includes the area around Beaver Creek (NFSR 111) and south of Mallo Camp on both sides of the state line (Schaupp Sept 2006). In 2004, this area had a large infestation along the South Parmlee Road (NFSR 109) on the east side of the Canyon Timber Sale and along the Beaver Creek Road.

The southern half of the analysis area has not become infested as heavily as the northern area with MPB. There are patches of dead trees in the southern half but in smaller patches of one to three or four trees scattered across the landscape. The southern area does have the potential for increased activity. Many of the trees in the southern three locations are small ponderosa pine sawtimber that were thinned in the early 1980s.

Risk Rating

The susceptibility of a pine stand to mountain pine beetle infestation can be estimated based on the diameter and density of trees within a stand. The Final Environmental Impact Statement for the Phase II Amendment to the Black Hills Forest Plan provides guidance on estimating the risk, based on structural stage condition. Table 3.19 displays the acres of ponderosa pine stands in various risk ratings within the project area.

Table 3. 19- Current MPB Rating for Ponderosa Pine

Insect Rating	Acres	Percentage
Low	813	2
Medium	18,254	53
High	15,575	45
Totals	34,642	100

Currently, there are approximately 15,575 percent of the pine stands in the analysis area. High-risk pine stands are at a greater potential for increased MPB activity. Generally, stands are considered to be most susceptible to infestation when 75 percent of the stand is in the 7 to 13 inch diameter range and the stand density is over 120 ft^2/ac of basal area (Allen, Dec 2003).

Environmental Consequences

Direct and Indirect Effects

ALTERNATIVE 1 – NO ACTION

Meadows

Meadows would continue to be encroached by conifers decreasing grass and forage production. Conifers currently growing in meadows would continue to increase in number taking over the meadow. Meadows without conifers encroachment at present would eventually become encroached.

Hardwoods

Existing aspen stands and aspen clones occurring within conifer stands will decline in numbers as the conifers out-compete the intolerant aspen for light and nutrients. The conifers within an aspen stand will over top the aspen eventually leading to a cover type change to pine or spruce. The paper birch stands would be impacted in the same manner. Hardwoods cannot out-compete conifers and therefore require some type of disturbance to release them from conifer encroachment and to therefore be maintained. The potential for disturbances such as insect or disease caused mortality, wildfires or other events such as a blowdown would be the sole method for removing conifers from these stands.

Rocky Mountain Juniper and Mountain Mahogany

There would not be any direct or indirect effects to the Rocky mountain juniper or Mountain Mahogany with this alternative.

Understory Vegetation

Within conifer stands, forbs, shrubs, and grasses would be shaded out reducing benefits to other resources such as wildlife and range. In areas with MPB infestation there would be an increase in forbs, shrubs, and grasses where MPB has caused mortality in pine allowing sunlight, moisture, and nutrients to become available to the understory vegetation creating more grass and forage for cattle and wildlife.

White Spruce

Spruce stands would not change much in the short-term (less than 20 years). In the long-term (more than 20 years), the shade intolerant aspen and pine would be shaded out and no longer be able to regenerate within the stand, as the shade tolerant spruce would occupy all growing space. The stand would lose species diversity and understory vegetation would

decrease as the canopy increases in density. Fire hazard and insect ratings would remain the same as the existing condition.

Ponderosa Pine

The number of ponderosa pine acres would remain the same with this alternative. The effects of deferring treatment in the pine stands would be a slower increase in yield over time as the size of the existing trees would increase at a reduced rate due to competition. Diameter growth of individual trees would be reduced over time due to age and overstocking. Mountain Pine Beetle and fire hazard risk would increase over time.

Mountain Pine Beetle Risk

Mountain pine beetle risk would remain the same with this alternative. The analysis area would continue to have 45 percent of pine stands in a high risk and 53 percent in a medium risk condition for MPB susceptibility. Mountain Pine Beetle caused mortality is expected to increase. The large infestations, located in the northern half of the analysis area, are expected to increase in size while the small infestations found in the southern half are expected to increase in size and frequency as the insect moves into the area.

Age class distribution may change where mortality occurs due to the MPB. The mortality caused by MPB would open up pine stands creating large openings or whole stands could be reduced to structural stage 1 (grass stage). Pine stands not affected by mountain pine beetle will have an increase in mortality due to competition between pine trees and an increase in merchantable defect due to disease in the long-term.

Structural Stages

The forestwide structural stage percentages would not change with this alternative in the short-term (approximately less than 10 years) for either management area 5.1 or management area 5.4 unless the MPB infestation, or other disturbance, would change stand structure. In the short term, in Management area 5.1, structural stages 1, 4A, 4B, and 4C would continue to exceed the objective percentages while 2, 3A, 3B, 3C, and 5 would be under the objective percentages. In Management area 5.4, structural stages 1 and 4C would be above the stated objectives, structural stages 2, 3A, 3B, 4B and 5 would remain below objective and structural stages 3C and 4A are within 2 percent of meeting the objective (refer to Tables 3.17 and 3.18 presented previously in this section).

The percentage of very large size stands would also remain the same with this alternative, 12 percent in MA 5.1 and 9 percent in MA 5.4.

In the long-term, structural stages will change as trees grow and regenerate, wildfires or wind events take place, or insects and disease related mortality occurs. These changes could take decades, or depending on the event, could happen overnight. Structural stage 1 (grass stage) will grow into structural stage 2 as the stand regenerates naturally or is planted with seedlings. As trees grow in height and diameter structural stage 2 (seedling/sapling) will grow into structural stage 3 (poles) and structural stage 3 will grow into structural stage 4 (sawtimber). The density of stands (A, B, or C) would also change as trees grow. Stands will become denser as the trees mature and compete for growing space. Eventually, the majority of structural stages would grow into 4B or 4C barring any disturbances to the stand.

This would not move ponderosa pine towards the forest objective for structural stages for the management area. These changes to structural stages would occur as long as there are no natural or man-made disturbances within the stand.

Adding natural disturbances such as wildfire, wind events, or insects and disease or man-made disturbances such as future timber harvesting could alter the structural stage of a stand. Natural occurrences could change structural stages or have no impact on the stand structure depending on how large the disturbance is. Small (less than 10 acres) natural disturbances usually have no effect on existing stand structure but large (greater than 10 acres) disturbances could open up a stand reducing stand density or change stand size. A wind event could come through a dense stand and blow over trees reducing stand density where as a wildfire could set back the stand structural stage from a 4C (dense sawtimber) to 1 (grass) by burning up the entire stand.

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

ALTERNATIVE 2 – Proposed Action

Under this alternative, approximately 14,231 acres would be commercially harvested (see Map 2 in Appendix A). Alternative 2 would harvest approximately 35.9 mmbf (million board feet) of commercial timber and 15,600 CCF (hundred cubic feet) of POL (products other than logs). Tables 3.20 and 3.21 display the post-harvest structural stages and cover types expected in the project area following implementation of this alternative.

Table 3. 20- Cover Types in the Norwood Project Area - Alternative 2

Cover Type	Acreage/Percentage
Meadow	2,133 / 5%
Aspen	2,380 / 6%
Ponderosa Pine	34,456 / 82%
White Spruce	3,023 / 7%
Paper Birch	31 / <1%
Mountain Mahogany	224 / <1%
Non-Forest Admin Site	5 / <1%
Total	42,252

Table 3. 21- Structural Stages by Cover Type in the Project Area - Alternative 2

Structural Stage	Ponderosa Pine	Spruce	Aspen	Paper Birch	Meadow	Shrub	Non-Forest	Total
Non-Forest							5	5
Meadow/ grassland					2,133			2,133
SS1	402	8	74					484
SS2	1,532	5	352	3		224		2,116
SS3A	306		689	6				1,001
SS3B	1,467	72	627	12				2,178
SS3C	320		49					369
SS4A	18,838	509	582					19,929
SS4B	9,542	1,675	7	10				11,234
SS4C	2,009	754						2,763
SS5*	40							40
Total	34,456	3,023	2380	31	2,133	224	5	42,252

* Structural stage 5 is the only structural stage that is not computed from stand data. The criteria is for pine stands to become structural stage 5 is the stand must be at least 160 years old and to have a tree size class of V, trees 16-inches in DBH or greater.

Meadows

Approximately 7 acres of Meadow restoration would occur. This historic meadow site has been encroached upon by pine and converted to a pine site. This meadow would be restored by removal of conifers of all sizes and would be converted back to a meadow site. As a result, increased grass and forage production would occur in this site.

In addition to the 7 acres of meadow restoration, existing meadow sites would be maintained by removing encroaching pine. Pine encroachment is proposed on a total of 85 acres, of which 76 acres are expected to be commercial tree removal.

Hardwoods

Hardwood sites would increase by 180 acres, as existing pine sites would be converted to 5 acres of paper birch and 175 acres of aspen. In addition to the hardwood conversion treatments, hardwood release treatments are also proposed on up to 1,724 acres (1,544 acres commercial and 180 acres non-commercial removal).

Following treatment, hardwood stands would receive more light, moisture, and nutrient which would promote sprouting and improve general vigor of these stands. The proposed treatments would ensure that hardwoods would not become shaded out and eventually taken over by conifers. Future conifer removal treatments would be necessary to maintain this condition.

Rocky Mountain Juniper

Rocky Mountain juniper (RMJ) is a very shade intolerant species as a mature tree but is a relatively shade tolerant species during the seedling and sapling stage. Removing conifers

from around mature RMJ would increase the amount of sunlight and moisture to the junipers, therefore improving conditions for tree growth and seedling establishment. While it has no value as a commercial species it is valued as a wildlife food source, mainly birds (Noble, 2007).

Mountain Mahogany

Mountain mahogany is found only in the Thompson Canyon area within the Norwood analysis area. There is no legal access to this area, therefore no activity would be planned within the mountain mahogany sites and no change to their condition would occur.

Understory Vegetation

This alternative would harvest and open up the canopy on 14,231 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 grass and forage for livestock and wildlife.

White Spruce

One 195 acre designated white spruce stand is proposed for group selection. The remaining designated spruce stands would not be treated in any of the Alternatives. However, where spruce occurs as an inclusion within treated pine stands, group selection is also proposed. In sites where group selection is proposed, there would be increased diversity within the stand as a result of the openings that are created. An initial increase in shrubs, forbs, and grasses would occur in the openings, increasing grass and forage for cattle and wildlife. The openings would eventually seed in with conifer regeneration or aspen suckers giving the stand an uneven-aged structure. Fire hazard and insect ratings would remain the same as the existing condition.

Ponderosa Pine

The majority of proposed treatments would occur in ponderosa pine stands. Commercial thinning is by far the main treatment proposed at approximately 7,576 acres. Three different basal areas are proposed in the commercial thinning depending upon specific site conditions and objectives. A basal area of 50 ft^2/ac (424 acres) would be prescribed in areas with large amounts of MPB infestation already present. This is mainly the Beaver Creek/Mallo Camp vicinity and south to the South Parmlee Road (FDR 109). A 60 ft^2/ac basal area (3,348 acres) would be used in the northern area (north of Mallo Camp) where MPB has begun to increase in numbers, and a 70 ft^2/ac basal area (3,804) in the southern half where the MPB infestation is much smaller.

In addition to commercial thinning, there would be 1,652 acres of overstory removal to release established seedlings; 1,907 acres of shelterwood seedcut to regenerate mature pine stands; 23 acres of prep cut to develop crowns of future seed trees in mature stands; 81 acres of individual tree selection to retain uneven-aged stand diversity; 317 acres of special cut designed to lessen the visual impact of overstory removal or seedcut treatments in areas of High Scenic Integrity; 505 acres of group selection in spruce sites or inclusions within pine sites; 271 acres of sanitation to remove live trees with beetle brood in them as a suppression method for mountain pine beetle;

Some pine stands have thick grass in the understory, which could hinder seedling establishment, especially in the northern half of the analysis area. Mechanical site prep may be used to break up this sod layer to exposed bare mineral soil for seedling establishment under shelterwood seed cuts post harvest. The number of potential mechanical site prep acres would equal the number of shelterwood seed cut acres. For this alternative a maximum of 1,907 acres would be mechanically site prepped.

Up to 7,576 acres of POL (Products Other than Logs) thinning is proposed with this alternative. Trees less than 9-inch diameter DBH would be thinned to a spacing of 18'x 18' or 24'x 24'.

The number of existing pine acres would decrease as 180 acres are converted from pine to aspen and birch and 7 acres are converted from pine to meadow. Pine acres would decrease from 34,642 to 34,455 in this alternative, less than a 1 percent reduction.

After harvest, residual trees would increase in yield and diameter growth due to reduced competition. There would be a decreased risk of insect infestation or large-scale, 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.

Commercial and non-commercial thinning would improve the residual stand 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.

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 in pine stands would move stands out of a high risk condition, with the exception of commercial thin 70BA. This treatment would maintain a high MPB risk rating because a moderately dense stand condition is maintained. Table 3.22 below, displays the expected MPB risk condition post-harvest, by treatment type.

Table 3. 22- Effect of Commercial Harvest to MPB Risk in Norwood Project Area

Harvest Treatment	MPB Risk Existing	Acres	MPB Risk After Harvest
Commercial Thin 50 BA	High	424	Medium
Commercial Thin 60 BA	High	3,348	Medium
Commercial Thin 70 BA	High	3,804	High
Overstory Removal	High	1,652	Low
Shelterwood Seedut	High	1,907	Medium
Prepcut	High	23	Medium
Individual Tree Selection	High	81	Medium
Special Cut	High	317	Medium or Low
POL	High	92	Medium
Sanitation	High or Medium	271	Medium

As a result of this alternative, acres in the high-risk rating would decrease by approximately 12 percent over existing conditions, to 11,200 acres. Pine stands at the medium risk rating would increase by approximately 7 percent (21,016 acres) and the low risk rating would increase by approximately 5 percent (2,241 acres) from existing conditions. Table 3.23 displays existing and post-harvest MPB risk.

Table 3.23 - Existing and Post Harvest MPB Risk – Alternative 2

MPB Risk Rating	Existing Acres	Existing Percentage	Post-Harvest Acres Alt 2	Post-Harvest Percent Alt 2	Percent Change from Existing
Low	813	2%	2,240	7%	Increase 5%
Medium	18,307	53%	20,305	59%	Increase 6%
High	15,522	45%	11,911	34%	Decrease 11%
Totals	34,642	100%	34,456*	100%	

*Total pine acres decrease due to meadow restoration and hardwood conversion

Structural Stages

No activity is planned within management area 5.4 due to lack of access and therefore, no change to structural stages is expected.

Alternative 2 would have a relatively minor impact on the range of structural stages in ponderosa pine in management area 5.1. In the short term, the percentages for all structural stages after harvest would remain the same except 4A and 4B. Structural stage 4A would increase by 1 percent to 37 percent, which moves away from the objective of 25 percent. Structural stage 4B would decrease by 1 percent to 26 percent, which moves toward the objective of 25 percent. Table 3.24 displays the post-harvest acres and percentages of pine structural stages within Management Area 5.1. These values are those expected to occur immediately following harvest activities. Management area acreages are those presented in the 2005 Black Hills National Forest Monitoring Report, (USDA, Forest Service, 20056b).

This alternative would move toward correcting deficiencies in early structural stages in the 5.1 management area forest-wide. To move the management area towards the target structural stage percentages, commercial harvest treatments would need to be implemented. Timber harvesting would open up the stands and change stand densities and/or tree size depending on the treatment prescribed. A shelterwood seed cut in the short term would move stands into structural stage 4A by maintaining tree size but reducing stand density. Initially, more 4A would need to be created in order to move to the other structural stages. A shelterwood seed cut is a regeneration cut and following harvest the area would regenerate naturally after the stand has been opened up. Once a shelterwood seed cut has regenerated and the seedlings are tall enough, an overstory removal could occur (approximately 15 to 20 years). An overstory removal would change tree size from sawtimber (structural stage 4) to seedlings/saplings (structural stage 2) following the commercial harvest. This would increase the number of acres for structural stage 2, which in turn would grow into structural stage 3. Commercial thinning would maintain tree size but depending on residual basal area, the stand could be reduced to 4A or 4B. Reaching the forest objectives is not only dependent

on forest growth rates but also funding. As a result it may take two or more decades to reach the structural stage objectives (USDA Forest Service, 2005a).

To reduce structural stage 1 (grass/forb) the stand would have to regenerate naturally or be planted with pine seedlings to move the stand into a structural stage 2 condition. For structural stage 4 pine sites, 12 percent of all stands within the management area would maintain a tree size of 'very large' (16-inches or greater dbh). This is 2 percent over the target of 10 percent.

The forest objective for structural stages applies to the entire management area. Depending on the type of harvests that are prescribed and how many acres are treated will depend on how soon the percentages of the forest plan objectives are reached. Forest growth rates and funding of post harvest treatments also must be taken into consideration. As a result, it may take two or more decades to achieve the Forest Plan structural stage objectives (USDA Forest Service, 2005a). Table 3.24 displays existing and post-harvest structural stages for Alternative 2, directly following treatment.

Table 3. 24 -Ponderosa pine structural stages in 5.1 Management Area for Alternative 2

Structural Stage	Forest Plan Objective	Existing Acres	Existing Percentages	Alternative 2 Acres	Alternative 2 Percentages
1	5%	61,938	13%	61,938	13%
2	5%	10,324	2%	11,732	2%
3A	10%	18,833	4%	18,852	4%
3B	15%	27,966	6%	28,011	6%
3C	5%	12,934	3%	12,845	3%
4A	25%	172,401	36%	174,380	37%
4B	25%	126,491	27%	123,705	26%
4C	5%	44,721	9%	43,957	9%
5*	5%	442	<1%	442	<1%

* Structural stage 5 is the only structural stage that is not computed from stand data. The criteria is for pine stands to become structural stage 5 is the stand must be at least 160 years old and to have a tree size class of V, trees 16-inches in DBH or greater. Note: Total pine acres are reduced in Alternative 2 due to meadow restoration and Hardwood conversion treatments.

ALTERNATIVE 3

This alternative was designed to reduce mountain pine beetle risk and increase aspen acres as compared to the proposed action, Alternative 2. To accomplish this, additional and more aggressive commercial thinning in pine stands and additional hardwood conversion treatments are proposed.

In this alternative 16,216 acres would be commercially harvested with an estimated volume of 40.7 MMBF and 17,800 CCF of POL. This alternative harvests the most volume from the greatest amount of acres. Tables 3.25 and 3.26 display the post-harvest structural stages and cover types expected in the project area following implementation of this alternative.

Table 3.25 - Cover Types in the Project Area - Alternative 3

Cover Type	Acreage/Percentage
Meadow	2,133 / 5%
Aspen	2,688 / 6%
Ponderosa Pine	34,148 / 81%
White Spruce	3,023 / 7%
Paper Birch	31 / <1%
Mountain Mahogany	224 / <1%
Non-Forest Admin Site	5 / <1%
Total	42,252

Table 3.26 - Structural Stages by Cover Type in the Project Area – Alternative 3

Structural Stage	Ponderosa Pine	Spruce	Aspen	Paper Birch	Meadow	Shrub	Non-Forest	Total
Non-Forest							5	5
Meadow/ grassland					2,133			2,133
SS1	402	8	74					484
SS2	1,532	5	352	3		224		2,116
SS3A	306		690	6				1,002
SS3B	1,456	72	626	12				2,166
SS3C	304		49					353
SS4A	24,181	509	890					25,580
SS4B	4,111	1,675	7	10				5,803
SS4C	1,816	754						2,570
SS5*	40							40
Totals	34,148	3,023	2,688	31	2,133	224	5	42,252

* Structural stage 5 is the only structural stage that is not computed from stand data. The criteria is for pine stands to become structural stage 5 is the stand must be at least 160 years old and to have a tree size class of V, trees 16-inches in DBH or greater.

Meadows – Rocky Mountain Juniper – Mountain Mahogany – White Spruce

Direct and indirect effects to Meadows, Rocky mountain juniper, mountain mahogany and white spruce would be the same as those described under Alternative 2.

Hardwoods

Aspen acreage would increase by an additional 309 acres over that proposed in Alternative 2. Alternative 3 would increase acres of pine converted to hardwood sites to a total of 489 acres. Of this total, 5 acres of pine would be converted to paper birch and 484 acres of pine converted to aspen.

The Hardwood Release treatments discussed in Alternative 2 would apply to this alternative as well.

Understory Vegetation

This alternative would harvest and open up the canopy on 1,984 more acres than Alternative 2. This would allow an increase in light, nutrients, and moisture over more acres to become available to the understory vegetation. Forbs, shrubs, and grasses would increase creating additional forage for livestock and wildlife.

Ponderosa Pine

The majority of proposed treatments would occur in ponderosa pine stands as in Alternative 2 but over more acres. Commercial thinning is increased by 1,676 acres to approximately 9,252 acres total. In addition to the increase in acres, an increase in intensity of thinning is incorporated. Approximately 99 percent of the thinning would be to a 50 or 60 BA as compared to approximately 50 percent to these BAs in Alternative 2. The resulting pine stands would be less dense than in Alternative 2.

The number of existing pine acres would further decrease due to additional acres of hardwood conversion. Pine acres would decrease to 34,148 in this alternative, a 1.4 percent reduction in overall pine acres.

As described in Alternative 2, residual trees would increase in growth and yield as a result of reduced competition. However, this effect would occur over more acres. There would be a greater decrease in fire risk because of a more open canopy over more acres treated than Alternative 2 (refer to the Fire and Fuels Section in this Chapter).

The maximum amount of acres to be mechanically site prepped would be the same as Alternative 2.

Up to 9,252 acres of POL thinning are proposed with this alternative. This is 1,676 acres more than Alternative 2.

Mountain Pine Beetle

This alternative would further reduce acres of pine in the high-risk category for MPB infestation and would increase acres of pine in the low and medium risk condition as compared to Alternative 2.

There would be 6,271 acres of ponderosa pine with a high-risk rating in the project area, which would be a decrease of 27 percent from the existing condition. Pine stands at the medium risk rating would increase to 25,636 acres; an increase of 22 percent over the existing condition. The low risk rating would increase to 2,241 acres, a 5 percent increase more than the existing condition, which is the same as in Alternative 2.

Table 3.27 - Existing and Post Harvest MPB Risk – Alternative 3

MPB Risk Rating	Existing Acres	Existing Percentage	Post-Harvest Acres Alt 3	Post-Harvest Percent Alt 3	Percent Change from Existing
Low	813	2%	2,240	7%	Increase 5%
Medium	18,307	53%	25,637	75%	Increase 22%
High	15,522	45%	6,271	18%	Decrease 27%
Totals	34,642	100%	34,148*	100%	

*Total pine acres decrease due to meadow restoration and hardwood conversion

Structural Stages

No activity is planned within management area 5.4 due to lack of access and therefore, no change to structural stages is expected.

Alternative 3 would have a relatively minor impact on the range of structural stages in ponderosa pine in management area 5.1, although a slightly more pronounced impact than Alternative 2. This alternative would move toward correcting deficiencies in early structural stages in the 5.1 management area forest-wide. The structural stages following the proposed harvest in Alternative 3 would be concentrated in structural stages 4A and 4B as in Alternative 2. The difference between these alternatives is that structural stage 4A would increase by 2 percent to 38 percentwhich moves further away from the Forest Plan objective, and that structural stage 4B would decrease 2 percent to 25 percent which meets the objective. All other structural stages would remain the same as Alternative 2. Table 3.28 displays the pine structural stages in Management Area 5.1, for this Alternative, immediately following harvest. As described under Alternative 2, each structural stage is not expected to be static and will change over time as natural growth or disturbance actions occur. The percentage of very large size stands would remain the same with this alternative, 12 percent in MA 5.1 and 9 percent in MA 5.4.

Table 3.28 - Ponderosa pine structural stages in 5.1 Management Area - Alternative 3

Structural Stage	Forest Plan Objective	Existing Acres	Existing Percentages	Alternative 3 Acres	Alternative 3 Percentages
1	5%	61,938	13%	61,938	13%
2	5%	10,324	2%	11,732	2%
3A	10%	18,833	4%	18,852	4%
3B	15%	27,966	6%	28,000	6%
3C	5%	12,934	3%	12,829	3%
4A	25%	172,401	36%	179,723	38%
4B	25%	126,491	27%	118,274	25%
4C	5%	44,721	9%	43,764	9%
5*	5%	442	<1%	442	<1%

* Structural stage 5 is the only structural stage that is not computed from stand data. The criteria is for pine stands to become structural stage 5 is the stand must be at least 160 years old and to have a tree size class of V, trees 16-inches in DBH or greater.

Note: Total pine acres are reduced in Alternative 3 due to meadow restoration and Hardwood conversion treatments.

ALTERNATIVE 4

This alternative was designed to provide for more acres of moderately dense mature pine stands. To accomplish this goal, some pine stands are deferred from treatment while other pine stands would defer thinning of the POL component of the stand. In the latter case, these stands would be commercially thinned to a 60 BA, however, the POL sized material would not be removed, thereby retaining a more dense stand condition.

In this alternative, approximately 13,459 acres would be commercially harvested with an estimated volume of 33.6 MMBF and 13,900 CCF of POL (see Map 4 in Appendix A). This alternative has the lowest volume and the fewest acres to be harvested of all the action alternatives. Tables 3.29 and 3.30 display the post-harvest structural stages and cover types in the project area expected following implementation of this alternative.

Table 3.29 - Cover Types in the Project Area – Alternative 4

Cover Type	Acreage/Percentage
Meadow	2,133 / 5%
Aspen	2,380 / 5%
Ponderosa Pine	34,456 / 82%
White Spruce	3,023 / 7%
Paper Birch	31 / <1%
Mountain Mahogany	224 / <1%
Non-Forest Admin Site	5 / <1%
Total	42,252

Table 3.30 - Structural Stages by Cover Type in the Project Area – Alternative 4

Structural Stage	Ponderosa Pine	Spruce	Aspen	Paper Birch	Meadow	Shrub	Non-Forest	Total
Non-Forest							5	5
Meadow/ grassland					2,133			2,133
SS1	402	8	74					484
SS2	1,532	5	352	3		224		2,116
SS3A	306		689	6				1,001
SS3B	1,456	72	627	12				2,167
SS3C	304		49					353
SS4A	17,504	509	582					18,595
SS4B	10,804	1,675	7	10				12,496
SS4C	2,108	754						2,862
SS5*	40							40
Totals	34,456	3,023	2,380	31	2,133	224	5	42,252

* Structural stage 5 is the only structural stage that is not computed from stand data. The criteria is for pine stands to become structural stage 5 is the stand must be at least 160 years old and to have a tree size class of V, trees 16-inches in DBH or greater.

Meadows – Hardwoods - Rocky Mountain Juniper – Mountain Mahogany – White Spruce

Direct and indirect effects to Meadows, Hardwoods, Rocky mountain juniper, mountain mahogany and white spruce would be the same as those described under Alternative 2.

Understory Vegetation

Fewer acres (772 ac) would be commercially harvested in this alternative. In addition, 1,360 acres of POL thinning would be deferred. As a result, fewer acres would see an increase in light, nutrients, and moisture to become available to the understory vegetation, as compared to Alternative 2. There would be an increase in forbs, shrubs, and grasses over the existing condition.

Ponderosa Pine

Alternative 4 proposes 592 acres less commercial thinning and 181 acres less shelterwood seedcut as compared to the proposed action (Alternative 2). In addition, Alternative 4 would defer the removal of POL sized material on 1,360 acres which are proposed for a commercial thinning to a 60 BA. All other harvest treatments would remain the same as Alternative 2.

The number of existing pine acres would decrease as 180 acres are converted from pine to aspen and birch. Pine acres would decrease from 34,643 to 34,456 in this alternative, less than a 1 percent reduction in pine acres. This is the same as Alternative 2.

As described in Alternative 2, residual trees would increase in growth and yield as a result of reduced competition. However, this effect would occur over fewer acres. There would be less of a decrease in fire risk because more moderately dense canopy stands would remain on the landscape, as compared to Alternative 2 (refer to the Fire and Fuels Section in this Chapter).

The maximum amount of acres to be mechanically site prepped would be 1,726 acres. This would be 181 acres less than Alternative 2.

Up to 5,624 acres of POL thinning are proposed with this alternative. This is 1,952 acres less than Alternative 2.

Mountain Pine Beetle

This alternative would retain more High risk condition pine stands than Alternative 2 because fewer acres are harvested and some harvested acres will remain more dense. This Alternative would have the least improvement in MPB risk of the action alternatives. Mortality from MPB would be expected to be greater than in Alternative 2 or 3, but less than Alternative 1, No Action. Table 3.31 displays the existing and post-harvest risk ratings for Alternative 4.

Table 3.31 - Existing and Post Harvest MPB Risk – Alternative 4

MPB Risk Rating	Existing Acres	Existing Percentage	Post-Harvest Acres Alt 4	Post-Harvest percent Alt 4	Percent Change from Existing
Low	813	2%	2,240	7%	Increase 5%
Medium	18,307	53%	18,960	55%	Increase 2%
High	15,522	45%	13,256	38%	Decrease 7%
Totals	34,642	100%	34,456*	100%	

*Total pine acres decrease due to meadow restoration and hardwood conversion

Structural Stages

No activity is planned within management area 5.4 due to lack of access and therefore, no change to structural stages is expected.

Alternative 4 would have a relatively minor impact on the range of structural stages in ponderosa pine in management area 5.1. This alternative would move toward correcting deficiencies in early structural stages in the 5.1 management area forest-wide. The only forestwide percentage that would change from the existing condition is in structural stage 4B which is reduced from 27 percent to 26 percent. This moves 4B closer to the forestwide objective of 25 percent. This spreadsheet automatically calculates percentages and rounds those percentages according to standard rounding rules. Therefore, the decrease of 1 percent in 4B is not necessarily compensated for in a 1 percent increase of another structural stage. Table 3.32 displays the existing and post-harvest structural stages for Alternative 4. These values are those expected directly following treatment. As described under Alternative 2, each structural stage is not expected to be static and will change over time as natural growth or disturbance actions occur. The percentage of very large size stands would also remain the same with this alternative, 12 percent in MA 5.1 and 9 percent in MA 5.4.

Table 3.32 - Ponderosa pine structural stages in 5.1 Management Area - Alternative 4

Structural Stage	Forest Plan Objective	Existing Acres	Existing Percentages	Alternative 4 Acres	Alternative 4 Percentages
1	5%	61,938	13%	61,938	13%
2	5%	10,324	2%	11,732	2%
3A	10%	18,833	4%	18,852	4%
3B	15%	27,966	6%	28,000	6%
3C	5%	12,934	3%	12,829	3%
4A	25%	172,401	36%	173,046	36%
4B	25%	126,491	27%	124,967	26%
4C	5%	44,721	9%	44,056	9%
5*	5%	442	<1%	442	<1%

* Structural stage 5 is the only structural stage that is not computed from stand data. The criteria is for pine stands to become structural stage 5 is the stand must be at least 160 years old and to have a tree size class of V, trees 16-inches in DBH or greater.

Note: Total pine acres are reduced in Alternative 4 due to meadow restoration and Hardwood conversion treatments.

Cumulative Effects

The Norwood analysis area has been commercially harvested many times in the past with recorded activities going back to the 1960s. Post sale activities followed with natural disturbances occurring throughout the years such as wildfires and insect and disease events. The time boundary considered in this cumulative effects analysis is from 1980 until 2017. Pre-commercial thinning in the 1980s has created large blocks of trees in similar diameter classes that are at high risk to MPB infestation today. The timber sales which may result from this analysis would likely be completed, including post-harvest activities, by approximately 2017. The analysis area boundary will be used for the cumulative effects analysis. Harvest activities along with post sale activities are confined to the stand level while natural disturbances such as wildfire or insects and disease may be confined to the stand level or the project area.

The past, present, and future activities considered in this analysis are summarized in Appendix E.

Meadow

There would be no adverse cumulative effects to meadows in the project area as a result of this project. Treatments which would remove pine encroachment from meadows and those which convert pine sites to meadow are beneficial. None of the activities proposed would cause adverse cumulative effects to meadows. The No Action alternative would continue to allow conifers to encroach into meadows. However, the encroachments would be minimal during the timeframe being analyzed.

Hardwoods

There would be no adverse cumulative effects to hardwoods in the project area as a result of this project. Treatments which would remove pine encroachment from hardwood stands and those which convert pine sites to hardwoods are beneficial. None of the activities proposed would cause adverse cumulative effects to hardwood stands. The No Action alternative would continue to allow conifers to encroach into hardwood stands. However, the encroachments would be minimal during the timeframe being analyzed.

Rocky Mountain Juniper

There would be no adverse cumulative effects to Rocky mountain juniper as a result of the action alternatives. All of the vegetation treatments proposed in the action alternatives would improve Rocky mountain juniper. Therefore, no adverse cumulative effects would occur as a result of the action alternatives. The No Action Alternative would maintain conditions which currently exist during the timeframe being analyzed and would not result in an adverse cumulative effect to Rocky mountain juniper.

Mountain Mahogany

There would be no direct or indirect effects to mountain mahogany and therefore, no cumulative effects would occur. In general, past fire suppression, timber harvest, roads, recreation (motorized), livestock grazing, and natural events such as drought have caused

impacts to shrubs within the project area. Past wildfires such as the Sheldon Fire in 2002 burned acreage within the project area. Fires as well as timber harvest can open up forests for early successional shrub species. Fire suppression has resulted in an increase of pine trees which may lead to sites with little ground cover other than pine needles. Drought conditions and foraging by livestock/wildlife can also negatively impact shrubs. Timber harvest, road use, motorized recreation and livestock grazing can increase noxious weeds and thereby decrease available acreage for shrubs.

Understory Vegetation

There would be no adverse cumulative effects to understory vegetation as a result of the action alternatives. All of the vegetation treatments proposed in the action alternatives would improve understory vegetation. Therefore, no adverse cumulative effects would occur as a result of the action alternatives. The No Action Alternative would maintain conditions which currently exist during the timeframe being analyzed and would not result in an adverse cumulative effect to understory vegetation.

White Spruce

All action alternatives have similar direct or indirect effects to white spruce. All of the described effects would improve or maintain spruce stands. The No action alternative also maintains spruce stands during the analysis period. Therefore, no adverse cumulative effects to white spruce are expected with any alternative.

Ponderosa Pine

There are no future vegetation treatment projects expected or planned within the Norwood area within the stated time boundary considered for this analysis.

Much of the Norwood analysis area has been harvested in the past. More than a dozen timber sales have taken place since 1980, in various locations within the project area. 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 and release have occurred and improved stand health by removing damaged, diseased, and poor quality trees.

The Black Hills, including the Norwood analysis area, has been in an on-going drought condition the last 7 to 8 years. While MPB does not depend on drought conditions for the insect 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 attack.

In the early 1980s, thousands of acres of ponderosa pine in the southern half of the analysis area were pre-commercially thinned. As a result, these trees are now encompassing a large area of even-aged trees all of which are about the same size and age with high-risk densities. Pine stands with an average tree size over 7-inches dbh and basal areas over 80-ft^2/ac leave the stands susceptible to MPB infestation.

The current epidemic has not showed signs of slowing down but continuously increasing in numbers. The number of infested acres has grown every year for the last 6 to 7 years.

Forty-five percent of the analysis area is in a high risk rating for MPB. The southern half of the analysis area has not encountered the higher levels of MPB infestation that is found in the northern half of Norwood.

There would be potential adverse cumulative effects to ponderosa pine with the No Action Alternative. Not harvesting pine stands would encourage beetle populations to increase and contribute to the MPB epidemic growing in the analysis area. The northern half of the analysis area has large areas of MPB infestations while the southern half is not as heavily infested. The MPB population is expected to increase in numbers and it is only a matter of time before the southern half also has large areas of MPB infestations.

There would be positive cumulative effects under the action alternatives. Treatment of pine stands to lower stand density reduces the susceptibility of a stand to MPB infestation. Mountain pine beetle-caused mortality would be expected to decrease with the action alternatives.

FIRE and FUELS

Affected Environment

The project area is comprised primarily of closed stand long needle pine, as well as open pine with grass. Fire Regime Group I with a fire return interval of 0 to 35+ years is present in the Ponderosa Pine Stands and Fire Regime Group IV with a fire return interval of 35 to 100+ years is present in the Black Hills Spruce stands. Although some private land with a few structures exists within the project boundaries, there are no major concerns with wildland urban interface at this time. However, it is possible that further development of the private land may occur in the future, increasing the potential for wildland urban interface problems.

Fire History

There have been 148 wildfires, less than 299 acres in size, within the project area since 1950. Of the fires identified, 16 are known lightning-caused, one is campfire caused, and 131 remain unknown due to data inconsistencies. However, the assumption can be made that several of the fires ignited by unknown methods were caused by lightning. Table 3.33 displays the number of fires by size class.

Table 3.33 - Fire history Occurrence by Size Class from 1950 to Present.

Fire Size Class	Fire Size (acres)	Number of Fires
A	0 – ¼	109
B	¼ to 10	36
C	10 - 99	1 occurred in 1982
D	100 – 299	2 occurred in 1950 and 1952

In addition to the above mentioned fires, 2 large fires (greater than 299 acres) intersected the project area for a portion of their boundary. The year 2000 Jasper fire was the largest fire in Black Hills history and intersected the project boundary for approximately 7 acres. The Sheldon fire of 2002 burned approximately 376 acres within the Norwood boundary.

There is a higher fire frequency in the central and southern regions of the project area. Both large fires intersecting the project area occurred in the southern region of the project boundary.

The number of fires on Black Hills National Forest system lands, as a whole, has remained fairly constant at 65 to 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 are more difficult to control with an average large fire size increasing from under 1,000 acres per fire in the early 1900s to over 8,000 acres in recent years (since 2000).

Fire Regime Condition Class (FRCC)

Historically, fire regimes varied greatly, both spatially and temporally throughout the Black Hills. Fire suppression activities have trended the forest outside historic ranges. Currently, there are three general types of Fire Regimes in the Black Hills:

1. Frequent, Low-Severity Fire Regimes
    a. General Characteristics: 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
    b. Major Controlling Variables: Weather (fires occur during dry periods), Climate (extensive fires then to occur in dry years that follow 1-3 wet years), and Fuels (fuels gradually accumulate during the intervals between successive fires).
    c. Distribution: Evidence of surface fire in ponderosa pine forests throughout the Black Hills, most frequent at the Prairie-Forest ecotone and less frequent in the interior forests at mid to high elevations (Fisher et al. 1987, Brown and Sieg 1996, Brown et al. 2000, Weink 2001, Brown 2003, Wienk et al. 2004)
2. Infrequent, High-Severity Fire Regimes
    a. General Characteristics: Fires recur within any stand at long intervals (100 – 500 + years), burning at high severity in the canopy and understory, and at vaiable severity to the soil.
    b. Major Controlling Variables: 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 fir frequency, extent, or severity).
    c. Distribution: 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).

3. Mixed Severity Fire Regimes
    a. General Characteristics: 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).

b. Major Controlling Variables: 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.
c. Distribution: 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)

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 3.34 below describes each Condition Class.

Table 3.34 - Fire Regime Condition Class (FRCC) rating descriptions (Hann et al., 2003)

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.

The coarse-scale national data characterizes the Black Hills as primarily Condition Class III (FEIS). The northern region of the project area has a cooler, moister environment than the central and southern areas which have a higher fire frequency; and although lightning strikes are relatively prevalent, fuel and burning conditions are generally not acceptable for

maintaining a significant burn. Evidence of past fires in the northern area is generally characterized by small, low-intensity surface fires. However, given the right conditions, stand-replacing fires could occur in this area. The southern region is a drier environment with a higher fire frequency. Fuels and burning conditions are generally more acceptable for maintaining a significant burn.

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

The Norwood project area is in the vicinity of two Class 1 airsheds (Badlands National Park and Wind Cave National Park), and four communities (Newcastle, Deerfield, Buckhorn, and Breakneck). Smoke generated by wildfire is usually greater and cannot be mitigated; however, smoke generated under controlled conditions can be mitigated using the following means:

- Limit treatment area size
- Specify wind directions and speed
- Specify minimum mixing heights
- Stagger 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 and Values on the Forest, and is integrated into the Forest Plan. **Risks** are defined as those uses or human activities that have the potential to result in a wildfire ignition. **Values** are defined as natural or developed areas where loss or destruction by wildfire would be unacceptable.

Values in the Norwood Project area, which would be threatened by wildfire include:

- Commercial timber stands
- Power lines
- Range improvements, such as fences and spring developments

- Private land and structures
- Investments in timber stand improvement and reforestation
- Wildlife habitat, including snags, forage, riparian areas, security cover, and mid to late seral ponderosa pine stands
- Long term dispersed camping sites
- Beaver Creek, Redbank, and Moon Campgrounds
- Visual quality
- Seismic Site
- Sensitive Plants or animals
- Heritage sites
- Water Quality

The approximate area and percent of the project area for fire risk and values are shown below in Table 3.35. Private land is included in these figures.

Table 3.35 - Acres and Percent of the Norwood Project Area by Fire Risk and Value

Risk/ Value Rating*	Acres	Percent of the Project Area
H / H	5,358	12%
H / M	16,341	35%
M/ M	24,701	53%
L / M	58	negligible

* H: High, M: Moderate, L: Low

Fire Hazard

Fire hazard is an estimate of potential fire behavior and effects expected to occur within any given area, based on fuel conditions. Fire behavior and effects impact the degree of difficulty in suppressing a fire once it is ignited. The Forest Plan provides a determination of fire hazard based on structural stages for white spruce. In ponderosa pine, fire hazard is estimated based on both structural stages and quadratic mean diameter (QMD) of Forested stands (Table 2-1 on page II-4 of the FEIS Phase II Amendment). "Structural stages are used…as an indicator of ponderosa pine forest structure and condition, along with several other indicators…that represent the ecosystem indicators of species viability" (USDA Forest Service, 2005a). The structural stages give an indication of the current fire hazard. Tables 3.36 and 3.37 display an approximate area of each existing structural stage and the corresponding fire hazard in pine and spruce. Tables 3.38 and 3.39 display a summary of fire hazard ratings for both pine and spruce. These tables refer to National Forest Lands only fire hazard on private lands is not included.

Table 3.36 - Existing Fire Hazard Rating for Pine in Norwood Project Area

Structural Stage	Acres	Fire Hazard	Percentage
1	402	Low	1
2	124	Medium	<1
3A	287	Medium	1
3B	1,441	High	4
3C	402	Very High	1
4A >9” QMD	9,144	Medium	26
4A <9” QMD	7,722	Very High	22
4B >9” QMD	6,508	High	19
4B <9” QMD	5,799	Very High	17
4C >9” QMD	489	Very High	1
4C <9” QMD	2,284	Very High	7
5	40	Very High	<1
Total	34,642		100

Table 3.37 - Existing Fire Hazard Ratings for Spruce Stands in Norwood Project Area

Structural Stage	Acres	Fire Hazard	Percentage
1	8	Low	<1
2	5	Medium	<1
3A	0	Medium	0
3B	72	High	2
3C	0	Very High	0
4A	509	High	17
4B	1,675	Very High	55
4C	754	Very High	25
5	0	Very High	0
Total	3,023		100

Table 3.38 - Summary of Existing Fire Hazard Rating in Pine in Norwood Project Area

Fire Hazard	Acres (approx)	Percentage
Low	402	1
Medium	9,555	28
High	7,949	23
Very High	16,736	48
Total	34,642	100

Table 3.39 -Summary of Existing Fire Hazard Rating in Spruce in Norwood Project Area

Fire Hazard	Acres (approx)	Percentage
Low	8	<1
Medium	5	<1
High	581	19
Very High	2,429	80
Total	3,023	100

At-Risk Communities (ARC)/ Structures

At-Risk Communities (ARC), formerly known as Communities At Risk (CAR), is a GIS layer developed to identify communities both within and surrounding the Black Hills National Forest. The ARC layer is based on the Federal Register listing of at-risk communities, dated August 17, 2001, per Public Law 106-291. Buffer zones were also created at distances of a half, one, two, and three miles around the communities to further assess the level of wildfire risk for each community. There are four ARC's located within or adjacent to the Norwood Project area. The Buckhorn Community is the only ARC in which the Norwood Project area enters the buffer zones. The 3 other ARCs, Breakneck, Newcastle, and Deerfield, lie adjacent to the project area.

There are approximately 16 structures in Pennington County, which are primarily summer-use homes. The Weston County structure data is currently out-of-date. It is known that the 2001 data does not incorporate many of the recent developments in the areas west of the Beaver Creek Road, along the stateline; Buckhorn and Castle Creek Road; Highway 85N; and existing Mallo areas. However, the Weston county Assessors' office has chosen to contract this deed and it will be updated this year. Currently there is no available data to analyze Lawrence County structures.

Environmental Consequences

Direct and Indirect Effects

The level of analysis chosen is an intermediate approach that focuses on a representative landscape for the alternatives. This project was modeled using the Forest Vegetation Simulation (FVS), as well as the Fire Area Simulator (FARSITE). These programs were used to determine existing conditions and the effects of each alternative on those existing conditions with regard to fire and fuels.

ALTERNATIVE 1 – NO ACTION

The only changes that would occur on the landscape are those that result from natural occurrences or those relative to wildfire suppression. No change would occur to FRCC or to

Fire hazard ratings as a result of this alternative (refer to tables 3.36, 3.37, 3.38 and 3.39 presented earlier in this section for fire hazard ratings).

Modeling of the existing situation over the next 50 years in the Norwood Project area shows what impact the no action alternative would have on fuel loading. Using FVS-FFE (Forest Vegetation Simulator-Fire and Fuels Extension), it could be shown that without treatment, fuel loading increases from approximately 20 tons/acre to approximately 50 tons/acre during this timeframe.

Changes would be expected to occur across the landscape as a result of mountain pine beetle caused mortality within the next five years. Aerial fuels would be expected to fall to the ground and contribute to ladder fuels, thus increasing the potential for crown fire. Needles would remain on downed vegetation for three to five years, depending on moisture conditions. After that point, fire behavior would be expected to moderate some. However, in the next stage, more fuels would continue to fall and create a buildup of large fuels on the ground, which would greatly contribute to fire intensities over the next 5 to 10 years. Large openings with heavy fuel loads would be expected under the no action alternative. Roads could be blocked by fuel build up, which in turn would delay suppression efforts.

A No Action Alternative would result in increasing fire risks. 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 a higher risk of losses to wildland fire. This trend would continue until interrupted by a natural disturbance such as a large-scale fire.

Although air quality would not be directly impacted under the No Action Alternative, the potential for a large-scale wildfire would be the highest of any alternative. There would be no 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 Norwood 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 – PROPOSED ACTION

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

This alternative would harvest 14,231 acres commercially and would treat fuels on up to 5,578 acres, including up to 2,356 acres of low to moderate intensity prescribed fire. Commercial and non-commercial fuel breaks would be constructed on lands adjacent to private lands. Many follow-up treatments or consecutive treatments are planned, resulting in more than one treatment in some sites. Map 5 in Appendix A displays proposed fuels treatments.

Alternative 2 would decrease the risk for large-scale, high intensity fires, allowing for characteristic low to mixed severity fires to occur. Very little vegetation treatment would occur in spruce and the post-harvest structural stages, which include fire hazard, remain the same as existing conditions.

There is measurable change in the ponderosa pine structural stages and corresponding fire hazard in this Alternative. The most pronounced change is in the Very High and medium hazard ratings. The percentage of pine stands in the Very High hazard category is reduced from 48 percent to 38 percent and those with a medium hazard rating are increased from 28 percent to 38 percent. Acres of Low hazard remain the same and those in a High hazard condition decrease from 23 percent to 22 percent. Refer to Tables 3.40 and 3.41 for a display of structural stages and fire hazard in pine for Alternative 2.

Table 3.40 - Post-Harvest Pine Fire Hazard Rating by Structural Stage - Alternative 2

Structural Stage	Acres (approx)	Fire Hazard	Percentage
1	402	Low	1
2	1,532	Medium	4
3A	306	Medium	<1
3B	1,467	High	4
3C	320	Very High	<1
4A >9” QMD	11,672	Medium	34
4A <9” QMD	7,166	Very High	21
4B >9” QMD	5,895	High	17
4B <9” QMD	3,647	Very High	11
4C >9” QMD	212	Very High	<1
4C <9” QMD	1,797	Very High	5
5	40	Very High	<1
Total	34,456		100

Table 3.41 - Post-Harvest Summary of Fire Hazard Rating in Pine - Alternative 2

Fire Hazard	Acres (approx)	Percentage
Low	402	1
Medium	13,510	39
High	7,362	22
Very High	13,182	38
Total	34,456	100

It is important to understand that fuels treatments would not prevent wildland fires from occurring. However, with fuel treatments, the risk of an extreme wildfire event would be greatly decreased. Fuel treatments in adjacent planning areas would contribute to the effectiveness over a larger landscape scale.

The existing FRCC of the project area would also improve across the landscape because stand density would be reduced and the vegetation attributes would be similar to those that occurred naturally. The risk of losing key ecosystem components would also be reduced, thus resembling the historic range.

Hardwoods and meadows provide diversity and also provide natural fuel breaks under most conditions. Where applicable, grazing would enhance the effectiveness of these fuel breaks by removing much of the annual growth of fine fuels. Alternative 2 would help maintain or create approximately 1800 acres of these natural fuel breaks as opposed to Alternative 1 where these untreated areas continue to be encroached upon by pine and spruce and lose their effectiveness.

The commercial treatments would decrease the fire potential by reducing the bulk density of the crown, and increasing minimum cover heights. Natural and activity surface fuels would also be treated to reduce the tons per acre to meet Forest Plan Standards of potential fireline intensity no greater than 200 BTUs/sec/ft. Treatment of created fuels by piling and burning would have the effect of lowering existing fuel levels. In general, treatment of activity fuels would result in the treatment of natural slash. Fire intensities would drop with increases in fuel treatments. The types of treatments proposed to treat activity fuels are described below.

- **Lop and scatter:** Fuels would be lopped into smaller pieces and left scattered on the ground with a maximum height of 18 inches.
- **Machine piling:** Machine piling would be used where a localized heavy concentration of fuel is undesirable, such as a major travel route or next to structures.
- **Hand piling:** On inoperable slopes and erosive soils, hand piling would occur.
- **Whole tree yarding:** The whole tree would be yarded to the landing. Once at the landing, the top would be severed from the merchantable bole and pushed aside for subsequent piling, burning, and rehabilitation.
- **Pile burning**: Piled slash would be burned after drying out for one year. Snow cover needs to be present for pile burning implementation to occur.
- **Mastication: F**uels would be mechanically “ground” to reduce fuel densities. One benefit of this treatment is that very little if any pile burning would occur thus saving money and time.

Prescribed fire is also proposed for up to 2,356 acres to treat residual fuel accumulations and raise canopy base height. Re-introducing fire into the ecosystem has benefits from a forest health standpoint including reducing the potential for high intensity wildland fires and thus has the potential to better maintain long-term air quality (FEIS). All prescribed fires would be conducted within limits of a burn plan explaining the conditions needed to meet resource objectives.

Some areas may receive smoke impacts from burning activities; however, it could be mitigated because pile burning and prescribed fire would be done under controlled events. Burning operations could be halted if smoke impacts were undesirable.

Forest visitors would be able to see activity piles from roads for approximately the next 1 to 5 years. Although the length of time a pile exists would depend on contracting and weather conditions, the majority of piles would not sit longer than two years including one winter needed for curing to burn. Scorched areas occurring from burning piles would be rehabilitated according to Forest Plan Standards and Guidelines. Some piles may also be sold for chips; however this may delay the disposal of them. The district also promotes the use of firewood, thus some piles may be left for that purpose.

ALTERNATIVE 3

The main difference between this alternative and the Proposed Action (Alternative 2) is that there would be additional acres and more aggressive thinning to address prevention of a Mountain Pine Beetle infestation and increased acres of hardwood conversion to aspen. Natural fuelbreaks, aspen, would be increased by 301 acres as compared to Alternative 2. Commercial treatment would increase by 1,985 acres over that proposed in Alternative 2. Overall direct and indirect effects would be similar to Alternative 2, however the degree of positive effects would be greater due to more acres being thinned and additional hardwood acres developed. Fire Hazard would be reduced further as displayed in the following tables.

Table 3.42 - Post-Harvest Fire Hazard Rating in Pine by Structural Stage - Alternative 3

Structural Stage	Acres	Fire Hazard	Percentage
1	402	Low	1
2	1,532	Medium	4
3A	306	Medium	<1
3B	1,456	High	4
3C	304	Very High	<1
4A >9” QMD	15,613	Medium	46
4A <9” QMD	8,568	Very High	25
4B >9” QMD	1,885	High	6
4B <9” QMD	2,226	Very High	7
4C >9” QMD	157	Very High	<1
4C <9” QMD	1,659	Very High	5
5	40	Very High	<1
Total	34,148		100

Table 3.43 - Post Harvest Summary of Existing Fire Hazard Rating in Pine - Alternative 3

Fire Hazard	Acres	Percentage
Low	402	1
Medium	17,451	51
High	3,341	10
Very High	12,954	38
Total	34,148	100

Alternative 3 would further reduce the number of acres in a Very High hazard condition although the overall percentage of stands does not change, as compared to Alternative 2. The more pronounced change occurs in the High and Medium hazard ratings. The percentage of pine stands with a High fire hazard is reduced from 22 percent to 10 percent and those in a medium fire hazard condition are correspondingly increased from 39 percent to 51 percent, as compared to Alternative 2. Those in a Low fire hazard condition remain the same.

As with alternative 2, increased thinning would decrease the risk for large-scale, high intensity fires. It would also increase the potential for success of initial attack as a result of reduced canopy fuels. Alternative 3 would meet Forest Plan Direction and the existing FRCC would improve for the same reasons described in Alternative 2; however, the effects would occur to a greater degree across the landscape. Increased aspen would provide increased natural fuel breaks. Increases in non-commercial thinning would continue to decrease the fire potential by reducing the bulk density of the crown and increase minimum cover heights. There would be no change in the amount of prescribed fire proposed in Alternative 2 resulting in no change in expected smoke impacts as well. Other effects described under Alternative 2 apply to this Alternative as well.

Losses to Mountain Pine Beetle in overstocked stands would also be reduced as stocking levels are reduced to below threshold levels identified by silvicultural personnel, thus reducing fuel loadings in the short-term, as well as long-term.

ALTERNATIVE 4

This Alternative proposes a reduced acreage of commercial and non-commercial treatment in pine stands in the project area, compared to the Proposed Action (Alternative 2). Fuels treatments remain the same as the proposed action. Overall effects to fire and fuels would be similar to Alternative 2, although somewhat less in magnitude as fewer acres are thinned. Tables 3.44 and 3.45 display the resulting acreage of Fire Hazard following implementation of Alternative 4.

Table 3.44 - Post-Harvest Fire Hazard Rating - Alternative 4

Structural Stage	Acres	Fire Hazard	Percentage
1	402	Low	1
2	1,532	Medium	4
3A	306	Medium	1
3B	1,456	High	4
3C	304	Very High	1
4A >9” QMD	10,193	Medium	30
4A <9” QMD	7,311	Very High	21
4B >9” QMD	6,249	High	18
4B <9” QMD	4,555	Very High	13
4C >9” QMD	301	Very High	1
4C <9” QMD	1,807	Very High	5
5	40	Very High	<1
Totals	34,456		100

Table 3.45 - Post-Harvest Summary of Existing Fire Hazard Rating in Pine - Alternative 4

Fire Hazard	Acres	Percentage
Low	402	1
Medium	12,031	35
High	7,705	22
Very High	14,318	42
Total	34,456	100

The main difference in fire hazard ratings between Alternative 4 and the Proposed Action (Alternative 2) is that fewer acres are moved from a Very High fire hazard rating to a Medium fire hazard rating. The acres of pine stands in High hazard ratings are also reduced, but very slightly and the overall percentage does not change. Low hazard stands remain the same.

The potential for Mountain Pine Beetle caused mortality would be higher than the other action Alternatives. As the amount of acreage proposed for treatment decreases, the risk of a large-scale, high intensity fire escaping from the project area would increase. Due to the negligible decrease, the overall risk to the general public, residential areas and firefighters would remain consistent with Alternative 2. The existing FRCC would improve for the same reasons described in Alternative 2, but to a lesser degree. Hardwood and meadow sites would remain consistent with Alternative 2, thus the impacts would remain consistent. There would be no change in the amount of prescribed fire proposed in Alternative 2, resulting in

no change in expected smoke impacts as well. Other effects described under Alternative 2 apply to this Alternative as well.

Cumulative Effects

In the Norwood 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 scale, 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 risks. The previous lack of thinning in dense stands has also contributed to an increase in wildland fire behavior, tree densities, the presence of ladder fuels, and dense crown closures, again all contributing to higher fire risks. This cumulative effects analysis considered past, present, and future activities summarized in Appendix E.

If fires had been allowed to burn instead of pursuing an aggressive fire suppression program over the last 75 to 100 years, a significant increase in the amount of acreage in stands would have burned at a more frequent interval and a lower intensity. However, current conditions favor wildfires of increased fire intensity at longer fire return intervals.

The cumulative effects in the Norwood project area are expected to occur within the project boundary and approximately 2 to 3 miles outside the project boundary. The cumulative effects would occur on all types of ownership that fall within the designated area; however, ownership lands other than Forest Service are not modeled. Fuel treatments are far more effective if collaboration occurs between landowners and other cooperators.

Under the No Action Alternative, cumulative effects would be expected to occur over the next 5 to 15 years or more due to the current Mountain Pine Beetle infestation and the overly dense forest and heavy fuel loadings which would continue to compound upon each other. Tree mortality from Mountain Pine Beetle provides for dead and dry flashy aerial fuels within the first 3 to 5 years, dramatically increasing the risk of large-scale, high intensity fires. The potential for sustained crown fires is greatly increased as well as fireline intensity. As dead needles and small branches fall to the ground, the hazard would also decrease. However, within the next 5 to 10 years the dead trees would start to fall to the ground creating heavy jackpot fuels for several years. This again would substantially increase risks, creating more intense and difficult fire behavior conditions for firefighters, especially ground crews, as flame lengths would exceed ground crews ability for direct attack. With this type of fire behavior, forest suppression objectives would not be met.

Under the No Action Alternative, the FRCC would not improve and would most likely continue to deteriorate, creating conditions conducive to extreme fire behavior as well as insect and disease infestations, thus resulting in a high risk of losing key ecosystem components. Defensible space would also be minimized, resulting in dangerous conditions for the firefighters and the general public in the event of a fire. Current access into the Norwood project area may also be blocked as dead trees begin to fall to the ground. This could create a major issue for firefighters, blocking ingress/egress routes for initial attack activities, as well as blocking evacuation routes, increasing the time required to perform these duties.

Fire occurring several miles outside of the project area may affect Norwood 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-scale, high intensity fire is more probable if no treatment is implemented. A fire start in Norwood, under the right conditions, would not only threaten or damage/destroy improvements in the immediate area, but would also have the potential to burn into or effect surrounding communities such as Newcastle within one burning period (12 hours). A large-scale, high intensity wildfire would bring with it numerous risks and effects. Homes in the path of a wildfire would perhaps be the most immediately recognized value at risk, however, severe wildfires would put numerous other important values at risk including critical infrastructure, critical 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. The proposed treatment combined with monitoring and foreseeable future projects would decrease the risk of large-scale, high intensity fires as well as decrease fuel loading and would continue to keep the forest in desirable conditions. The proposed treatments would reduce stand density and canopy closure bringing the forest back to a more historical type condition. Adjacent area projects would also have an impact. These projects combined with the treatments proposed in Norwood would decrease the hazardous fuels much more efficiently for longer periods of time. In addition, under the action alternatives, the risk of blocked routes would be decreased because expected mortality would be decreased.

With the fuel treatments proposed, fire behavior would be much more manageable consisting of lower intensity surface fires easily managed by ground crews, thus meeting forest suppression objectives and significantly decreasing the potential for sustained crown fires. The FRCC would improve as fuel composition and vegetation characteristics would be returned to more historical type conditions and the risk of losing key ecosystem components would decrease. Defensible space would also be increased providing for increased protection for firefighters and the general public, allowing firefighters to work where they otherwise may not have been able to if no treatment was implemented.

It is important to understand that regardless of treatment, humans and lightning will still ignite fires within the project boundary. These fires are likely to have an impact on residential areas within the project boundary as well as structures within a two to three mile buffer outside of the project boundary. However the impact would be lessened with the implementation of fuels treatments.

WILDLIFE

Wildlife Habitat

The project area contains many different habitat types. Some of these include ponderosa pine (*Pinus ponderosa*)/common juniper (*Juniperus communis*), ponderosa pine/bearberry (*Arctostaphylos uva-ursi*), ponderosa pine/snowberry (*Symphoricarpos albus*), quaking aspen (*Populus tremuloides*)/bracken fern (*Pteridium aquilinum*), white spruce (*Picea glauca*)/grouseberry (*Vaccinium scoparium*), bebb willow (*Salix bebbiana*) shrubland, mountain mahogany (*Cercocarpus montanus*) shrubland, shrubby cinquefoil (*Potentilla fruticosa*) shrubland, western snowberry (*Symphoricarpos occidentalis*) shrubland, and white spruce alluvial Black Hills Forest. The project area is large and therefore consists of many habitat classifications (see Marriott et. al. 2000 for detailed descriptions of each habitat type).

Topography is generally gentle rolling hills that support contiguous pine stands broken by meadows, grasslands, or hardwood canyons. The majority of the forested acres are covered in ponderosa pine, but white spruce and aspen/birch are also present. There are several sections of perennial creeks in this project area. Beaver Creek is the most recognized. It is located in the north end of the project area and flows for approximately two miles within the boundaries. Cold Springs Creek is located in the northwest portion of the project area. Less than 700 feet of the creek is on Forest Service land. Developed and undeveloped springs are present on the Forest Service lands as well as the private. This area has an extensive road system. Total road density is 4.0 miles/square mile (some of these roads have administrative closures). Open road density is actually 3.7 mi/sq mi from 4/1-12/14 and 2.6 mi/sq mi from 12/15-3/31. These roads provide access for various forest management activities, and recreational uses including snowmobile routes. There are 9.1 miles of existing trails in the project area.

Please refer to the Silviculture section presented earlier in this Chapter for more information on these habitat components and the effects of the alternatives on each.
The cumulative effects area for this analysis includes the project area and activities that have occurred within the last 10 years and 10 years into the future. Appendix E provides a summary of past, present, and future activities considered in the cumulative effects analysis.

GRASSLANDS/MEADOOWS

Approximately five percent (2,126 acres) of the National Forest lands in the Norwood Project Area are classified as natural (grassland) meadow. Additional meadow/grassland acreage is on private lands, mostly unoccupied. However, there are opportunities on National Forest land in the project area to maintain and expand grassland/meadow acreage. Pine encroachment treatment and meadow restoration would increase the acreage. Livestock grazing is permitted on these meadows. The Action Alternatives would improve forage conditions for big game, and provide forage and cover habitat for small mammals, birds and

other wildlife species. Between 1995 and 2002 there has been a +7.5 percent change in forest-wide grassland acres reported (USDA Forest Service, 2004a).

SHRUBS

Less than one percent of the Norwood project area is classified as shrubland. There are 224 acres of mountain mahogany shrubland along the west edge of the project area in Wyoming, in management area (MA) 5.4. Mountain mahogany is present on rocky dry slopes generally at elevations between 3,800 and 4,900 feet. It is considered strongly dominant where it exists. It is often associated with rocky mountain juniper and ponderosa pine. Ground vegetation below the mountain mahogany is seldom over 25 percent cover (Marriott et. al. 2000). Mule deer and elk often feed on the twigs of mountain mahogany.

Primary shrubs (within 5.1 MA) include western snowberry, shrubby cinquefoil, bebb willow and common juniper. Western snowberry and shrubby cinquefoil is usually found in grassland/meadow bottomlands. The bebb willow in the project area is located in dry and wet draws. The health of the bebb willow populations falls short of desired. The willows are suffering from many pressures, such as livestock grazing, wildlife browsing and drought conditions. The ponderosa pine/common juniper woodland type is common in the Black Hills. Common juniper is typically found under a wide range of canopy coverages (i.e., 25 to 60 percent) (Marriott et. al. 2000). Common juniper is also found in some of the spruce sites. The majority of the spruce acreage is in SS 4B or 4C which has a canopy cover of 40 to 100 percent.

Mountain mahogany sites would not be affected by any Action Alternative in the Norwood project area. The Action Alternatives may have a negative impact on common juniper within treated stands because of damage or mortality associated with heavy machinery, skidding, and felling trees, and canopy cover reduction. Although most of the timbered stands would be classified as SS 4A and 4B after completion of treatments, most of these stands should have the minimum canopy cover available (i.e., greater than 25 percent) for common juniper to persist. Additionally, there are a number of ponderosa pine and spruce sites of different structural stages being deferred that should maintain common juniper. The Action Alternatives should have a beneficial impact on early successional shrub species. Grazing, browsing, drought conditions, and other pressures may continue to affect/alter various shrub species in the project area. Objective 5.1-203 would be met through any of the three action alternatives. Hardwood shrub communities would be enhanced through many of the proposed treatments and post harvest activities, such as riparian protection and willow planting.

Under the No Action Alternative early successional shrubs may decrease. The mountain mahogany sites would not be affected under this alternative. Riparian shrubs would not receive protection through post-harvest activities.

FORESTED STANDS

The project area contains 2,206 acres of aspen, 26 acres of paper birch, 3,023 acres of white spruce and 34,642 acres of ponderosa pine sites. There is opportunity to maintain and increase aspen and birch within the project area and to maintain and improve structural

diversity within the pine and spruce stands. Refer to the Silviculture section in this Chapter for further information on forested stands, including the effects of the Alternatives.

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+ inches DBH) of at least 160 years in age. Late succession ponderosa pine may occur in dense stands but may also grow in the open or in 'park-like' stands. This structural stage is not automatically calculated by stand exam, but rather is determined by field verification. In the Norwood project area, there is one, 40-acre pine stand which was field verified and determined to be structural stage 5. There are additional stands in the canyon areas along the western edge of the project area, which contain stands of pine which are very old. However, these stands do not meet the criteria of very large trees. Other stands in the project area, approximately 2,630 acres, have very large trees, but do not meet the age criteria for SS 5.

Direct and Indirect Effects

ALTERNATIVE 1 – NO ACTION

No change in existing SS5 would occur with this alternative, in the short-term (less than 10 years) unless some unplanned disturbance action were to occur in this stand. The potential for loss to a wildfire or insect infestation would be the greatest with this alternative. Over time, barring a disturbance, this alternative would provide the most potential for development of SS5 as mature conifer stands age and become more dense.

ALL ACTION ALTERNATIVES

None of the alternatives would implement any harvest treatments or other management activities within late succession stands. Each would harvest mature tree stands, which may lessen or lengthen the time necessary to achieve a SS5 condition. Overstory removal treatments would remove all the mature overstory trees in a stand 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 likely hasten the development of SS5.

The potential for loss of dense, mature stands would be reduced under all of the Action Alternatives. Alternative 3 would present the least potential for loss, followed by Alternative 2, then Alternative 4. The proposed vegetation treatments would reduce fire hazard rating and insect susceptibility ratings in treated stands.

Cumulative Effects

There would be no direct or indirect effect to existing late succession stands and therefore, no cumulative effects.

Snags and Downed Woody Material

Affected Environment

Stand exam data collected in 2002-2004 was used to determine existing snag numbers and amounts of down woody material within the project area. This data shows sufficient amounts of down woody debris throughout the Norwood Project Area to either meet or exceed Forest Plan Standard 2308. This data also show that existing snag numbers are below those stated in Forest Plan Objective 211.

In addition to the stand exam data, random transects were completed in 2005 in the project area to count ponderosa pine snags with at least 9-inch dbh and at least 25 feet in height. Spruce and hardwood snags with at least 10-inch dbh and at least 15 feet in height were also counted. Using both the stand exam information and snag transects, existing hard snag density per acre ranged from 0.58 to 2.36 across the project area. Snag densities in this project area are below the Objective 211 of an average of 3 hard snags per acre. Acres containing spruce habitat generally had higher snag and down woody material counts and snag clumping was common.

Mountain Pine Beetle (MPB) infestations are present within the Norwood project area. There are 15,575 acres (45 percent) of pine habitat in the project area that are considered at high risk for MPB infestation. Pine beetles and recent wildfires within the project area have created more snags and downed wood in the last five years. One of the most recent wildfires was the Sheldon Fire which burned more than 350 acres in the project in 2002, creating many snags. These localized patches of snags are mostly unaccounted for in the snag density estimate shown above. Therefore, in reality, snag densities are higher. With the active MPB infestation adjacent to the Norwood project area, snag densities are increasing. In addition, the Jasper fire area is directly southeast of the project area and provides an abundance of snags.

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

Direct and Indirect Effects

ALTERNATIVE 1 – NO ACTION

This Alternative would provide the greatest opportunity for increased snag numbers and down woody material. Snags would be expected to increase because of natural mortality. Trees would become more dense and over time, competition for water and nutrients would stress the trees, which would make them more susceptible to insects and disease agents. Dense trees would increase wildfire risk as well. Natural mortality levels would be higher with this alternative than any of the Action Alternatives. As these trees die and fall to the

ground there would be an increase in down woody debris. No large diameter trees would be removed in this alternative.

ALL ACTION ALTERNATIVES

Insect infestations in the project area are enlarging and spreading within the project boundary. It is expected that snag densities will increase due to the numerous "bug" pockets causing tree mortality in the area. No snags would be cut unless deemed a safety hazard during operations. As per Standard 2301, if the project area does not meet Objective 211 then all snags would be left during treatments unless deemed a safety hazard. These alternatives propose sanitation treatment on approximately 271 acres. This treatment would harvest those trees that have been hit by pine beetles but are still green. Proposed fuel treatments on 5,931 acres, including mechanical thinning, broadcast burning and fuel breaks, have the potential to destroy snags and downed wood, however design criteria would include ensuring snags are protected (refer to Appendix B). Vegetation treatments, both commercial and non-commercial, would have the potential to destroy snags and downed wood. Of the action alternatives, Alternative 4 would have the greatest potential for future snag numbers and down woody material. Since large snag densities are low during this entry, any protection of standing snags would move snag densities toward Forest Plan standards and guidelines. Road closures planned under this action alternative would help deter illegal firewood cutting of snags.

Cumulative Effects

Past firewood cutting, timber harvest, and past fuels management activities have contributed to the loss of snag and downed wood habitat. Fire, insects, and other causes of tree mortality continue to create snag/downed wood habitat. With the restriction on cutting standing dead for firewood, insect outbreaks moving into the area, wildfires, and proposed road closures, the outlook for improving snag densities for this area is good. No adverse cumulative effect to snags or downed wood is expected with any alternative.

Riparian Habitat

Affected Environment

There are several stretches of perennial creeks within the Norwood project area. During riparian surveys by district biologists and technicians, fish were observed in one creek. Beaver creek contained rainbow, brook, and brown trout. Beaver Creek flows through Sections 5, 6 and 8 of T1N R1E in South Dakota and through a piece of Section 3 of T47 N R60W in Wyoming within the Norwood project area. This creek flows through RIS site 40501-001 in South Dakota and site 40304-085 in Wyoming. The creek and its adjacent riparian habitat are fenced from livestock and off-road motorized use. There is a stock tank for cattle use along the creek. There are native willows and spruce in this creek corridor. The banks along the creek are stable and vegetated. An occupied beaver dam/pond is west of the campground.

There is a 600 to 700 foot long section of Cold Springs Creek in Township 2N Range 1E, Section 6 SW1/4SW1/4 within the project area. This creek runs through RIS site 40203-063 at the extreme south end. The creek and its adjacent riparian habitat are fenced from private on two of its three sides. The remaining side is open Forest Service land. Cattle are allowed to water in this section of creek from the allotment to the north. There are native willows and spruce in this creek corridor. The banks along the creek are stable and vegetated. The condition of Cold Springs Creek is variable depending on ownership of the land through which the creek flows. Cattle grazing on the private land is intensive. With the removal of the spruce trees along the creek on private land, available cover to keep the water temperatures cooler has disappeared.

The SD Dept. of Game, Fish and parks 1984/85 fishery report lists finding brook trout (*Salvelinus fontinalis*), brown trout (*Salmo trutta*), and rainbow trout (*Oncorhynchus mykiss*) in Cold Springs Creek. In June of 1995, brook and brown trout were collected. Cold Springs Creek is managed as a put-and-take fishery with catchable brown trout (statewide fisheries surveys, SD Dept. GFP, 1984/85 and 1995). Currently, the majority of the Norwood roject area is meeting Forest Plan Guidelines 3210-3212 for riparian health. Numerous reservoirs have been created for livestock watering within the project area. Ponds have also been specifically created for wildlife use. In addition there are riparian communities in some of the canyons within the project area.

Direct and Indirect Effects

ALTERNATIVE 1 – NO ACTION

There would be no change to the existing riparian habitat or riparian habitat protection measures in the project area. This alternative would forego the opportunity for riparian enhancement projects including, planting willows, additional fencing, road closures, installing new tanks and fencing new riparian areas, and re-locating existing stock tanks farther from riparian corridors.

ALL ACTION ALTERNATIVES

These alternatives would improve riparian condition and protection. All three Action Alternatives propose the same riparian protection/enhancement projects (post harvest). These include planting willows, building more exclosure fences, road closures, installing new tanks, fencing new riparian areas, and re-locating existing stock tanks farther from riparian corridors. Therefore the Action Alternatives would move the riparian areas to better condition overall in the project area. Many of the Forest Objectives, Standards, and Guidelines are being currently met in the project area or would be reached under the Action Alternatives. None of the proposed commercial treatments are adjacent to perennial streams nor would cause negative impacts to riparian habitat.

Cumulative Effects

Past fire suppression, timber harvest, road use, recreation (motorized), livestock grazing, and natural events such as drought and flooding have caused impacts to riparian areas within the

project area. Fire suppression has resulted in an increase of pine trees which may lead to a change in water tables. Drought conditions and livestock/wildlife use can also negatively impact the water level in the riparian areas. Timber harvest, road use, motorized recreation, flooding, and livestock grazing can contribute sediment buildup. The post-sale projects discussed in Chapter 1 would improve riparian habitat under the action alternatives. The harvest of trees may also be beneficial for riparian areas by decreasing acreage of pine trees and thereby decreasing water use. None of the alternatives would have an adverse cumulative effect to riparian areas.

MANAGEMENT INDICATOR SPECIES (MIS)

Direct and Indirect Effects

Management Indicator Species (MIS) or their habitats are representative of a variety of habitats and can indicate overall changes in the forest ecosystem. The Phase II Amendment to the 1997 Forest Plan-FEIS (USDA Forest Service 2005a) lists MIS to be considered during project-level planning. MIS species were selected from that list for analysis in this document if they are present or have habitat within the Norwood Project Area (Table 3.46). Some MIS species have additional status (such as R2 sensitive), and additional analyses are provided for them in the Norwood Biological Assessment/Biological Evaluation (BA/BE) which is summarized in Appendix D. Refer to Appendix D for a summary of the BA/BEs for sensitive species within the project area.

Table 3.46 - MIS List and Rationale for Project-Level Analysis.

Species	Analyzed in Rep.	Rationale	Habitat Description
Beaver *(Castor canadensis)*	Yes	Beaver are present in the Norwood 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	The project area is suitable habitat. The species was observed numerous times during summer field work.	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)*	Yes	Preferred habitat is present in the project area. Species has been observed in project area.	Found almost exclusively in white spruce habitat but occasionally present in habitats with a spruce component (Panjabi 2003).
Grasshopper sparrow (*Ammodramus savannarum*)	No	Suitable habitat is not present within the project area.	Found almost exclusively in native mixed-grass prairies (Panjabi 2003).
Black-backed woodpecker (*Picoides arcticus*)	Yes	Habitat is present in the project area. This species has been observed within the project area.	Burned areas with a high density of pre-burn snags; dense and/or mature forests with a high snag density (Anderson 2003, Panjabi 2003).
Brown creeper (*Certhia americana*)	Yes	Spruce habitat and late successional pine is available. Brown creepers have been sighted in the project area.	In the Black Hills, white spruce and late successional pine appears to be the most important habitat type for this species (Panjabi 2001, 2003).
Ruffed grouse *(Bonasa umbellus)*	Yes	Habitat is present within the Norwood project area. This species has been observed in the project area.	Variable aged aspen stands, other hardwoods and pine forests provide habitat. Winter habitat is almost exclusively aspen (Tallman et al. 2002, DeGraaf et al. 1991).
Song sparrow *(Melospiza melodia)*	Yes	Habitat is present within the Norwood project area. This species has been observed 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*)	Yes	The mountain sucker has marginal habitat in the Norwood Project Area within Beaver Creek.	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 population changes of MIS is accomplished through coordinated efforts involving US Forest Service biologists, research, contracted monitoring surveys, 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 Black Hills National Forest Monitoring Reports (2001-2005) summarize the best available population/habitat information from available sources.

Beaver (MIS)

Beavers are found in suitable habitat throughout much of North America and are widely distributed in South Dakota (Higgens et al. 2000). Their populations were significantly reduced by the 1880s from extensive trapping (Parrish et al. 1996). However, numbers have increased since then and although they can still be legally harvested, active management and regulations have moderated the effect of trapping on populations. Beavers can be found in large rivers, lakes, streams, marshes, and just about anywhere there is at least a weak flow of water and material for damming. The species is vegetarian and forages on leaves, twigs and the inner bark of woody plants. Its preferred diet consists of aspen, willows, cottonwoods and alders (Higgens et al. 2000).

Baseline beaver surveys were conducted on the Forest in the fall of 2004. The species was most commonly found in the Bearlodge Mountains and central Black Hills. A total of 74 active and 5 inactive beaver colonies were identified. Assuming an average of 3.5 to 5.3 beaver per colony (Payne 1981), the current estimated population size is between 250 and 390 beavers (USDA Forest Service 2005b). Long-term beaver population trend has increased in the Black Hills since heavy trapping has decreased. Changes in riparian habitat and the amount of aspen habitat indicate a long-term declining habitat trend for beaver. More recent riparian enhancement projects have improved habitat conditions. More monitoring and habitat restoration projects are warranted for a better assessment of benefits to beaver. Changes to habitats and populations are expected to be slow (USDA Forest Service 2005a). Beaver have been present in the project area in the past and are currently present west of Beaver Creek campground. Beaver Creek is the only riparian area suitable for beaver in the Norwood project area.

The beaver was selected as a Forest MIS to evaluate the effects of Forest Plan implementation and natural change on the ability of the Forest to support species that rely on a variety or riparian and hardwood forest conditions to meet their needs (USDA Forest Service 2005a).

ALTERNATIVE 1 – NO ACTION

Under the no action alternative, beaver habitat in the project area would remain in tact due to the riparian protection along Beaver Creek. Shrubs and other forage will continue to grow in this riparian area. Objective 238a will continue to be met for beaver along Beaver Creek.

ALL ACTION ALTERNATIVES

No commercial or non-commercial treatments are proposed in the Beaver Creek corridor. In all three action alternatives post-harvest activities would be in place to keep the protective fencing in good condition around Beaver Creek. Planting of willows is proposed in all three action alternatives which will improve forage opportunities for the Beaver. None of the action alternatives would contribute to a loss of habitat or decrease in the beaver population Forest-wide. Post-harvest activities planned under the action alternatives may be beneficial for beaver. Objective 238a is currently being met for beaver along Beaver Creek. It would continue to be met under any of the three action alternatives. The analysis completed for the Phase II Forest Plan amendment concluded that there will be adequate habitat for

maintaining viable populations of beaver (page III-290, USDA Forest Service, 2005). All of the alternatives would follow Forest Plan standards and guidelines and move toward Forest Plan objectives. Therefore, beaver are likely to persist on the Forest.

CUMULATIVE EFFECTS

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

The past activity of protecting Beaver Creek by constructing a fence to exclude cattle has benefited beaver. Past harvest operations may have been beneficial for the water flow in the creek. Fewer pine trees in the area may lead to increased available water. Beaver may be impacted due to the presence of humans in the nearby campground. This is likely to continue. In the future, human presence may increase in the vicinity of the beaver habitat due to recreation opportunities. The project area has had several years of drought conditions and this may go into the future as well. This factor may influence the riparian habitat for the beaver in the area. The Action Alternatives would be beneficial to the beaver due to riparian protection and enhancement activities and potential increases in available water as trees are thinned. No Adverse cumulative effects would occur to the beaver as a result of any alternative.

There are no foreseeable future activities which would affect riparian areas.

White-tailed Deer (MIS)

The Norwood area is mainly spring, summer and fall range for white-tailed deer, although they may inhabit the area in winter if the season is mild. Usually if snow depths exceed 6 inches in depth, deer move to lower elevations. The Norwood area is normally snow covered all winter. For white-tailed deer, spring migration back to summer range generally takes place from mid-to-late May. Fall migration to winter range is normally done during the September to October time frame but is primarily dependent on snow accumulation (Griffin et al. 1999). During field surveys in 2002-2006, white-tailed deer were commonly observed. The area is used for fawning of white-tailed deer.

Black Hills white-tailed deer population trend has increased between 2000 and 2004. Habitat trend at the Forest-level suggests that summer habitat is increasing while winter habitat is stable to slightly decreasing. The Forest is meeting Objective 238a, with regard to summer habitat, but the Forest may not be maintaining winter habitat, although the decline might not be significant (USDA Forest Service 2006b).

White-tailed deer were selected as a Forest MIS to evaluate the effects of Forest Plan implementation and natural change on the ability of the Forest to support species that rely on a variety of forest conditions, including the presence of understory shrubs, to meet their needs (USDA Forest Service 2005a).

Big Game Screening

Forest Plan Guideline 3203 states "Provide big game screening along at least 20 percent of the edges of arterial and collector roads. Consider vegetation, slopes, landform, etc. in evaluating available screening."

Screen cover is defined as being able to hide 90 percent of an adult deer or elk from human view at a distance of 200 feet or less (of the road). There are eleven collector and arterial roads in the Norwood project area where the screening cover requirement applies. Currently nine of the eleven roads are in compliance (Table 3.47). Screening cover was determined by driving these eleven roads and measuring distances providing adequate screening cover either from vegetation (generally pine regeneration) or topography (slope and landform). These measurements were then compared to total distances (through Forest Service lands only) along the roads.

Two collector roads, 809 and 968, have inadequate hiding cover (less than 20 percent). The remaining nine roads have more than adequate screen cover from vegetation and/or topography. Sites along 809 and 968 are in structural stage 4A (ponderosa pine) and grassland habitat. Topography does provide some hiding cover along these two roadways. Regeneration in the pine stands is not yet adequate to meet the definition of hiding cover.

Table 3.47 - Current Screening Cover in the Norwood Project Area On Forest Service Land.

Road Numbers	Functional Class	Percent Screening Cover
US Hwy. 85	Arterial	33
109.1	Collector	42
109.3	Collector	57
110	Arterial	51
117.1	Arterial	30
265	Collector	39
268	Collector	53
809	Collector	17
810	Arterial	45
811	Arterial	100
968	Collector	11

ALTERNATIVE 1 – NO ACTION

In time pine seedlings would provide some additional hiding cover along the roads listed above. Under this alternative no timber harvest would occur. Trees would become denser and provide better cover. Other areas would develop into cover over time. However, pine would continue to encroach into meadows and hardwoods, further reducing the amount of quality forage. This would likely to cause an increase in competition for forage between livestock and big game. The potential for insect infestations and wildfire would be the

greatest with this alternative. These disturbances would remove cover and create forage over large areas. No roads would be closed.

ALTERNATIVE 2

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 identified for treatment such as commercial thinning, seedcut and overstory removals. SS 2 would also increase due to overstory removal treatments. Structural stage 2 would increase to 5 percent of the project area, from 2 percent in the existing condition. SS 4A would increase to 47 percent of the project acreage from 43 percent in the existing condition. SS 4B would decrease from 33 percent existing, to 27percent of the area acreage. SS 4C would decrease from 8 percent existing to 7 percent of the area acreage. By increasing SS 4A acreage, completing pine encroachment and meadow restoration, hardwood release, and harvesting in general, forage production for white-tailed deer should increase. This would include grasses, forbs and shrubs.

This alternative would increase early successional vegetative 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).

The proposed road closures could help compensate for lacking high quality hiding cover. Road closures also reduce disturbance to big game. Any vegetative treatments and/or post-harvest projects proposed under this action alternative may cause displacement of individuals; however, deer would be expected to come back to the affected areas in a short time period.

No treatment is proposed along FDR 809 or 968 which are currently not meeting Objective 3203 for screening cover. Therefore, no reduction in screening cover would occur along these roads and over time, pine regeneration would grow and provide screening cover in the future. Proposed treatments would slightly reduce the amount of cover habitat along roads US Highway 85, 109.1, 109.3, 110, 117.1, 265 and 268. Vegetative treatments, such as commercial thinning, hardwood release, seedcut, and overstory removal, would not have much of an effect on the current screening cover in the sites along these collector and arterial roads because the focus in these treatments is the removal of larger sized pine trees that are not providing much screen cover. Fuel treatments may remove smaller pine which contribute to screening cover. However, screening cover would remain above 20 percent after any fuels treatments along the roads currently meeting the objective. Design criteria would be included to insure screening cover percentages are met (see Appendix B).

This alternative would not contribute to a Forest-wide loss of habitat or decrease in population for white-tailed deer. The analysis completed for the Phase II Forest Plan amendment concluded that there will be adequate habitat for maintaining viable populations of white-tailed deer (page III-298, USDA Forest Service, 2005). This alternative would follow Forest Plan standards and guidelines and move toward Forest Plan objectives. Therefore, white-tailed deer are likely to persist on the Forest.

ALTERNATIVE 3

The main difference in effects to white-tailed deer as compared to Alternative 2 is the magnitude of change in forage and cover habitat, as well as increased aspen habitat. As with Alternative 2, cover would be reduced and forage increased in this alternative. The magnitude of this change in Alternative 3 is the greatest of all alternatives. SS 4B would be reduced by 19 percent from the existing condition and SS 4C would be reduced to 6 percent of the project area from 8 percent in the existing condition. SS 4A would increase to 61 percent of the project area acreage from the existing 43 percent. This alternative shows the same increase in SS 2 as Alternative 2.

Hardwood habitat would be further increased in Alternative 3. A total of 489 acres of hardwood conversion would occur under this alternative, which is 309 acres more than in Alternatives 2 or 4. This would benefit white-tailed deer by increasing this browse opportunity.

The effects to screening cover would be the same as described under Alternative 2.

Proposed road closures are the same as in Alternative 2. This alternative may cause a short-term temporary displacement of individuals, but areas void of disturbance would be available in the project area.

This alternative would not contribute to a Forest-wide loss of habitat or decrease in population for white-tailed deer. The analysis completed for the Phase II Forest Plan amendment concluded that there will be adequate habitat for maintaining viable populations of white-tailed deer (page III-298, USDA Forest Service, 2005). This alternative would follow Forest Plan standards and guidelines and move toward Forest Plan objectives. Therefore, white-tailed deer are likely to persist on the Forest.

ALTERNATIVE 4

The effects to white-tailed deer as a result of Alternative 4 are similar to those described under Alternative 2 above. The difference is that less cover stands would be converted to forage. Alternative 4 proposes less harvest of SS 4B and 4C than Alternatives 2 and 3. SS 4A would be increased by 1 percent from the existing condition. Because lack of forage has been attributed to the recent declines in white-tailed deer populations (DePerno 1998, Griffin et al. 1999), this alternative would have less of a positive impact on white-tailed deer than Alternative 2.

Other effects in regard to screening cover, hardwoods and roads are the same as described in Alternative 2. This alternative may cause temporary displacement of individuals. Deer would return to the affected areas.

This alternative would not contribute to a Forest-wide loss of habitat or decrease in population for white-tailed deer. The analysis completed for the Phase II Forest Plan amendment concluded that there will be adequate habitat for maintaining viable populations of white-tailed deer (page III-298, USDA Forest Service, 2005). This alternative would

follow Forest Plan standards and guidelines and move toward Forest Plan objectives. Therefore, white-tailed deer are likely to persist on the Forest.

CUMULATIVE EFFECTS

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

Private land in-holdings in Norwood are currently used for summer livestock grazing and the grass is considered livestock forage. By the end of the grazing season, little usable herbaceous cover remains on these private lands. Roads on private lands contribute to disturbance levels. Past fires have produced areas of good forage, while at the same time the fires have decreased cover. Pine insects have and are creating pockets of forage for white-tailed deer within forested sites in the project area. Past and present drought conditions may be decreasing available forage.

Alternative 3 takes a more aggressive approach toward increasing aspen acres over alternatives 2 and 4 and would have the most benefit of increased aspen acreage. This could help offset impacts on other lands where aspen is not being restored. Alternative 4 would retain the most dense cover (structural stages 3C, 4B, 4C and 5). Alternative 2 would retain less and alternative 3 the least. Reductions in cover would be offset by increases in forage.

There are several foreseeable future activities that may impact white-tailed deer cover and forage within and adjacent to the project area. These activities include thinning, prescribed burning, hardwood release, hardwood regeneration and pine encroachment removal and are associated with the Stateline, Canyon, Mallo, Run and Fanny timber sales on National Forest and a possible treatment area on BLM lands in Wyoming. All of these activities would be expected to increase the amount and diversity of forage available for deer while reducing cover.

Golden-crowned Kinglet (MIS)

The golden-crowned kinglet breeds from Alaska to California, southern Utah, south-central New Mexico, Mexico, Guatemala and east of the Rockies to New York, eastern Tennessee, western North Carolina and southern Maine (DeGraaf et al. 1991). The species is considered an uncommon permanent resident in the higher elevations of the Black Hills (Tallman et al. 2002). Recent monitoring shows that it is most abundant in the northwestern Black Hills (Panjabi 2003). It is closely tied to white spruce and that is where the highest densities of the species can be found. However, they have been observed in other habitat types but there is usually some spruce present. A golden-crowned kinglet was found in the project area within a spruce site in 2002 (Panjabi 2003). In 2005 golden-crowned kinglets were observed along Cold Springs Creek and Beaver Creek (Beason et al. 2006).

From observations of the golden-crowned kinglet on the Forest in the last five years, it appears population trend is increasing. Habitat trend for the golden-crowned kinglet appears to be increasing based on the short-and long-term increases in spruce forest. The Forest is meeting Objective 238c (USDA Forest Service 2006b).

The golden-crowned kinglet was selected as a Forest MIS to evaluate the effects of Forest Plan implementation and natural change on the ability of the Forest to support species that rely on a variety of conditions in spruce habitat to meet their needs (USDA Forest Service 2005a).

There are 3,023 acres of spruce designated in the Norwood Project Area. The majority of these acres are in structural stages 4A, 4B, and 4C. The majority of the spruce acres are in the north half of the project area. There are additional acres of spruce within designated ponderosa pine sites.

ALTERNATIVE 1 – NO ACTION

Under this alternative, no spruce sites would receive any treatment. Trees would continue to mature and eventually become snags. Small openings wouldl naturally occur in spruce sites allowing succession. No preferred habitat would be treated under the No Action Alternative. Spruce acreage would continue to expand in the project area. Therefore golden-crowned kinglet habitat would be most enhanced under the no action alternative. No change to Objective 238c would occur.

ALL ACTION ALTERNATIVES

Under all action alternatives, one designated spruce site would be treated. This site (40203-017) is 195 acres and is proposed for group selection treatment in each alternative. The structural stage is 4A and it would remain a 4A after treatment. This site represents 6 percent of the designated spruce acreage. Of the total 505 acres proposed for group selection treatment in the three action alternatives, 310 (505-195) of these acres are in designated pine sites, which contain some spruce acreage. In these pine sites with proposed group selection treatment, the spruce pockets would be harvested and the surrounding pine acres would be thinned. The group selection treatment could impact the golden-crowned kinglet by removing habitat which would cause displacement of individuals to more suitable habitat.

The Beaver Creek and Cold Springs Creek corridors of spruce are not proposed for any treatment in any of the three action alternatives. The majority of the spruce acres in the project area would be deferred from treatment for marten connectivity habitat and/or land snail habitat.

Although all of the action alternatives may contribute to a slight loss of habitat for the golden-crowned kinglet within the project area boundaries, the potential habitat available in the project area would be on a small scale when comparing it to Forest-wide potential habitat. This in conjunction with conserving spruce habitat would mean that the Forest-wide habitat trend, population trend and Objective 238c would not be influenced by the Norwood action alternatives.

The analysis completed for the Phase II Forest Plan amendment concluded that there will be adequate habitat for maintaining viable populations of golden crowned kinglets (page III-263, USDA Forest Service, 2005). These alternatives would follow Forest Plan standards and guidelines and move toward Forest Plan objectives. Therefore, golden-crowned kinglets are likely to persist on the Forest.

CUMULATIVE EFFECTS

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

Spruce in this area has not been treated as heavily as the pine. Many of the spruce sites have not been entered for decades and do not receive much impact from roads, recreation, or grazing. Past and on-going fire suppression activities have allowed spruce to increase, at the expense of other forest types (USDA, Forest Service 2005). The past and present drought condition may be impacting the acres of spruce in the project area. The trees may be weakened in the long run. The project activities in all action alternatives in spruce are not expected to further reduce acres of spruce. The group selection harvest in the only treated spruce stand may offset some effects of the drought by reducing competition in that stand. There are no known foreseeable future activities which would impact spruce in the project area. Habitat for this species will be maintained.

Black-backed Woodpecker (R2 sensitive species and MIS)

Refer to the BA/BE for details on habitat, distribution and project level analysis.

Black-backed woodpeckers are most prevalent in burned areas and to a lesser extent, pine beetle areas, storm damaged stands, and late successional stands of ponderosa pine. Observations from 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). In 2003, RMBO reported a sighting of a black-backed woodpecker in the project area. This site is in SS 4B and is ponderosa pine (Panjabi, 2004). During the spring of 2004, a black-backed woodpecker was observed one to two miles northwest of Moon Campground within the Norwood Project Area by a district biological technician. In the summers of 2002 and 2004, black-backed woodpeckers were observed along the project boundary (Panjabi 2003 and 2005). This species was also observed in the project area in 2005 (Beason et al. 2006).

It is estimated that 88,648 acres of large wildfires (greater than 300 acres) have burned forest-wide between 2001 and 2005, and approximately 449,000 acres have been affected by mountain pine beetles from 2000-2004. Within the affected beetle acreage, not all trees were killed or affected (USDA Forest Service 2006b). Research conducted by Mohren (2002) indicated that this species prefers dense stands of mature ponderosa pine (SS 4C) and avoids the more open nature of SS 4A and 4B stands. In 2005, there was almost twice as much SS 4C available than is desired by the Forest Plan objectives (USDA Forest Service 2006b). Forest population trend analysis reveals a notable increase and subsequent decrease in the black-backed woodpecker densities over the past 5 years. Long-term habitat trend (10 to 25 years) has shown a large increase. In the past few years habitat trend has been stable or slightly decreasing. However, overall the habitat is relatively abundant and Objective 238b is being met on the Forest (USDA Forest Service 2006b).

The black-backed woodpecker was selected as a Forest MIS to evaluate the effects of Forest Plan implementation and natural change on the ability of the Forest to support species that

rely on mature and late successional forest, burned forest, insects, and snags to meet their needs (USDA Forest Service 2005a).

There are currently 12,307 acres of SS 4B ponderosa pine 2,773 acres of SS 4C ponderosa pine and 40 acres of SS 5 pine within the project area. Refer to the snag discussion section earlier in this Chapter for information on snag conditions within the project area.

ALTERNATIVE 1 – NO ACTION

This alternative would allow natural successional changes to occur in vegetation. All existing stands would be maintained and trees would become larger and denser; this would eventually cause competition for water and resources inducing stress in the trees. Stressed trees are more susceptible to insect attack and dense trees are more susceptible to wildfire. Insects provide food for woodpeckers and trees killed by insects provide snags for nest sites. This alternative would provide for the greatest potential increase in woodpecker habitat over time.

ALTERNATIVE 2

Treatments included in this alternative are designed to thin overstocked tree stands by harvesting commercial sized trees. This would create more open stands that are less susceptible to attack by insects. It reduces the total acres of dense stands and the number of large (greater than 9-inch dbh) trees.

Proposed fuel treatments along with other vegetative treatments and harvest have a slight potential to decrease existing snag numbers (refer to snag section earlier in this Chapter). However, design criteria is included as part of this project to protect existing snags and therefore, any loss of snags would be expected to be negligible. Proposed harvest may disturb nesting woodpeckers if harvest occurs during the nesting season. This impact would be expected to be short-term, affecting only one brood at most since harvest of each unit usually takes only a short time. Alternative 2 proposes 1,652 acres of overstory removal. The majority of these acres would be converted to SS 2, which is not preferred by this species. No treatment is proposed in the 40 acre SS 5 site.

Proposed road closures are the same under each alternative. These closures may help deter the illegal taking of snags for firewood and thereby protect black-backed woodpecker habitat.

Under this alternative, the resulting acreage of SS 4B pine would be 9,542. There would be 2,009 acres of SS 4C pine remaining. This equates to a reduction of nearly 3,000 acres of SS 4B pine and more than a 700 acres of SS 4C pine, when comparing this Action Alternative with the existing condition. These decreases in structural stages would decrease available black-backed woodpecker habitat. In addition, the proposed treatments would lessen the potential for large-scale wildfire or insect caused mortality, thereby lessening the potential for preferred black-backed woodpecker habitat to develop in the future (refer to the Fire and Fuels section presented earlier in this Chapter for more information).

Although this alternative may decrease preferred and/or potential habitat, it would not affect the habitat or population trend Forest-wide for the following reasons: standards 2301, 2304

and 2305 (providing for Forest Objective 211 snag numbers and the preservation of large and soft snags) would apply to the Norwood project area; the project area makes up a small portion of the black-backed woodpeckers' available habitat on the Forest; and new habitat acres (insect areas and burns) are being created across the Forest. Objectives 221 (sensitive species) and 238b are currently being met and would be met under the Action Alternatives.

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 and that abundance is expected to exceed levels which would cause concern for viability (page III-246, USDA Forest Service, 2005). This alternative would follow Forest Plan standards and guidelines and move toward Forest Plan objectives. Therefore, black-backed woodpeckers are likely to persist on the Forest.

ALTERNATIVE 3

As part of Alternative design, the potential for large-scale fire or mountain pine beetle caused mortality would be much reduced in this alternative. Alternative 3 proposes the most harvesting of SS 4B and 4C stands. Under this alternative SS 4B pine would decrease by more than 8,000 acres from the existing condition and 5,000 acres from Alternative 2. SS 4C pine would decrease by more than 900 acres from the existing condition which is nearly 200 less than Alternative 2. No change would occur to SS 5 stands.

As a result, Alternative 3 would have the most impact on the black-backed woodpecker by decreasing available preferred habitat and further reducing the potential for larger-scale disturbance events which create extensive snag habitat. Of the action alternatives this one has the potential to remove the most snags due to safety hazard concerns.

Although this alternative may decrease preferred and/or potential habitat, it would not affect the habitat or population trend Forest-wide for the following reasons: standards 2301, 2304 and 2305 (providing for Forest Objective 211 snag numbers and the preservation of large and soft snags) would apply to the Norwood Project Area, the project area makes up a small portion of the black-backed woodpeckers' available habitat on the Forest, and new habitat acres (insect areas and burns) are being created across the Forest. Objectives 221 (sensitive species) and 238b are currently being met and would be met under the action alternatives.

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 and that abundance is expected to exceed levels which would cause concern for viability (page III-246, USDA Forest Service, 2005). This alternative would follow Forest Plan standards and guidelines and move toward Forest Plan objectives. Therefore, black-backed woodpeckers are likely to persist on the Forest.

ALTERNATIVE 4

Alternative 4 proposes the least amount of total harvest and least amount of harvest in SS 4B and 4C stands. Under this alternative SS 4B pine would decrease by nearly 1,500 acres from the existing condition. SS 4C pine would decrease by 665 acres from the existing condition. This alternative would have the least amount of impact on available habitat, but would have

the greatest potential of the action alternatives to result in potential future habitat from MPB or fire. Of the Action Alternatives, this one would potentially remove the least amount of snags due to safety hazard concerns and therefore may result in the most nesting and foraging opportunities.

Although this alternative may decrease preferred and/or potential habitat, it would not affect the habitat or population trend Forest-wide for the following reasons: standards 2301, 2304 and 2305 (providing for Forest Objective 211 snag numbers and the preservation of large and soft snags) would apply to the Norwood project area; the project area makes up a small portion of the black-backed woodpeckers' available habitat on the Forest; and new habitat acres (insect areas and burns) are being created across the Forest. Objectives 221 (sensitive species) and 238b are currently being met and would be met under the action alternatives.

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 and that abundance is expected to exceed levels which would cause concern for viability (page III-246, USDA Forest Service, 2005). This alternative would follow Forest Plan standards and guidelines and move toward Forest Plan objectives. Therefore, black-backed woodpeckers are likely to persist on the Forest.

CUMULATIVE EFFECTS

Over 88,600 acres of the Black Hills have burned in large wildfires between 2001 and 2005 and an additional 449,000 acres have been affected by the Mountain Pine Beetle from 2000-2004 (USDA Forest Service 2006b), which has created extensive habitat. The Sheldon Fire of 2002 added to this acreage. Of this fire's nearly 700 acres, more than half are within the Norwood Project Area. This fire along with larger ones nearby, such as Jasper, may provide excellent areas of source habitat from which individuals may colonize this area. Additionally, there are numerous insect infestations within the project area, creating beneficial habitat.

There would be no adverse cumulative effects from the No Action Alternative. Lack of harvesting increases the potential for large-scale disturbances and the creation of snags.

Phase II Standard 2304 prohibits the cutting of snags for firewood (unless in designated areas) and this should provide better habitat for this species over time. No snags would be cut in the action alternatives, unless they are deemed a safety hazard. Therefore, there would be no additive effects on existing snag densities. Past timber harvest has removed large diameter trees in treated stands which may have reduced the potential for large diameter snags. This project would also remove large diameter trees. However, natural succession and tree growth has continued to replace large diameter trees in untreated and treated areas. Past timber harvest has reduced area of dense pine stands, however, natural succession and tree growth, coupled with fire suppression, continues to replace these dense stands. The action alternatives would reduce 4B and 4C pine stands (see direct and indirect effects section) which may offset some creation of these stand structures through natural succession and fire suppression.

There are no known future activities on any lands in the project area that are expected to affect snags or forest structure.

Brown Creeper (MIS)

This small forest bird is associated with mature and late succession forest conditions. Optimal habitat is structural stage 5 (late succession). Suitable cover exists in SS 4A, 4B, and 4C spruce and pine although pine is the preferred habitat type. Nests are constructed in the bark cracks and folds of large diameter (20-inch dbh or greater) ponderosa pine.

Recent 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. 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 percent and 90 percent of all brown creeper observations in 2002 and 2003 respectively, were recorded at sites where the surrounding habitat was classified as either seral stage 4 or 5 (Panjabi 2003, 2004). From 2001-2005, RMBO observed many brown creepers within the project area. They were mainly located in dense, mature or late successional pine and mature white spruce sites (Panjabi 2001, 2003, 2004 and 2005; Beason et al. 2006).

Observation data for the brown creeper reveals no obvious upward or downward Forest-wide population trend. When comparing acres of preferred habitat available in 2005 and 1995, habitat trend is stable. Therefore Objective 238a is being met on the Forest (USDA Forest Service 2006b).

The brown creeper was selected as a Forest MIS to evaluate the effects of Forest Plan implementation and natural change on the ability of the Forest to support species that rely on a variety of spruce and late successional and dense mature pine conditions to meet their needs (USDA Forest Service 2005a).

ALTERNATIVE 1 – NO ACTION

Alternative 1, No Action, is the preferred alternative for the brown creeper. This alternative results in the most acreage of mature and late successional pine. Spruce is also retained in this alternative. No change to existing brown creeper habitat would occur in the short-term with this alternative. However, over time this alternative would move mature pine and spruce stands to SS 5, which is a more preferred habitat than SS 4A, B, or C. As a consequence, as mature stands of ponderosa pine become more dense, they become more susceptible to insect infestation and large-scale wildfire. This alternative presents the highest potential for losses of preferred brown creeper habitat to wildfire or MPB caused mortality. Spruce would continue to encroach into some meadow and hardwood sites and possibly into pine sites, which would contribute to an increase of brown creeper habitat in the project area.

Although this alternative may contribute to a slight loss of habitat for the brown creeper within the project area boundary, the potential habitat available in the project area is on a small scale when comparing it to Forest-wide potential habitat. This in conjunction with

conserving spruce habitat would mean that the Forest-wide habitat trend, population trend and Objective 238a would not be influenced by this alternative.

ALTERNATIVE 2

No treatment would occur in the 40 acre SS 5 site in the project area in this alternative and therefore, this habitat would continue to be available to the brown creeper. The proposed treatments would, however, reduce the overall acres of preferred habitat by decreasing the density of pine stands. Approximately 700 acres of 4C pine stands would be reduced to 4A or 4B structural stage. The resulting acres of 4B structural stage is approximately 2,765 acres less than in the existing condition. The percentage of dense and moderately dense pine stands would be reduced from 44 percent to 34 percent in the project area. These decreases in dense and moderately dense mature pine stands would negatively impact brown creeper habitat.

In addition to reductions in dense habitat, there would also be a reduction of large trees. Approximately 1,652 acres of overstory removal would be included, which would remove the majority of large trees in a site, as well as decrease the amount of mature forest and increase the amount of SS 2 (sapling tree).

No change to the spruce habitat structural stage would occur with this alternative. One spruce site, 195 acres, is proposed for treatment in each of the three action alternatives. In addition to the 195 acres, another 310 are proposed for group selection in each of the three action alternatives. These 310 acres would be in designated pine sites, which contain some spruce acreage. In these pine sites with proposed group selection treatment, the spruce pockets would be harvested and the surrounding pine acres would be thinned. The group selection treatment could impact the brown creeper by removing habitat. The remaining designated spruce acreage would be deferred from any treatment.

This alternative reduces the potential for losses of preferred habitat to disturbance events such as wildfire or MPB infestations.

Any vegetative treatments and/or post-harvest projects proposed under this alternative may cause displacement of individuals; however, brown creepers may return to the affected areas depending on the post-harvest condition. Nesting may be disturbed if harvest occurs during the nesting season. This impact is expected to be short-term affecting only one brood, if at all.

Although this alternative may contribute to a slight loss of habitat for the brown creeper within the project area boundary, the potential habitat available in the project area would be on a small scale when comparing it to Forest-wide potential habitat. This in conjunction with conserving spruce habitat would mean that the Forest-wide habitat trend, population trend and Objective 238a would not be influenced by this alternative. The analysis completed for the Phase II Forest Plan amendment concluded that there will be adequate habitat for maintaining viable populations of brown creeper (page III-256/257, 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.

ALTERNATIVE 3

Alternative 3 would reduce the acreage of dense and moderately dense pine stands in the project area the most of any alternative. The percentage of dense and moderately dense pine stands would be decreased from an existing condition of 44 percent to 17 percent. Under this alternative, SS 4B pine would decrease by approximately 8,196 acres from the existing condition. SS 4C pine would decrease by approximately 957 acres from the existing condition. Alternative 3 would result in more than 5,000 less acres of SS 4B pine than Alternative 2. Alternative 3 would result in nearly 200 less acres of SS 4C pine than Alternative 2. Alternative 3 proposes creating more SS 4A than Alternatives 2 and 4 and therefore could cause the most impact to brown creeper habitat. SS 4B and 4C spruce sites would not be affected by this alternative.

This alternative would result in a forested condition which best reduces the potential for losses of preferred habitat to disturbance events such as wildfire or MPB infestations.

Other effects described under Alternative 2 would apply to this alternative as well.

Although this alternative may contribute to a slight loss of habitat for the brown creeper within the project area boundary, the potential habitat available in the project area would be on a small scale when comparing it to Forest-wide potential habitat. This in conjunction with conserving spruce habitat would mean that the Forest-wide habitat trend, population trend and Objective 238a would not be influenced by this alternative. The analysis completed for the Phase II Forest Plan amendment concluded that there will be adequate habitat for maintaining viable populations of brown creeper (page III-256/257, 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.

ALTERNATIVE 4

Of the action alternatives, Alternative 4 would retain the highest acreage of preferred habitat for the brown creeper. However, it also would do the least to prevent losses to fire or MPB. Alternative 4 would retain the most acres of SS 4B and 4C pine and therefore would cause the least amount of impact, of the action alternatives, to brown creeper habitat. Under this alternative, SS 4B pine would decrease by nearly 1,503 acres from the existing condition. SS 4C pine would decrease by 665 acres from the existing condition. SS 4B and 4C spruce sites would not be affected by this alternative. Under Alternative 4, SS 4B and 4C would be 37% of the project areas total acreage.

Other effects described under Alternative 2 would apply to this alternative as well.

Although this alternative may contribute to a slight loss of habitat for the brown creeper within the project area boundary, the potential habitat available in the project area is on a small scale when comparing it to Forest-wide potential habitat. This in conjunction with conserving spruce habitat would mean that the Forest-wide habitat trend, population trend and Objective 238a would not be influenced by this alternative. The analysis completed for the Phase II Forest Plan amendment concluded that there will be adequate habitat for maintaining viable populations of brown creeper (page III-256/257, 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.

CUMULATIVE EFFECTS

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

Fuel treatments that aid in the prevention of wildfires and help maintain mature and late successional stage stands can improve habitat for this species. Wildfires on the other hand can reduce habitat if they become stand-replacing events. Understory burns are not likely to substantially reduce habitat since large diameter pines are the most fire-resistant. Past timber harvest has removed large diameter trees in treated stands which may have reduced the potential for large diameter snags. This project would also remove large diameter trees. However, natural succession and tree growth has continued to replace large diameter trees in untreated and treated areas. Past timber harvest has reduced area of dense pine stands, however, natural succession and tree growth, coupled with fire suppression, continues to replace these dense stands. The action alternatives would reduce 4B and 4C pine stands (see direct and indirect effects section) which may offset by some creation of these stand structures through natural succession and fire suppression.

There are no known future activities on any lands in the project area that are expected to affect large diameter trees, snags or forest structure.

Ruffed Grouse (MIS)

Ruffed grouse are a resident species where found and range from central Alaska to northwestern California, Idaho, Utah, Wyoming and Montana. They extend east through Minnesota, Ohio, and the Appalachian Mountains from Virginia to northeastern Georgia (DeGraaf et al. 1991). It is considered an uncommon permanent resident in the Black Hills (Tallman et al. 2002) with greatest abundance in the northern Hills (Panjabi 2003). Ruffed grouse prefer young to medium aged aspen stands (Tallman et al. 2002) but have been observed in other habitat types in the Black Hills (Panjabi 2003). In 2002 and 2005, several ruffed grouse were observed in the project area (Panjabi 2003; Beason et al. 2006). A district biologist observed a ruffed grouse in the project area and heard drumming in the fall of 2006. Currently 5 percent of the project area is in an aspen cover type.

A monitoring protocol to collect necessary information on the ruffed grouse is currently being developed. This protocol should be available for testing sometime in the next year. Data collected through this protocol will serve as baseline data for trend assessments. Forest-wide habitat trend over the last eleven years has slightly decreased (USDA Forest Service 2006b).

The ruffed grouse is selected as a Forest MIS to be an indicator of aspen quantity and vigor in pure and mixed stands. It was selected to evaluate the effects of Forest Plan implementation and natural change on the ability of the Forest to support species that rely on a variety of conditions in aspen to meet their needs (USDA Forest Service 2005a).

Hardwood acreage in the project area totals 2,232, of which 2,206 acres is aspen and 26 acres is paper birch. This does not include scattered hardwood clones within conifer dominated sites. The hardwood sites represent many structural stages from SS 1 up to SS 4B (Table III-4). Most of the hardwood acreage is in the north half of the project area.

ALTERNATIVE 1 – NO ACTION

The quality and quantity of ruffed grouse habitat in the project area may decrease due to increasing conifers into the hardwood sites. Both ponderosa pine and spruce would continue to encroach and eventually take over remaining aspen stands within the project area if left untreated. This could eventually lead to the extinction of individual aspen clones, or groups of clones in certain areas. This alternative is the least beneficial alternative for the ruffed grouse. Acres of aspen would in time convert to conifer stands, thereby decreasing habitat for this species.

ALTERNATIVES 2 AND 4

Alternatives 2 and 4 propose the same sites/acreage (1,544 acres) for hardwood release. Hardwood release should encourage new hardwood growth, regeneration and enhancement by removing commercial and non-commercial conifer trees from within aspen sites. Removing the pine allows sunlight to reach regenerating hardwoods and allows for more hardwood growth both of existing trees and potential seedlings.

Both also propose the same amount (180 acres) of hardwood conversion. Conversion involves treating existing pine acres to become hardwood acres. Aspen are scattered in clones through many of the designated pine sites. Harvesting within the pine sites will also enhance the area for aspen. Hardwood release, hardwood conversion and pine harvesting (where hardwoods may be present) would enhance the aspen clones and therefore enhance ruffed grouse habitat.

These alternatives would not contribute to a loss of habitat or decrease in population Forest-wide for the ruffed grouse. These alternatives would increase the amount of hardwoods and therefore would enhance ruffed grouse habitat. Therefore Forest Objective 238a would be met for ruffed grouse under this alternative. The analysis completed for the Phase II Forest Plan amendment concluded that there will be adequate habitat for maintaining viable populations of ruffed grouse (page III-273, USDA Forest Service, 2005). These alternatives would follow Forest Plan standards and guidelines and move toward Forest Plan objectives. Therefore, ruffed grouse are likely to persist on the Forest.

ALTERNATIVE 3

This alternative proposes the same hardwood release acreage as Alternatives 2 and 4. However, hardwood conversion acreage would be increased to 489 acres. This is 309 additional acres over the other two Action Alternatives. This alternative also harvests more pine in general which may lead to more forest openings for aspen encouragement, especially in the north portion of the project area. Therefore, this alternative would be most beneficial to the ruffed grouse.

This alternative would not contribute to a loss of habitat or decrease in population Forest-wide for the ruffed grouse. This alternative would increase the amount of hardwoods and therefore would enhance ruffed grouse habitat. Therefore Forest Objective 238a would be met for ruffed grouse under this alternative. The analysis completed for the Phase II Forest Plan amendment concluded that there will be adequate habitat for maintaining viable populations of ruffed grouse (page III-273, USDA Forest Service, 2005). This alternative would follow Forest Plan standards and guidelines and move toward Forest Plan objectives. Therefore, ruffed grouse are likely to persist on the Forest.

CUMULATIVE EFFECTS

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

Past fire suppression has contributed toward an increase of pine in the project area. Insect infestation has created, and continues to create, open pockets where aspen may spread. Livestock and ungulate browsing and drought conditions have negatively impacted the hardwood habitat in this project area. Aspen has been suppressed due to these impacts. Proposed harvest and hardwood release activities would be expected to offset those impacts by increasing aspen acreage and vigor. Habitat for this species would be enhanced in the next 10 years through vegetative treatments.

There are future planned activities to regenerate and release aspen stands within the project area as part of the Mallo, Sanders, Canyon and Run timber sales. These activities would improve aspen habitat in the project area.

Song Sparrow (MIS)

The song sparrow breeds from Alaska across Canada to Newfoundland and south across the northern part of the United States. It is considered common in the eastern United States and locally common in the West (DeGraaf et al. 1991). In South Dakota, it is considered an uncommon and local migrant in the western part of the state (Tallman et al. 2002). The species can be found throughout the Black Hills but is primarily dependent on riparian habitat with streamside thickets and willows. Highest densities were recorded in montane riparian habitat and to a lesser extent foothill riparian and white spruce habitat types. The spruce habitat the species was observed in usually occurred adjacent to riparian areas (Panjabi 2003). In 2002, a song sparrow was observed in the project area (Panjabi 2003). In 2005, song sparrows were observed along Cold Springs Creek and Beaver Creek in white spruce habitat (Beason et al. 2006).

There are many perennial stream and intermittent stream corridors within the Norwood project area. These riparian corridors have a variety of vegetation. Hardwood trees and shrubs are found in many of these corridors.

Recent data indicates an upward Forest-wide population trend between 2002 and 2004. Further monitoring and analysis is required to clarify the population trend. Since the quality of riparian habitat has decreased since pre-European settlement, this would indicate a long-

term declining habitat trend. However, in the short-term, riparian habitat enhancement projects may contribute to achievement of Objective 238a. More monitoring and habitat restoration projects are warranted for a better assessment of the song sparrow trends (USDA Forest Service 2006b).

In addition to the beaver, this species is an indicator of riparian habitat condition. The song sparrow was selected as a Forest MIS to evaluate the effects of Forest Plan implementation and natural change on the ability of the Forest to support characteristic riparian species that rely on a variety of riparian conditions to meet their needs (USDA Forest Service 2005a).

ALTERNATIVE 1 – NO ACTION

Under the No Action Alternative, song sparrow habitat in the project area would remain in tact where riparian protection is present, such as along Beaver Creek. The section of Cold Springs Creek that is on Forest land has suitable habitat for the song sparrow and the habitat should remain suitable under this alternative. Shrubs and nesting vegetation would continue to grow in the protected riparian areas. Riparian areas with suitable habitat that are not currently protected areas may see a decrease in riparian condition with the no action alternative. The No Action Alternative would not include any activities to enhance riparian habitat and therefore is not the preferred alternative for the song sparrow.

The No Action Alternative would not contribute to a loss of habitat or decrease in population Forest-wide. Objective 238a is currently being met for the song sparrow along protected riparian corridors, such as Beaver Creek and it will continue to be met.

ALL ACTION ALTERNATIVES

Riparian areas, which support habitat for the song sparrow, would not be treated commercially under any of the three action alternatives. Post-sale projects are included in all action alternatives, which would improve riparian areas (see post-sale projects section in Chapter 2). Shrub plantings are also proposed in the Beaver Creek riparian corridor. Habitat for this bird species should be enhanced due to the proposed post-harvest projects in riparian zones. Refer to Appendix H and the Range, Wildlife and Hydrology reports in the project file for additional information on the proposed riparian projects. All post-harvest projects would be the same in each of the action alternatives.

Any of the three action alternatives would enhance riparian habitat over its present condition through proposed post-harvest activities such as riparian habitat protection and shrub plantings. The action alternatives would not contribute to a loss of habitat or decrease in population Forest-wide. Objective 238a is currently being met for the song sparrow along protected riparian corridors, such as Beaver Creek. It would continue to be met under any of the three action alternatives. The analysis completed for the Phase II Forest Plan amendment concluded that there will be adequate habitat for maintaining viable populations of song sparrow (page III-282, USDA Forest Service, 2005). These alternatives would follow Forest Plan standards and guidelines and move toward Forest Plan objectives. Therefore, song sparrow is likely to persist on the Forest.

CUMULATIVE EFFECTS

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

The past activity of protecting Beaver Creek by constructing a fence to exclude cattle has benefited song sparrow habitat. Past harvest operations may have been beneficial for the water flow in the creek. Fewer pine in the area contributes to increased available water. The project area has had several years of drought conditions and this may go into the future as well. This factor may influence the riparian habitat for the song sparrow in the area. Cold Springs Creek flows mainly through private land. The private land portion has had all spruce and shrubs cleared away from the creek in the past few years. The riparian protection and enhancement activities proposed in the action alternatives for the Norwood Project Area will benefit the song sparrow.

There are no known future activities which would impact riparian habitat in the project area.

Mountain sucker (R2 sensitive species and MIS)

Refer to BA/BE for details on habitat, distribution and project level analysis.

Historic surveys show the mountain sucker was widely distributed in the Black Hills. Recent surveys have produced the mountain sucker in many of its historic drainages. Localized absence or population reduction may have occurred (USDA Forest Service 2005b). Although Beaver Creek, within the Norwood project area, may be potentially suitable habitat for the mountain sucker, the species has not been documented in the stream. According to the South Dakota Department of Game, Fish and Parks, this creek is to be managed for wild brook trout with supplemental stocking of brown trout annually (SDGFP 1994). In 1985 two stations on the creek were surveyed. No mountain suckers were caught. Brook and brown trout were present (Ford 1986). In 1893, Evermann and Cox (1896) located mountain sucker on Stockade Beaver Creek below LAK Reservoir in Wyoming (Isaak et al. 2003). Beaver Creek does flow into Stockade Beaver Creek in Wyoming.

Surveys in the Black Hills have shown that mountain sucker are showing presence where once absent as well as the opposite. Mountain sucker may be limited in locations due to the presence of game fish, especially brown trout, natural events and/or instream barriers (USDA Forest Service 2005a). Forest-wide population trend shows a decline when presence data is analyzed from the last 40+ years. Data shows that mountain suckers within 17 of 27 established survey reaches/sites are no longer present (USDA Forest Service 2006b). Projects to benefit fisheries and aquatic ecosystems have occurred on the Forest to meet Objective 221 (USDA Forest Service 2004a). These conservation measures maintain habitat suitability and connectivity upstream and downstream of major barriers so that mountain sucker distribution and numbers should be maintained within their historic range on the Forest.

Mountain sucker was selected as a Forest MIS to evaluate the effects of Forest Plan implementation and the natural change on the ability of streams to support characteristic fish

species that rely on a variety of aquatic conditions to meet their needs (USDA Forest Service 2005a).

ALL ALTERNATIVES

Neither the No Action Alternative nor the three Action Alternatives would have an impact on the mountain sucker's potential habitat within the Norwood Project Area. No treatments are planned along the creek corridor in the action alternatives. Under all alternatives, spruce and shrubs would continue to fill in grass openings along Beaver Creek, livestock grazing would not be allowed, and recreational fishing would continue.

Beaver Creek may be potentially suitable habitat for the mountain sucker. This creek is managed for recreational trout fishing. For this reason and the fact that mountain sucker have not been found in Beaver Creek, it is unlikely that they are present. It is unlikely that there would be any impacts to this species under the No Action Alternative or the Action Alternatives. None of the Action Alternatives in the Norwood project area propose any treatment along Beaver Creek; other than occasional maintenance or new construction on a fence exclosure along Beaver Creek.

None of the alternatives would affect the Forest-wide population or habitat trend for the mountain sucker. No presence has ever been detected within the project area and the only potential habitat would not be impacted by the project. The riparian habitat would be enhanced within the project area by improving livestock exclosure fencing and planting more willows around Beaver Creek. All alternatives would meet Objectives 238d and 221 for the mountain sucker.

CUMULATIVE EFFECTS

No direct or indirect effects are expected as a result of any alternative. Therefore, none of the alternatives would have an adverse cumulative effect on this species.

SPECIES OF LOCAL CONCERN (SOLC)

Direct and Indirect Effects

Black Hills Supplement "r2_bh_2600-2005-1" to Forest Service Manual 2600 became effective November 7, 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. This 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 3.48 lists potential SOLC for the Black Hills National Forest and whether or not they are included in the analysis for this project. Rationale is provided if the species is not analyzed in this report.

Table 3.48 - SOLC List and Rationale for Norwood Project-Level Analysis.

Species	Species Present? (Y/N)	Habitat Present? (Y/N)	Include in NEPA document? (Y/N)	Rationale for not carrying species forward into the NEPA document
Atlantis fritillary *(Speyeria atlantis pahasapae)*	N	Y	Y	
Tawny crescent *(Phycoides batesii)*	N	Y	Y	
Callused vertigo *(Vertigo arthuri)*	N	Y	Y	
Mystery vertigo *(Vertigo paradoxa)*	N	Y	Y	
Frigid ambersnail *(Catinella gelida)*	N	Y	Y	
Striate disc *(Discus shimekii)*	N	Y	Y	
Sharp-shinned hawk *(Accipiter striatus)*	Y	Y	Y	
Cooper's hawk *(Accipiter cooperi)*	Y	Y	Y	
Broad-winged hawk *(Buteo platypterus)*	Y	Y	Y	
Northern saw-whet owl *(Aegolius acadicus)*	N	Y	Y	
Pygmy nuthatch *(Sitta pygmaea)*	Y	Y	Y	
American dipper *(Cinclus mexicanus)*	Y	Y	Y	
Black and white warbler *(Mniotilta varia)*	N	N	N	This area lacks the lower elevation bur oak woodlands and associated edges that is typical habitat for this species in the Black Hills (Beason et al. 2006)
Northern long-eared myotis *(Myotis septentrionalis)*	N	Y	Y	
Small-footed myotis *(Myotis ciliolabrum)*	N	Y	Y	
Long-eared myotis *(Myotis evotis)*	N	Y	Y	
Long-legged myotis *(Myotis volans)*	N	Y	Y	
Northern flying squirrel *(Glaucomys sabrinus)*	N	Y	Y	
Meadow jumping mouse *(Zapus hudsonius campestris)*	Y	Y	Y	

Species	Species Present? (Y/N)	Habitat Present? (Y/N)	Include in NEPA document? (Y/N)	Rationale for not carrying species forward into the NEPA document
Mountain goat *(Oreamnos americanus)*	N	N	N	The project area lacks the rugged, steep, rocky habitat typical of this species. In the Black Hills, primary range basically consists of the rugged terrain around Harney Peak, the Needles and Mount Rushmore (Richardson 1971).
Bighorn sheep *(Ovis canadensis)*	N	N	N	There are two main populations of bighorn sheep in the Black Hills: Custer State Park herd and the Rapid City herd (Merwin 2000). These are far from the project area.

Atlantis Fritillary (SOLC)

The Atlantis fritillary is an endemic butterfly of the Black Hills. In general, it occurs in riparian areas adjacent to openings, moist meadows and in boreal forests (NatureServe 2006). In the Black Hills, this subspecies is restricted to Custer, Lawrence, and Pennington counties. It prefers wet meadows and moist canyons (Marrone 2002).

Due to the restricted nature of the Atlantic fritillary's distribution in the Black Hills, development or management activities within suitable habitats pose a risk to long-term persistence. Much of the fritillary's habitat in the Black Hills is privately owned. There are currently no reliable estimates of the Black Hills population (NatureServe 2006). No records were found of this species in the project area.

ALTERNATIVE 1 – NO ACTION

Under this alternative, the moist canyons and wet meadows within the project area would not receive any treatment. Pine encroachment and meadow restoration would not be accomplished. There would be no prescribed burning, however, there may be wildfires that move through the area. Under the No Action Alternative, conifer encroachment would occur in meadow acreage and riparian habitat. This would not enhance habitat for the atlantis fritillary. This species is likely to persist on the Forest.

ALL ACTION ALTERNATIVES

No wet meadows or moist canyons would receive treatment under any of the three Action Alternatives. All action alternatives prescribe the same amount of acreage for pine encroachment, meadow restoration and prescribed burning. Three grassland/meadow sites (40901-199, 40901-124, 40903-135) are proposed for prescribed burning, a fuel reduction treatment. Total acreage burned in these sites would be approximately 20 acres. All three sites are small and mainly surrounded by ponderosa pine habitat. These sites are not considered suitable habitat for the atlantis fritillary butterfly. Therefore, this project is consistent with Guideline 3105. There are riparian acres proposed, by several district

disciplines, for fencing in post-harvest projects. These projects associated with the action alternatives should enhance habitat for the atlantis fritillary butterfly. Noxious-weed treatments, proposed post-harvest work, could positively impact the atlantis fritillary by aiding in native plant restoration. Treatments could potentially harm the species if nectar or larval host plants were treated.

All three Action Alternatives should enhance habitat for the atlantis fritillary by protecting riparian habitats and restoring meadows. The Environmental Impact Statement for the Phase II Amendment determined that this species should persist across the Planning Area if Forest Plan objectives, standards, and guidelines referring to riparian and meadow habitats are followed. The action 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

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

Management activities may indirectly affect this species by modifying the quality or extent of riparian habitat. Indirect effects to the Atlantis fritillary are mitigated through a wide variety of standards and guidelines, watershed conservation practices, and State BMPs that protect riparian areas. Numerous objectives, standards, and guidelines strive to maintain or enhance the quality and/or quantity of existing riparian communities, wetlands, and wet-meadow areas.

Livestock grazing may have affected atlantis fritillary habitat by altering plant species composition and by trampling. Utilization could be beneficial by opening grass cover and allowing the establishment and growth of violets and nectar-producing forbs. Heavy utilization could be detrimental by causing noxious-weed establishment and spread or through consumption or trampling of important forbs.

The beneficial effects of meadow treatments and riparian protection and enhancement post-harvest activities proposed in the Action Alternatives for the Norwood project area are expected to offset some of the effects of past and ongoing activities. There are no reasonably foreseeable future projects that would have additional effects to this species.

Private in-holdings occur frequently within riparian areas. These private lands provide suitable habitat, but conditions may have been altered by private land management activities, such as livestock grazing, or tree harvesting. Efforts to conserve and enhance riparian habitat for this species on the Forest may be constrained by habitat conditions on adjacent non-NFS lands.

Tawny Crescent (SOLC)

The tawny crescent is found in open meadows, stream bottoms, along roads, trails, and riparian woodlands (Stefanich 2001). It is also found in mesic forest corridors across an ecotone between mixed-grass meadows or prairie grasslands to adjacent woodlands (Royer and Marrone 1992). Elsewhere in the Dakotas, adults are known to forage for nectar from a variety of floral species, including dogbane, leafy spurge and various composite flowers. Tawny crescent larvae appear dependent on asters as a food source although the specific host species and their relationship remain unclear (Stefanich 2001).

In South Dakota, the tawny crescent is restricted in its distribution to the Black Hills. The populations inhabiting the Black Hills of South Dakota and Wyoming are considered genetically isolated and disjunct from crescents elsewhere (Royer and Marrone 1992). Tawny crescents were observed at two of 20 monitoring sites on the Mystic Ranger District in 2002 (USDA, Forest Service 2004a). However, there continue to be no reliable estimates of local abundance or population estimates for the Black Hills (Stefanich 2001). Stefanich (2001) hypothesized that the only limiting factor in the Black Hills is the destruction of this butterfly's habitat or isolation of colonies to the extent that populations are unable to disperse.

ALTERNATIVE 1 – NO ACTION

Under this alternative, riparian areas and meadows within the project area would not receive any treatment. Pine encroachment and meadow restoration would not be accomplished. Pine and spruce trees would continue to encroach into meadows/grasslands and riparian hardwood communities. Foraging plants needed by the tawny crescent butterfly could decrease with decreasing meadow acreage. Fire suppression may create a more dense pine habitat in the project area, which would be more susceptible to pine beetle infestation and wildfire. If these occur, there is potential for a large increase in meadow/grassland acreage that would benefit this butterfly species. The No Action Alternative does not include any habitat enhancing projects for the tawny crescent butterfly and therefore is not the preferred alternative for this species. This species is likely to persist on the Forest.

ALL ACTION ALTERNATIVES

All Action Alternatives prescribe the same amount of acreage for pine encroachment, meadow restoration and hardwood release. Hardwood conversion treatments are also included although Alternative 3 would accomplish 309 acres more than Alternatives 2 or 4. There are riparian acres proposed, by several district disciplines, for fencing in post-harvest projects. These projects would enhance habitat for the tawny crescent butterfly. Noxious-weed treatments and proposed post-harvest work, would positively impact the tawny crescent by aiding in native plant restoration. Weed treatments could potentially harm the species if nectar or larval host plants were treated.

Any of the Action Alternatives would enhance habitat for the tawny crescent butterfly within the Norwood project area. 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

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 impacted potential habitat for this species. These activities are expected to continue in the future. Drought conditions in the 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.

Callused Vertigo (SOLC)

In 2003 and 2004 surveys were conducted by biological technicians. No callused vertigo snails were found in the project area. In 2002, the Forest received the final report for a contract to inventory and/or monitor 357 sites for land snails (Frest and Johannes 2002). Callused vertigo was found sparingly in 63 of the 357 sites inventoried/monitored. Specimens were identified at two sites just east of the project area (Sites 72 and 73), indicating that the species may be found throughout the project area in similar habitat (refer to Frest and Johannes 2002 for exact location of these two sites). This snail prefers wet, relatively undisturbed forest with closed canopied white spruce or ponderosa pine with a varied understory. 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 the adjacent floodplain. The most common substrate was limestone, but callused vertigo also occurred occasionally on schist-derived soils. Down woody material that helps maintain moist soil conditions and lessens sun exposure is an important habitat element. Foraging substrate appears to consist of decayed deciduous leaves and herbaceous plants.

Callused vertigo has been found at 12 different habitats in Minnesota, with the highest densities occurring in Balsam-white spruce forests and aspen forests (Anderson 2004). They have also been found in bur oak riparian areas and mountain mahogany shrublands. The diversity of habitat types may indicate that additional locations could be found in the Black Hills. 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 2006).

ALTERNATIVE 1 – NO ACTION

Under this alternative, there would be no treatment in spruce or dense canopy (SS 3C/4C) pine sites. Fire suppression is likely to continue which may increase density of pine trees and therefore canopy cover would increase. The more dense the pine sites, the more likely is a stand replacing wildfire or bug infestation. If these would occur then canopy would decrease as well as moisture levels for this snail species. Pine and spruce would continue to encroach into hardwood sites. This would eventually mean less deciduous litter (one preferred habitat component) on the groundlayer. The No Action Alternative is the preferred alternative for this snail species. It would maintain the more dense forest conditions; although this may change with stand replacing wildfires or beetle infestation. This species is likely to persist on the Forest.

ALL ACTION ALTERNATIVES

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 and mystery 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 on 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 also affect snails by eliminating habitat or killing snails. Roadside brushing or weed spraying can also damage snails and/or their habitat (Anderson 2004).

Each action alternative would construct 2.7 miles of new road. However, there are no known snail colonies within the area where road construction would occur. Therefore the proposed road construction in all action alternatives is consistent with standard 3103. The only potential impact therefore, would be on unknown colonies.

Under all Action Alternatives, one designated spruce site would be treated. This site (40203-017) is 195 acres and is proposed for group selection treatment in each alternative. The structural stage is 4A and it would remain a 4A after treatment. This site represents 6 percent of the designated spruce acreage. The remaining designated spruce acreage would not be treated. Of the total 505 acres proposed for group selection treatment in the three action alternatives, 310 (505-195) of these acres are in designated pine sites, which contain some spruce acreage. In these pine sites with proposed group selection treatment, the spruce pockets would be harvested and the surrounding pine acres would be thinned. The group selection treatment could impact the callused vertigo, if present, by removing habitat. There are no known colonies of this species in the project area and therefore, the project is consistent with standard 3103.

Many of the activities proposed under the Action Alternatives may cause mortality of this species 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 in soil. Opening up canopy and

thereby changing moisture levels in the groundlayer could be detrimental to unknown colonies.

In each Action Alternative, the same acres are identified to defer from treatment due to the presence of a R2 sensitive snail species Cooper's mountain snail (*Oreohelix strigosa cooperi*). Refer to 'Endangered, Threatened or R2 Sensitive Species' section below for more information on this snail. The callused vertigo and the Cooper's mountain snail prefer similar habitats.

Alternative 4 is the preferred alternative for callused vertigo habitat. It proposes the least amount of harvest in the dense pine sites. Alternative 3 has the potential to cause the most impact to this snail species and its habitat.

This species was not found in the project area and as a result this project is consistent with standard 3103. 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 are planned. Dense forest conditions may lead to more moist site conditions in the next 10 years, but a higher chance of habitat destruction due to stand-replacing wildfires in the future would exist.

Past activities have resulted in the existing road density. The action alternatives would result in a net reduction of approximately 54 miles of road. There are no known future activities which would create new roads. Therefore, the cumulative effects would be a reduction in the impacts on this species from roads.

Past activities have reduced the area of dense conifer stands while fire suppression has allowed natural succession to occur which has developed dense stands. The proposed activities would reduce the area of dense stands in some areas, while maintaining dense stands in other areas.

Spruce in this area has not been treated as heavily as the pine. Many of the spruce sites have not been entered for decades and do not receive much impact from roads, recreation, or grazing. Past and on-going fire suppression activities have allowed spruce to increase, at the expense of other forest types (USDA, Forest Service 2005). The past and present drought condition may be impacting the acres of spruce in the project area. The trees may be weakened in the long run. The project activities in all action alternatives in spruce are not expected to further reduce acres of spruce. The group selection harvest in the only treated spruce stand may offset some effects of the drought by reducing competition in that stand.

There are no known foreseeable future activities which would impact spruce in the project area. Habitat for this species will be maintained.

Some of the future activities, such as thinning or hardwood release could cause additional impacts to unknown snail colonies if heavy equipment were to destroy unknown colonies. If future prescribed burning is consistent with Forest Plan standard 3103, there would be no cumulative effects from that activity to known colonies.

Mystery Vertigo (SOLC)

In 2002, the Forest received the final report for a contract to inventory and/or monitor 357 sites for land snails (Frest and Johannes 2002). Mystery vertigo was found in 23 of the 357 sites inventoried/monitored. They were not generally abundant at any site. This snail was not found in the Norwood project area by Frest or by Forest biological technicians (2003/2004). Mystery vertigo is generally restricted to rich lowland wooded sites, quite often in the white spruce community, but occasionally in the ponderosa pine community. The forest canopy is generally closed or nearly so, with well-developed litter and a rich understory. Sites are usually in leaf litter at the base of a wooded, north-facing slope on limestone or schist substrates. Down woody material that helps maintain moist soil conditions and lessens sun exposure is an important habitat element. Mystery vertigo was not common in taluses but could be found crawling on rock surfaces in moist weather and appears to feed on the organic coating of rock surfaces and partially decayed leaves. All sites with mystery vertigo were in the central or northern Black Hills or the Bear Lodge Mountains.

The mystery vertigo is rare in the United States and occurs only in South Dakota (21 sites); Wyoming (2 sites in the Bear Lodge Mountains); Michigan (1 site); Maine (2 counties); and a few northern Wisconsin, Michigan, and Minnesota sites (Frest and Johannes 2002). The species appears to be more common in adjoining areas of southern Canada, generally from the Great Lakes eastward. Mystery vertigo is currently ranked vulnerable globally and critically imperiled in South Dakota; it has not been ranked in Wyoming (NatureServe 2006).

ALTERNATIVE 1 – NO ACTION

Under this alternative, there would be no treatment in spruce or dense canopy (SS 3C/4C) pine sites. Fire suppression is likely to continue which may increase density of pine trees and therefore canopy cover would increase. The more dense the pine sites, the more likely is a stand replacing wildfire or bug infestation. If these would occur, then the canopy would decrease as well as moisture levels for this snail species. Pine and spruce would continue to encroach into hardwood sites. This would eventually mean less deciduous litter (one preferred habitat component) on the groundlayer. The No Action Alternative is the preferred alternative for this snail species. It would maintain the more dense forest conditions; although this may change with stand replacing wildfires or beetle infestation. This species is likely to persist on the Forest.

ALL ACTION ALTERNATIVES

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 and mystery 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 on 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 also affect snails by eliminating habitat or killing snails. Roadside brushing or weed spraying can also damage snails and/or their habitat (Anderson 2004).

Each action alternative would construct 2.7 miles of new road. However, there are no known snail colonies within the area where road construction would occur. Therefore the proposed road construction in all action alternatives are consistent with standard 3103. The only potential impact therefore, would be on unknown colonies.

Under all Action Alternatives, one designated spruce site would be treated. This site (40203-017) is 195 acres and is proposed for group selection treatment in each alternative. The structural stage is 4A and it would remain a 4A after treatment. This site represents 6 percent of the designated spruce acreage. The remaining designated spruce acreage would not be treated. Of the total 505 acres proposed for group selection treatment in the three Action Alternatives, 310 (505-195) of these acres are in designated pine sites, which contain some spruce acreage. In these pine sites with proposed group selection treatment, the spruce pockets would be harvested and the surrounding pine acres would be thinned. The group selection treatment could impact the callused vertigo, if present, by removing habitat.

Many of the activities proposed under the action alternatives may cause mortality of this species 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 in soil. Opening up canopy and thereby changing moisture levels in the groundlayer could be detrimental to unknown colonies.

In each Action Alternative, the same acres are identified to defer from treatment due to the presence of a R2 senstive snail species Cooper's mountain snail (*Oreohelix strigosa cooperi*). Refer to 'Endangered, Threatened or R2 Sensitive Species' section below for more information on this snail. The mystery vertigo and the Cooper's mountain snail prefer similar habitats.

Of the action alternatives, Alternative 4 is the preferred alternative for mystery vertigo habitat. It proposes the least amount of harvest in the dense pine sites. Alternative 3 has the potential to cause the most impact to this snail species and its habitat.

This species was not found in the project area and as a result this project is consistent with standard 3103. 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 are planned. Dense forest conditions may lead to more moist site conditions in the next 10 years, but a higher chance of habitat destruction due to stand-replacing wildfires in the future would exist.

Past activities have resulted in the existing road density. The action alternatives would result in a net reduction of approximately 54 miles of road. There are no known future activities which would create new roads. Therefore, the cumulative effects would be a reduction in the impacts on this species from roads.

Past activities have reduced the area of dense conifer stands while fire suppression has allowed natural succession to occur which has developed dense stands. The proposed activities would reduce the area of dense stands in some areas, while maintaining dense stands in other areas.

Spruce in this area has not been treated as heavily as the pine. Many of the spruce sites have not been entered for decades and do not receive much impact from roads, recreation, or grazing. Past and on-going fire suppression activities have allowed spruce to increase, at the expense of other forest types (USDA, Forest Service 2005). The past and present drought condition may be impacting the acres of spruce in the project area. The trees may be weakened in the long run. The project activities in all action alternatives in spruce are not expected to further reduce acres of spruce. The group selection harvest in the only treated spruce stand may offset some effects of the drought by reducing competition in that stand.

There are no known foreseeable future activities which would impact spruce in the project area. Habitat for this species will be maintained.

Some of the future activities, such as thinning or hardwood release could cause additional impacts to unknown snail colonies if heavy equipment were to destroy unknown colonies. If future prescribed burning is consistent with Forest Plan standard 3103, there would be no cumulative effects from that activity to known colonies.

Frigid Ambersnail (SOLC)

Nekola (2003) considered this species a “duff-specialist.” Duff specialists were strongly affected by human activities, suggesting that protecting soil and surface characteristics are important in their conservation. In 2002, the Forest received the final report for a contract to inventory and/or monitor 357 sites for land snails (Frest and Johannes 2002). The frigid ambersnail was found in 12 (none of which are in the project area) of the 357 sites inventoried/monitored. The frigid ambersnail was rare at all locations, and very few live adults were observed during the early 1990s surveys. Locations are widely distributed

geographically across the Forest at varying elevations (3,800 to 6,800 feet). The species was usually found on limestone but also on schist soils, and colonies were often found in somewhat dry wooded limestone talus, generally near the slope base. They were most often found in rather open ponderosa pine forest, often with a secondary deciduous tree and shrub component, although white spruce was a minor component at a few sites. According to Frest and Johannes (2002), the family of land mollusks that includes the frigid ambersnail is associated not only with rather moist forest sites but also with quite dry and open settings in much of the western United States.

The frigid ambersnail is currently found only in Iowa (14 sites), South Dakota (12 sites), and Wisconsin (Frest and Johannes 2002). The frigid ambersnail is currently ranked as critically imperiled globally and in South Dakota and Iowa; it is ranked imperiled/critically imperiled in Wisconsin (NatureServe 2006). The state of Iowa considers the frigid ambersnail an endangered species.

This species was not found in the project area during 2003 and 2004 surveys conducted by biological technicians.

ALTERNATIVE 1 – NO ACTION

With this alternative there would be no treatment. Stands of pine would continue to become more dense. Deciduous components below a conifer canopy would likely decrease. Dense pine acreage may lead to stand replacing wildfires or insect outbreaks. The no action alternative would create more dense forest conditions. This alternative would not enhance habitat for the frigid ambersnail. This species is likely to persist on the Forest.

ALL ACTION ALTERNATIVES

Commercial thinning, non-commercial thinning and fuel treatments proposed in all Action Alternatives should increase potential habitat for this snail species. The thinning would open up the canopy and would release any deciduous components in the understory, which should benefit this species. All Action Alternatives propose the same mileage of new road construction and road closure. Open road densities would decrease in the action alternatives. Each action alternative would construct 2.7 miles of new road. However, there are no known snail colonies within the area where road construction would occur. Therefore the proposed road construction in all action alternatives is consistent with standard 3103. The only potential impact therefore, would be on unknown colonies.

Livestock grazing and recreational use would be expected to continue. Overall, all Action Alternatives should decrease the risk of stand replacement wildfire, which would more than likely destroy the microclimate and habitat desired by this snail.

Many of the activities proposed under the Action Alternatives may cause mortality of this species 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 in soil. The Action Alternatives may benefit this species in the long-term by enhancing preferred habitat.

The preferred alternative for this species is Alternative 3. It would provide the most open pine forest condition. 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 are planned. Dense forest conditions may lead to more moist site conditions in the next 10 years, but a higher chance of habitat destruction due to stand-replacing wildfires in the future would exist.

Land snails, in general, are susceptible to habitat changes that change sun exposure, disturb ground cover, reduce micro site humidity, or compact the soil. The frigid ambersnail and striate disc may be negatively affected by road construction, livestock grazing, initial timber harvest, herbicides and pesticides, and high-intensity forest fires. Habitat for this species would be conserved and/or enhanced. Dense forest conditions may lead to a higher chance of habitat destruction due to stand-replacing wildfires.

There are no known future activities which would increase roads or affect spruce habitat in the project area to known colonies.

Striate Disc (SOLC)

In 2002, the Forest received the final report for a contract to inventory and/or monitor 357 sites for land snails (Frest and Johannes 2002). The striate disc was found live in only 18 of the 357 sites inventoried/monitored. 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, although four sites were on schist substrate. Foraging substrate consists of decayed deciduous leaves and herbaceous plants. Down woody material that helps maintain moist soil conditions and lessens sun exposure is an important habitat element. Sites where the striate disc occurs appear restricted to the higher elevations of the limestone plateau of the west-central and north-central portions of the Black Hills.

The range of the striate disc includes Wyoming (2 sites), Montana (1), Colorado (perhaps 26 sites), South Dakota (1), Oregon (1), California (2), Utah (5), Arizona (3), and New Mexico (7) (Frest and Johannes 2002). Hendricks (2003) also lists 5 records in Montana. Live sites have also been reported from several Canadian provinces. The striate disc is currently ranked globally as G5 (secure), and S2 (imperiled) in South Dakota (NatureServe 2006).

No striate disc snails were found during district survey efforts and none were located in the seven Frest sites within the Norwood project area.

ALTERNATIVE 1 – NO ACTION

Under this alternative, there would be no treatment in spruce or hardwood sites. Fire suppression is likely to continue which may increase density of pine trees and therefore canopy cover would increase. The more dense the pine sites, the more likely is a stand replacing wildfire or bug infestation. If these would occur, then canopy would decrease as well as moisture levels for this snail species. Pine and spruce would continue to encroach into hardwood sites. This would eventually mean less deciduous litter (one preferred habitat component) on the groundlayer. This species is likely to persist on the Forest.

ALL ACTION ALTERNATIVES

Each action alternative would construct 2.7 miles of new road. However, there are no known snail colonies within the area where road construction would occur. Therefore the proposed road construction in all action alternatives are consistent with standard 3103. The only potential impact therefore, would be on unknown colonies.

Under all action alternatives, one designated spruce site would be treated. This site (40203-017) is 195 acres and is proposed for group selection treatment in each alternative. The structural stage is 4A and it would remain a 4A after treatment. This site represents 6 percent of the designated spruce acreage. The remaining designated spruce acreage would not be treated. Of the total 505 acres proposed for group selection treatment in the three Action Alternatives, 310 (505-195) of these acres are in designated pine sites, which contain some spruce acreage. In these pine sites with proposed group selection treatment, the spruce pockets would be harvested and the surrounding pine acres would be thinned. The group selection treatment could impact the striate disc, if present, by removing habitat.

Many of the activities proposed under the action alternatives may cause mortality of this species 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 in soil. Opening up canopy and thereby changing moisture levels in the groundlayer could be detrimental to unknown colonies.

In each Action Alternative the same acres are identified to defer from treatment due to the presence of a R2 senstive snail species Cooper's mountain snail (*Oreohelix strigosa cooperi*). Refer to 'Endangered, Threatened or R2 Sensitive Species' section later in this Chapter for more information on this snail. The striate disc and the Cooper's mountain snail may be in similar habitats.

All three Action Alternatives would affect spruce to the same degree (generally group selection) in the project area. Spruce is the preferred habitat for this species. The No Action Alternative is the preferred alternative for this snail species. It would maintain the more dense forest conditions; although this may change with stand replacing wildfires or beetle

infestation. Of the Action Alternatives, Alternative 3 would provide the most aspen acreage, a preferred habitat, in the long-term.

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. There are no known occurrences in the project area and therefore, the project is consistent with Standard 3103. 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 are planned. Dense forest conditions may lead to more moist site conditions in the next 10 years, but a higher chance of habitat destruction due to stand-replacing wildfires in the future would exist.

Land snails, in general, are susceptible to habitat changes that change sun exposure, disturb ground cover, reduce micro site humidity, or compact the soil. The frigid ambersnail and striate disc may be negatively affected by road construction, livestock grazing, initial timber harvest, herbicides and pesticides, and high-intensity forest fires. Habitat for this species would be conserved and/or enhanced. Dense forest conditions may lead to a higher chance of habitat destruction due to stand-replacing wildfires.

There are no known future activities which would increase roads or affect spruce habitat in the project area.

Sharp-shinned Hawk (SOLC)

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 percent, but previous studies have tended to find high canopy closure (68 percent 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). Habitat loss may also occur as forests mature beyond early seral stages.

The sharp-shinned hawk breeds from Alaska to Newfoundland, south throughout much of North America, Mexico, and into Central and South America wherever suitable habitat occurs (Stephens and Anderson 2002). The species is considered a partial to long-distance migrant, with northern-most individuals wholly abandoning their breeding ranges and wintering in the southern United States. Other birds may remain on their breeding ranges throughout the winter. In South Dakota, the sharp-shinned hawk is considered "uncommon," with the only recorded occurrences in the western part of the state (Peterson 1995). In Wyoming, the bird is regarded as a "common summer resident," with some known to remain throughout the winter (Luce et al. 1999). In the Black Hills, they have been observed at all elevations (Peterson 1995), but estimates of local abundance are not available due to their low numbers (Panjabi 2003). The species has been observed an average of three times per year since bird monitoring began in 2001 (Panjabi 2005). A pair of sharp-shinned hawks was observed in the project area near private land along Cold Springs Creek in section 9 in May of 2006. There are no known nests in the project area. The amount of potential nesting habitat (SS 3B, 3C, 4B, 4C, and 5 pine and spruce) in the project area is approximately 19,500 acres or 46 percent of the project area.

ALTERNATIVE 1 – NO ACTION

Under this alternative, pine stands would become more dense. Conifers would continue to encroach into meadows and hardwoods. The threat of stand replacing wildfire and beetle infestation would increase. Nesting habitat for the sharp-shinned hawk would be enhanced under this alternative providing that wildfires and beetles would not overtake the area. The No Action Alternative provides diverse habitats and the most potential nesting habitat for the sharp-shinned hawk. This species is likely to persist on the Forest.

ALL ACTION ALTERNATIVES

Preferred habitat characteristics for this species are not well defined. An Action Alternative that would create a diversity of habitats and densities may provide the best potential opportunities for this species. All three Action Alternatives propose the same treatments for meadow/grasslands and hardwood release. The same spruce site, 195 acres, is proposed for treatment in each action alternative. The majority of the spruce acreage, more than 2,800 acres, will not be treated. Pine and spruce sites in the 3B, 3C, 4B, 4C and 5 structural stages will be reduced to 38%, 24% and 41% for Alternatives 2, 3 and 4, respectively. Refer to the structural stage analysis in the Silvicultural section of this Chapter for more information on alternative impacts to cover types and structural stages.

A change in nesting habitat, under any of the action alternatives, may cause displacement of this species if present. If there are unknown nests in the project area, any of the Action Alternatives may disturb nesting if harvest occurs during the nesting season. This impact is expected to be short-term affecting only one brood at most if harvest operations are conducted during the nesting season. Known nests would be protected through Standard 3204.

Of the Action Alternatives, Alternative 4 provides more nesting habitat than the other two. All Action Alternatives will increase shrub and tree species diversity by increasing hardwood and meadow acreage. 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 are planned. Dense forest conditions remain as is but there is a higher chance of habitat destruction due to stand-replacing wildfires in the future.

Past treatment of spruce on private lands, Cold Springs Creek, may have negatively impacted habitat for this species. Spruce was harvested along the creek in the 1990s. The riparian area does not show any signs of recovering shrubs and/or spruce trees. Past fire suppression has created pockets of dense timber that may be preferred by this species. In general, spruce acreage in the project area has been deferred from treatment in the past. This has allowed for more nesting opportunities. Future activities on private land, such as tree harvesting and/or development, may affect habitat for this species. Forestwide, spruce acreage has increased in the Black Hills by approximately 3,725 from 1997 to 2005 (USDA, Forest Service 2006). Habitat for this species would be conserved.

There are no known future activities which would affect riparian or spruce habitats.

Cooper's Hawk (SOLC)

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. Bird monitoring over the past three years has yielded an average of five sightings per year (Panjabi 2005). Cooper's hawks have been observed in the project area (Panjabi 2001, 2005). There are no known nests in the project area.

The Cooper's hawk is considered a habitat generalist but typically requires wooded areas for nesting. The most common forest type in the Black Hills, ponderosa pine, is used for nesting in other areas of the species range. The bird is known to nest in riparian, conifer, and aspen forests. 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 percent) canopy closure near openings. Nest tree diameters are usually larger than what is randomly available. 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).

In general, the Cooper's hawk is more tolerant of human presence and habitat fragmentation than other North American accipiters (Curtis et al. 2006). However, 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).

In ponderosa pine, structural stages 4B (mature stands with 40 to 70 percent canopy closure) and 4C (mature stands with more than 70 percent canopy closure) and 5 (late succession) correspond most closely to the nesting habitat preferences of the Cooper's hawk. There is currently approximately 15,120 acres of 4B, 4C and 5 pine in the project area (37% of total Forest Service acres). 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.

The Cooper's hawk breeds throughout the United States, southern Canada, and northern Mexico. The species is considered a partial migrant, with populations in the northern portions of its breeding range considered more migratory than those to the south (USDA Forest Service 2005a). Some birds may remain on their breeding ranges throughout the winter. In South Dakota, the Cooper's hawk is considered "uncommon," with the only recorded occurrences in the western part of the state (Peterson 1995). In Wyoming, it is regarded as a "common summer resident" (Luce et al. 1999).

ALTERNATIVE 1 – NO ACTION

Under this alternative, no treatments would occur in the project area. Trees would become more dense over time. More SS 4B/4C/5 pine acres may be created. This condition may lead to an increased chance of stand replacing wildfire and beetle infestation. Conifers would continue to encroach into meadows, riparian areas and hardwood communities. The no action alternative provides the most potential nesting habitat for the Cooper's hawk. This species is likely to persist on the Forest.

ALL ACTION ALTERNATIVES

Under all Action Alternatives, the total acres of preferred nesting habitat for the Cooper's hawk (SS 4B, 4C and 5 pine, combined) would decrease from the existing condition. Spruce acreage would remain the same for all action alternatives and would not change from the existing condition. Hardwood and riparian acreage would be increased and enhanced under the action alternatives. Refer to the Silviculture section earlier in this Chapter for more information on alternative impacts to cover type and structural stages in the project area.

Any of the action alternatives may cause Cooper's hawks, if present, to avoid, or move from, an area being treated. If there are unknown nests in the project area than any of the action alternatives may disturb nesting if harvest occurs during the nesting season. This impact is expected to be short-term affecting only one brood at most if harvest operations are conducted during the nesting season. Known nests would be protected through Standard 3204. Nesting habitat is probably the most important factor for long-term persistence of the

Cooper's hawk. 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. Of the Action Alternatives, Alternative 4 would result in the most combined acreage of SS 4B/4C/5 pine.

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 are planned. Dense forest conditions remain as is but there is a higher chance of habitat destruction due to stand-replacing wildfires in the future.

Past treatment of spruce on private lands, Cold Springs Creek, may have negatively impacted habitat for this species. Spruce was harvested along the creek in the 1990s. The riparian area does not show any signs of recovering shrubs and/or spruce trees. Forest-wide, spruce acreage has increased in the Black Hills by approximately 3,725 from 1997 to 2005 (USDA Forest Service 2006b).

Past activities have reduced the area of dense conifer stands while fire suppression has allowed natural succession to occur which has developed dense stands. The proposed activities would reduce the area of dense stands in some areas, while maintaining dense stands in other areas.

There are no known future activities which would reduce dense stands within the project area.

Spruce in this area has not been treated as heavily as the pine. Many of the spruce sites have not been entered for decades and do not receive much impact from roads, recreation, or grazing. Past and on-going fire suppression activities have allowed spruce to increase, at the expense of other forest types (USDA, Forest Service 2005). The past and present drought condition may be impacting the acres of spruce in the project area. The trees may be weakened in the long run. The project activities in all action alternatives in spruce are not expected to further reduce acres of spruce. The group selection harvest in the only treated spruce stand may offset some effects of the drought by reducing competition in that stand.

There are no known foreseeable future activities which would impact spruce in the project area.

Past fire suppression has contributed toward an increase of pine in the project area. Insect infestation has created, and continues to create, open pockets where aspen may spread. Livestock and ungulate browsing and drought conditions have negatively impacted the hardwood habitat in this project area. Aspen has been suppressed due to these impacts.

Proposed harvest and hardwood release activities would be expected to offset those impacts by increasing aspen acreage and vigor. Habitat for this species would be enhanced in the next 10 years through vegetative treatments.

There are future planned activities to regenerate and release aspen stands within the project area as part of the Mallo, Sanders, Canyon and Run timber sales. These activities would improve aspen habitat in the project area.

Broad-winged Hawk (SOLC)

The broad-winged hawk is one of eastern North America's most common woodland hawks. It is generally associated with dry to wet deciduous, mixed, or occasionally coniferous forests (Johnsgard 1990). Broad-winged hawks forage in mature to old-growth forests, along forest streams, roads, and openings (Stephens and Anderson 2003).

In the Black Hills, the broad-winged hawk nests primarily in ponderosa pine in mixed pine and deciduous habitats, occasionally with a white spruce component (Powder River Eagle Studies 2000). Late-successional pine and aspen probably make-up the majority of desirable habitat for the species in the Black Hills (Panjabi 2005). Although considered rare in both Wyoming (Luce et al. 1999) and South Dakota (Peterson 1995), the species was the second most frequently encountered raptor during surveys in 1996 and 1997 (Powder River Eagle Studies 2000). Of 27 broad-winged hawk nests found on the Forest, 25 were in ponderosa pine while one was in an aspen and one was in a paper birch. Nest trees had an average DBH of about 16 inches; canopy closure in nest stands averaged 66 percent with a range of 45 to 96 percent (Stephens and Anderson 2003). These nest-stand characteristics equate to structural stages 4B, 4C and 5. Nest sites typically were in areas with slopes less than 10 percent. No association between nest sites and forest openings or wetlands was detected on the Forest (Stephens and Anderson 2003). There were 24 broad-winged hawks identified along transects in 2004, mainly in the northern Black Hills and Bear Lodge mountains. Fourteen of these were located in aspen, eight in late-successional pine and two in the Jasper Burn Area (Panjabi 2005). In 2005 RMBO observed a broad-winged hawk in white spruce habitat within the project area (Beason et al. 2006). There are no known nests in the project area.

The broad-winged hawk breeds from Nova Scotia to central Alberta, south to Texas, and east to the Atlantic coast (Johnsgard 1990). These hawks are complete migrants, best known for their migratory congregations of thousands of individuals as they head south into Central and South America (Johnsgard 1990, Stephens and Anderson 2003).

ALTERNATIVE 1 – NO ACTION

Under this alternative, no treatments would occur in the project area. Pine trees would become more dense in time. More SS 4B/4C/5 pine acres may be created. This condition may lead to an increased chance of stand replacing wildfire and beetle infestation. Conifers would continue to encroach into meadows, riparian areas and hardwood communities. Due to conifer encroachment into hardwoods, browsing pressure and wildfire suppression, hardwood acreage may decrease. If beetle and/or stand replacing wildfires occur, then

preferred pine nesting habitat may be lost. However, aspen acreage may increase. The No Action Alternative provides the most potential pine nesting habitat for the broad-winged hawk. This species is likely to persist on the Forest.

ALL ACTION ALTERNATIVES

Under all Action Alternatives, the total, combined acres of preferred nesting habitat for the broad-winged hawk (SS 4B, 4C, and 5 pine, combined) would decrease from the existing condition. Hardwood release, 1,544 acres, is the same under each action alternative. Refer to the Silviculture section earlier in this Chapter for more information on alternative impacts to cover type and structural stages in the project area.

Any of the Action Alternatives may cause broad-winged hawks, if present, to avoid, or move from, an area being treated. If there are unknown nests in the project area than any of the Action Alternatives may disturb nesting if harvest occurs during the nesting season. This impact is expected to be short-term affecting only one brood at most if harvest operations are conducted during the nesting season. Known nests would be protected through Standard 3204.

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. Of the Action Alternatives, Alternative 4 results in the most acreage of SS 4B/4C/5 pine. The large aspen stands located in the project area may provide the deciduous component sought-after by the species. The Action Alternatives would increase nesting habitat within the hardwood communities due to conifer removal treatments.

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 Action 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

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

Past treatment of spruce on private lands, Cold Springs Creek, may have negatively impacted habitat for this species. Spruce was harvested along the creek in the 1990s. The riparian area does not show any signs of recovering shrubs and/or spruce trees. Forest-wide, spruce acreage has increased in the Black Hills by approximately 3,725 from 1997 to 2005 (USDA Forest Service 2006b).

Fuel treatments that aid in the prevention of wildfires and help maintain mature and late successional stage stands can improve habitat for this species. Wildfires on the other hand can reduce habitat if they become stand-replacing events. Understory burns are not likely to

substantially reduce habitat since large diameter pines are the most fire-resistant. Past timber harvest has reduced area of dense pine stands, however, natural succession and tree growth, coupled with fire suppression, continues to replace these dense stands. The action alternatives would reduce 4B and 4C pine stands (see direct and indirect effects section) which may be offset by some creation of these stand structures through natural succession and fire suppression.

There are no known future activities on any lands in the project area that are expected to affect forest structure.

Past fire suppression has contributed toward an increase of pine in the project area. Insect infestation has created, and continues to create, open pockets where aspen may spread. Livestock and ungulate browsing and drought conditions have negatively impacted the hardwood habitat in this project area. Aspen has been suppressed due to these impacts. Proposed harvest and hardwood release activities would be expected to offset those impacts by increasing aspen acreage and vigor. Habitat for this species would be enhanced in the next 10 years through vegetative treatments.

There are future planned activities to regenerate and release aspen stands within the project area as part of the Mallo, Sanders, Canyon and Run timber sales. These activities would improve aspen habitat in the project area.

Northern Saw-whet Owl (SOLC)

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 (*Collaptes auratus*) 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).

Structural stages 4C and 5 most closely resemble the preferred breeding and nesting habitat for the saw-whet owl. These structural stages contain mature and old growth forest cover respectively with at least 70 percent canopy cover in the 4C stage. Snags are an integral part of nesting habitat. Snags do not occur evenly across the landscape. There will likely be some areas with higher snag densities that will allow the species to persist. Large trees are also important for this species because they provide future large snags.

Saw-whet owls occur from the southern boundary of Alaska, across most of Canada and into the northern tier of states from Maine to Minnesota. The Rocky Mountains, the Cascade Range, Coastal Range and the Sierra Nevada Mountains all support year-round populations. In the Black Hills, seasonal migration is likely among high- and low-elevation habitat (Johnson and Anderson 2003). In South Dakota, the northern saw-whet owl is considered an uncommon resident (Tallman et al. 2002). The saw-whet owl was determined to be widely distributed and common in the Black Hills (Fauna West Wildlife Consultants 2003). The northern saw-whet owl is tracked by the South Dakota Natural Heritage Program (SDNHP)

as a rare species and is ranked three on a rarity scale of one to five, with one being critically imperiled and five being secure (SDNHP 2006). There are no known sightings or nests in the project area.

ALTERNATIVE 1 – NO ACTION

No treatments would occur in the project area under this alternative. Pine would become more dense. Pine trees would increase in size and provide larger future snags. The dense pine conditions could lead to stand replacing wildfires and/or beetle infestation. Either of these activities could eradicate preferred nesting and roosting habitat but would create snags. The No Action Alternative provides the most potential pine nesting habitat for the northern saw-whet owl. This species is likely to persist on the Forest.

ALL ACTION ALTERNATIVES

All Action Alternatives propose commercial treatment in SS 4C pine sites. The one SS 5 pine site is not proposed for treatment in any of the alternatives. There is less than 100 acres difference in SS 3B/3C (preferred roosting habitat) pine totals when comparing the existing condition to each action alternative. SS 4C/3B/3C spruce sites are not proposed for treatment in any of the alternatives.

Any of the Action Alternatives may cause northern saw-whet owls, if present, to avoid, or move from, an area being treated. If there are unknown nests in the project area, then any of the Action Alternatives may disturb nesting if harvest occurs during the nesting season. This impact would be expected to be short-term affecting only one brood, at most, if harvest operations are conducted during the nesting season. Known nests would be protected through Standard 3204. No snags would be cut unless deemed a safety hazard during treatments. Riparian areas are not proposed for commercial treatment. There are post-harvest projects proposed that would protect riparian areas from degradation.

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. Of the action alternatives, Alternative 4 would result in the most acreage of SS 4C/5 pine.

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

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

Fuel treatments that aid in the prevention of wildfires and help maintain mature and late successional stage stands can improve habitat for this species. Wildfires on the other hand can reduce habitat if they become stand-replacing events. Understory burns are not likely to substantially reduce habitat since large diameter pines are the most fire-resistant. Past timber harvest has removed large diameter trees in treated stands which may have reduced the potential for large diameter snags. This project would also remove large diameter trees. However, natural succession and tree growth has continued to replace large diameter trees in untreated and treated areas. Past timber harvest has reduced area of dense pine stands, however, natural succession and tree growth, coupled with fire suppression, continues to replace these dense stands. The action alternatives would reduce 4B and 4C pine stands (see direct and indirect effects section) which may offset some creation of these stand structures through natural succession and fire suppression.

Past and present beetle infestation has and will continue to create snags of variable sizes within the project area. The Sheldon Fire of 2002 also has created snags in the project area. Habitat for this species would be conserved.

There are no known future activities on any lands in the project area that are expected to affect large diameter trees, snags or forest structure.

Pygmy Nuthatch (SOLC)

The pygmy nuthatch is a primary cavity nester that also uses secondary cavities (Ghalambor 2003, Kingery and Ghalambor 2001) found in mature yellow-pine communities 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). This presents a challenge in the Black Hills where ponderosa pines typically grow very densely in the absence of disturbance. Roosting habitat for the pygmy nuthatch varies seasonally. Foraging habitat is primarily in pine stands with high canopy closure (Ghalambor 2003). 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 1996a, Appendix H p. 40). Dead or decaying coniferous trees and snags provide substrate for nest cavities. 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 inches in diameter) per acre (Kingery and Ghalambor 2001).

Structural stages 4C and 5 most closely resemble one component of preferred habitat (old or mature undisturbed forest). Structural stage 4A most closely resembles open, park-like, mature forest conditions. Large trees are a habitat component because they provide foraging habitat and are a source for future large snags. Phase II structural stage objectives are designed to manage for the various structural stages across the landscape in a diversity of sizes and shapes. Snags that are greater than 15 inches in diameter are an integral part of

pygmy nuthatch nesting and roosting habitat. Snags do not occur evenly across the landscape. There will likely be some areas with higher snag densities that will allow the species to persist. Large trees are also important for this species because they provide foraging habitat, and because they are source for future large snags used for roosting and nesting.

The pygmy nuthatch subspecies of the Black Hills (*Sitta pygmaea melanotis*) is found from southern interior British Columbia and south throughout the forests of the Rocky Mountain West into Mexico and western Texas (DeGraaf et al. 1991). It is considered an uncommon resident in both Wyoming (Luce et al. 1999) and South Dakota (Peterson 1995). 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). A pygmy nuthatch was observed at the edge of the project area in 2002 (Panjabi 2003).

ALTERNATIVE 1 – NO ACTION

No treatments would occur in the project area under this alternative. Pine would become more dense. Pine trees would increase in size and provide larger future snags. The dense pine conditions could lead to stand replacing wildfires and/or beetle infestation. Either of these activities could eradicate preferred nesting and roosting habitat but would create snags. The No Action Alternative would provide the most potential pine nesting habitat for the pygmy nuthatch and therefore is the preferred alternative. This species is likely to persist on the Forest.

ALL ACTION ALTERNATIVES

The Action Alternatives propose to remove mature pine and reduce SS 4B and 4C down to SS 4A. Under this alternative, SS 4A pine acres would be increased by nearly 2,000 from the existing condition. The percentage of pine stands with a Very Large size class would not change over the management area (refer to the large tree discussion in the Silviculture section presented earlier in this Chapter).

Structural stage 5 acres would not be treated in any of the Action Alternative. Any of the Action Alternatives may cause pygmy nuthatches, if present, to avoid, or move from, an area being treated. This action alternative may disturb nesting if harvest occurs during the nesting season. This impact would be expected to be short-term, affecting only one brood at most, if at all, if harvest operations were conducted during the nesting season. No snags would be cut unless they were deemed a safety hazard during treatments.

Of the Action Alternatives, Alternative 4 results in the most acreage of SS 4C/5 pine. Alternative 4 also could potentially result in more large snags than Alternatives 2 and 3. Alternative 3 would result in the greatest amount of SS 4A acreage.

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

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

Past and present beetle kill has created and continues to create snags in the project area. Wildfires have also created snags in the past as well as created park-like habitat for the pygmy nuthatch.

Fuel treatments that aid in the prevention of wildfires and help maintain mature and late successional stage stands can improve habitat for this species. Wildfires on the other hand can reduce habitat if they become stand-replacing events. Understory burns are not likely to substantially reduce habitat since large diameter pines are the most fire-resistant. Past timber harvest has removed large diameter trees in treated stands which may have reduced the potential for large diameter snags. This project would also remove large diameter trees. However, natural succession and tree growth has continued to replace large diameter trees in untreated and treated areas. Past timber harvest has reduced area of dense pine stands, however, natural succession and tree growth, coupled with fire suppression, continues to replace these dense stands. The action alternatives would reduce 4B and 4C pine stands (see direct and indirect effects section) which may offset some creation of these stand structures through natural succession and fire suppression.

There are no known future activities on any lands in the project area that are expected to affect large diameter trees, snags or forest structure.

American Dipper (SOLC)

The dipper inhabits clear, fast-flowing streams. It feeds primarily on aquatic insects and insect larvae that it catches by diving underwater. Dippers nest within 25 feet of a stream (Anderson 2002) on rocky streamside ledges and cliffs, boulders, behind waterfalls, and under bridges. During winter, dippers move to areas of open water (Anderson 2002) and may move to lower elevations.

The primary risk factor appears to be the degradation of water quality due to sedimentation and other pollutants that affect prey availability (Anderson 2002). Flow reductions, especially in the winter; likely pose a risk as well. Limiting factors are thought to be adequate summer foraging habitat, suitable winter habitat, stream connectivity and availability of nest sites.

Anderson (2002) assesses the conservation status of the American dipper on the Black Hills. This species occurs from Alaska south along the Pacific Coast to Panama and inland mountain ranges of the west, including scattered populations in southeast Oregon, Nevada, Utah, and Arizona, western and southern New Mexico, and in the Black Hills of South

Dakota (Kingery 1996). The Black Hills population is at the eastern edge of its global distribution (Panjabi 2001). The dipper is not considered migratory, but movements within or between drainages are common near open, moving water during the freeze-up months of winter (Anderson 2002). There are no stream migration corridors to dipper populations to the west of the Black Hills (Backlund 2001).

In the Black Hills, the species occurs in Spearfish Creek and several of its tributaries. It has also been found at Rapid Creek and some of the streams between Rapid Creek and Spearfish Creek. However, Spearfish Creek is considered to be the only creek left in the Black Hills capable of supporting a self-sustaining population of dippers (Backlund 2001). Annual monitoring along Spearfish Creek began in 1993. Surveys conducted in 2003 indicate that there are less than 100 dippers in the Black Hills (Backlund 2003).

American dipper habitat is present in and along Beaver Creek within the Norwood Project Area. Seven years, 1991-1997, of random surveys for dippers on Beaver Creek reported just one 1992 sighting. In June of 1998, a dipper was observed near the state line pond on Beaver Creek (USDA Forest Service 1998). Beaver Creek is the only stream that has potential dipper habitat within the project area. This creek is currently protected from livestock grazing with exclosure fencing. Recreationists can camp at Beaver Creek campground, which is directly adjacent to the creek.

ALTERNATIVE 1 – NO ACTION

Beaver Creek would remain fenced from livestock. The campground would continue hosting recreationists and fishing would continue in the creek. Riparian shrubs should continue to thrive. The No Action Alternative does not include any riparian habitat enhancement projects and therefore, would be less beneficial to this species than the Action Alternatives. This species is likely to persist on the Forest.

ALL ACTION ALTERNATIVES

Under all Action Alternatives, the same post-harvest projects are proposed along Beaver Creek. No timber treatments are proposed near Beaver Creek. Beaver Creek resource protection treatments, such as livestock exclosure fencing, would be implemented. The Action Alternatives would move the Beaver Creek riparian area to a better condition overall and thereby create better dipper habitat. Willow planting in the riparian zone is also proposed under each Action Alternative. There is no treatment proposed along the riparian zone of Beaver Creek in the Action Alternatives. American dipper habitat would be benefited under any of the Action Alternatives due to the proposed post-harvest projects.

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

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

The past activity of protecting Beaver Creek by constructing a fence to exclude cattle has benefited American dipper habitat. Past harvest operations may have been beneficial for the water flow in the creek. Fewer pine in the area contributes to increased available water. The project area has had several years of drought conditions and this may go into the future as well. This factor may influence the riparian habitat for the American dipper in the area. Cold Springs Creek flows mainly through private land. The private land portion has had all spruce and shrubs cleared away from the creek in the past few years. The riparian protection and enhancement activities proposed in the action alternatives for the Norwood Project Area will benefit the American dipper.

There are no known future activities which would impact riparian habitat in the project area.

Northern Long-eared Myotis (SOLC)

At the western edge of its range, the northern myotis is found in the wooded riparian zone in badlands and prairies to higher elevation coniferous and deciduous woodlands. In the Black Hills region, this species has been captured at elevations ranging from 4,000 to 6,500 feet (Schmidt 2003a). Luce et al. (1999) listed habitat associations as dense ponderosa pine and mixed coniferous/deciduous forest.

Hibernacula include caves and mines. Individuals tend to wedge into crevices and are not easily detected or counted. During the summer, non-reproductive bats roost singly or in small groups of fewer than 10 individuals. Day roosts of males and non-reproductive females have been reported in buildings; under shingles; behind shutters of buildings; underneath exfoliating tree bark; inside cavities or crevices of trees; and in caves, mines, and quarries (Schmidt 2003a). Maternity roosts have been reported in buildings, 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) and in other regions (Rabe et al. 1998). 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 2003a). 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 2003a). The availability of suitable hibernacula, maternity roosting sites, and foraging areas all represent potential risk factors for this species (Schmidt 2003a).

The northern myotis ranges across most of eastern North America, extending from central Quebec, Ontario, and the southern half of Manitoba, south through all of the Dakotas, eastern

Nebraska, Kansas, and Oklahoma, and then east to the Atlantic coast. Turner (1974) reported northern myotis from Pennington and Custer counties in South Dakota and Weston County in Wyoming. NatureServe (2006) reported records of this species from Meade and Lawrence counties as well. Luce et al. (1999) reported records of northern myotis from latitude 7 and longitude 21, which includes Crook and Weston Counties, Wyoming and one historical record from the western part of the state.

No records were found for this species in the project area. No caves or mines were found in the Norwood project area during field surveys. There are currently 12,307 acres of SS 4B ponderosa pine and 2,773 acres of SS 4C ponderosa pine within the project area. The Forest is conserving habitat for this species through cave, mine, and snag management.

ALTERNATIVE 1 – NO ACTION

No treatments would occur in the project area under this alternative. Pine would become more dense. Pine trees would increase in size and provide larger future snags. The dense pine conditions could lead to stand replacing wildfires and/or beetle infestation. Either of these activities could eradicate some habitat for this species but would create snags. Conifers would continue to encroach into meadows and riparian zones where this species may forage. Conifers would also increase in hardwood stands, which may cause a hardwood site to be converted to a conifer site. The No Action Alternative should provide the most suitable roosting snags for this bat species. This species is likely to persist on the Forest.

ALL ACTION ALTERNATIVES

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; however, snags from the Sheldon Fire (2002) and snags in localized pockets of pine beetle activity provide habitat for this species in the area.

Pine encroachment, meadow restoration and hardwood release acres remain constant in the three Action Alternatives. None of the Action Alternatives propose treatment in the 40 acre SS 5 site. Proposed road closures are the same under each alternative. These closures may help deter the illegal taking of snags for firewood. Riparian habitats are proposed for protective treatments through various discipline post-harvest projects.

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.
Any caves and/or mines found in the project area and determined to be important bat habitat would be protected through Forest Standards/Guidelines.

The Action Alternatives would enhance foraging habitat. Suitable roosting snags would also be available with the Action Alternatives. There are no known caves or abandoned mines within the project area. Thus, impacts from the action alternatives on this particular bat species should be minimal.

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

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 has created potential habitat (snags) for this species. Beetles are still active in the area and this is expected to continue into the future. Future enhancement of riparian areas may be beneficial to the species for foraging habitat. Habitat for this species would be conserved.

In general, human disturbance in or near hibernacula may cause site abandonment and local population losses. Recreational activities including spelunking can disturb hibernating bats. Habitat loss can occur with the closure of abandoned mines or destruction of buildings used by bats. Disturbance to cave and mine openings that changes airflow patterns, temperature regimes, and bat access can also impact bats (USDA, Forest Service 2001b).

There are no known future activities which would impact this bat species' habitat in the project area.

Small-footed Myotis (SOLC)

The small-footed myotis is found in a variety of habitats ranging from arid desert and badland habitats to riparian zones and grasslands. It is usually associated with rocky areas like bluffs, dissected breaks, ridges, cliffs, and major rock outcroppings within these habitats. In the Black Hills region, this species has been captured at elevations ranging from 3,800 to 6,000 feet (Schmidt 2003b).

Hibernacula for this species include mines and caves. Relatively warmer areas of caves with the least climatic fluctuations seem to be the preferred micro-site. Mine hibernacula are also documented (Turner 1974). 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 2003b). The small-footed myotis is one of the few bat species that actually roosts in cavities at ground level. Day roosts include buildings, behind the bark of pine trees, in rock crevices, under rocks on the ground, in 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 2003b).

The small-footed myotis ranges across most of western North America, extending from central British Columbia, southern Alberta and southwestern Saskatchewan, south to the central States of Mexico (Schmidt 2003b). It has been reported from all five South Dakota counties of the Black Hills (Turner 1974). Luce et al. (1999) reported records from latitude 7, and longitude 21 and 28 in Wyoming, which is most of the area bordering South Dakota with the possible exception of Weston County. However, Turner (1974) reported seven records from Weston County, Wyoming and recorded this species as widespread but not abundant in the Black Hills.

No records were found for this species in the project area. No caves or mines were found in the Norwood project area during field surveys. The Forest is conserving habitat for this species through cave, mine, and snag management.

ALL ALTERNATIVES

Refer to 'Northern long-eared myotis' section above. All action alternatives may 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 3, which proposes the most vegetative treatment. Roosting disturbance should be of short duration. This species is likely to persist on the Forest.

CUMULATIVE EFFECTS

Refer to 'Northern long-eared myotis' section above. All action alternatives may 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 3, which proposes the most vegetative treatment. Roosting disturbance should be of short duration.

Long-eared Myotis (SOLC)

The only records of long-eared myotis in the Black Hills come from unpublished reports (Schmidt 2003c). Clark and Stromberg (1987) report long-eared myotis occur in suitable habitat throughout Wyoming although the majority of the records are from the western half of the state. Luce et al. (1999) reported long-eared myotis in 22 of the 28 surveys in Wyoming but in only one of the two counties in the Black Hills of Wyoming. It is unknown whether the Black Hills supports a self-sustaining population (Schmidt 2003c).

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: roost snags were generally in larger DBH, had more loose bark, and were found at higher densities. Stumps, also of large diameter, have been documented as summer roost sites for the long-eared myotis in British Columbia (Vonhof and Barclay 1997).

Although relatively little is known about this bat's specific hibernation needs, hibernation sites include caves and mines (Higgins et al. 2000), but there are no known reports of them hibernating in the Black Hills (Schmidt 2003c). Reproductive females have been found in buildings, rock crevices, and hollow trees. Reported day roosts for this species include buildings (often abandoned), under loose tree bark, in hollow trees, among timbers of an unused railroad trestle, in caves and mines, in cliff fissures, and in portable latrines (Schmidt 2003c). This bat often uses caves and mine tunnels as nightly roosts (Higgins et al. 2000, Schmidt 2003c).

The long-eared myotis ranges across much of montane western North America, extending from central British Columbia; the southern half of Alberta and the southwestern corner of Saskatchewan; south to Baja California along the Pacific coast; along the western edges of the Dakotas; and most of Wyoming and Colorado to northwestern New Mexico and northeastern Arizona (Schmidt 2003c).

No records were found for this species in the project area. No caves or mines were found in the Norwood project area during field surveys. The Forest is conserving habitat for this species through cave, mine, and snag management.

ALL ALTERNATIVES

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.

Long-legged Myotis (SOLC)

The long-legged myotis is primarily associated with montane forest. In the Black Hills, this species occurs primarily at elevations between 4,500 and 6,500 feet (Turner 1974). 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 in the Black Hills where they may be subject to disturbance by rock climbing activities. 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-successional pine forests. Day roosts are usually under the bark of ponderosa pine and in snags. These bats prefer dead snags characterized by reduced needles and twigs, loose bark, broken tops, hard-to-spongy heartwood, and spongy-to-soft sapwood. Roost snags are generally taller than surrounding trees, close to other available trees, and surrounded by a relatively open canopy. Reproductive females have been found roosting in buildings, 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 Bush's and Jewel Caves (Schmidt 2003d, Luce et al. 1999, Turner 1974).

The long-legged myotis forages over meadows, ponds, streams, and open mesic habitats of the Black Hills where it feeds on flying insects, particularly moths (Luce et al. 1999, Turner 1974). Although this species is the most common and widely distributed bat in the Black Hills (Turner 1974), general limits to persistence include availability of roost sites, hibernacula, and foraging areas. 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).

The long-legged myotis is common across the western United States. Its range extends across most of western North America, from southeastern Alaska through the western and southern half of British Columbia and the southern half of Alberta, down the western edge of the Great Plains states and into central Mexico (Schmidt 2003d). This species is considered the most common and widely distributed member of the genus *Myotis* in the Black Hills region and has been reported from all counties occupied by the Black Hills in both South Dakota and Wyoming (Schmidt 2003d, Luce et al. 1999, Clark and Stromberg 1987, Turner 1974).

No records were found for this species in the project area. No caves or mines were found in the Norwood Project Area during field surveys. The Forest is conserving habitat for this species through cave, mine, and snag management.

ALL ALTERNATIVES

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)

Throughout their range, northern flying squirrels inhabit a wide variety of woodland habitats, typically dominated by conifers or mixed coniferous/deciduous forests (Wells-Gosling and Heaney 1984). Optimal northern flying squirrel habitat has been reported as cool, moist, mature forest with abundant standing and down snags. It is often most abundant near surface water (swamps and streams) (NatureServe 2006). Recent studies have indicated northern flying squirrels occupy a variety of forest types and are not necessarily old growth dependent (Cotton and Parker 2000).

Flying squirrels tend to avoid large openings, possibly because they cannot cross them by gliding in the air (USDA, Forest Service 1996a). They use hollow trees, cavities, abandoned woodpecker holes, or dense portions of trees as nest sites (USDA Forest Service 1996a, Wells-Gosling and Heaney 1984).

Although flying squirrels are thought to prefer mesic, mature, spruce forests in the Black Hills, mature and late-successional stage pine forests (Structural Stages 4C and 5) on more mesic sites may also contain the snag resource 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 successional habitat is distributed as patches at low abundance, 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. Duckwitz (2001) found flying squirrels in Wind Cave National Park in ponderosa pine types that had an open canopy allowing understory grasses to prosper. Open pine types may provide the "openness" necessary for gliding. Locations where flying squirrels were found in Wind Cave National Park did have large pines while stands of dense dog-hair pine were avoided (Duckwitz 2001).

The northern flying squirrels range includes Alaska, most of Canada, the montane western United States, the upper plains states, the Great Lakes region and the northeastern United States (Natureserve 2006). The northern flying squirrel in the Black Hills is an isolated population with the nearest population located in the forests of western Wyoming (Clark and Stromberg 1987, Wells-Gosling and Heaney 1984).

ALTERNATIVE 1 – NO ACTION

Under this alternative, no treatments would occur in the project area. Pine trees would become more dense in time. More SS 4C/5 pine acres may be created which could lead to larger potential snags. This condition may lead to an increased chance of stand replacing wildfire and beetle infestation. Conifers would continue to encroach into meadows, riparian areas and hardwood communities. Due to conifer encroachment into hardwoods, browsing pressure and wildfire suppression, hardwood acreage may decrease. If beetle and/or stand replacing wildfires occur, then preferred pine nesting habitat may be lost. However, aspen acreage may increase. Spruce habitat would possibly increase due to encroachment into hardwoods and/or pine sites. Natural mortality would continue in the spruce trees, creating natural openings for new regeneration. The No Action Alternative would provide the most potential large snags for this species. However, hardwoods may suffer due to conifer encroachment. This species is likely to persist on the Forest.

ALL ACTION ALTERNATIVES

Acres of 4A ponderosa pine are higher in the Action Alternatives compared to the existing condition. SS 5 acres would not be treated under any Action Alternative. None of the Action Alternatives proposes changing the structural stage of any of the spruce sites. Only one spruce site, 040203-0017, is proposed for treatment in each of these alternatives. It's a SS 4A site and would remain in that condition. All Action Alternatives propose the same acreage of hardwood release.

Any of the Action Alternatives may disturb nesting if harvest occurs during the nesting season. This impact is expected to be short-term. No snags would be cut unless deemed a safety hazard during treatments. All of the action alternatives result in no change to pine sites with a Very Large size class over the management area (refer to silviculture section

presented earlier in this Chapter). Of the Action Alternatives, Alternative 4 would retain the most dense pine conditions and potentially the most large size snags throughout the project area.

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

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

Forest management activities, such as thinning, that reduce the amount of mature mesic forest or increase forest fragmentation could negatively affect northern flying squirrels. Alteration of forest structure that reduces the availability of suitable nesting snags could also negatively affect these squirrels. Timber harvest activities that occur within occupied flying squirrel nesting habitats during the nesting season could directly displace, harm, or kill young, non-mobile flying squirrels. Past fires and beetle infestation has created potential habitat (snags) for this species. Beetles are still active in the area and this is expected to continue into the future. Privately-owned lands within the project area may also provide suitable northern flying squirrel habitat. Private lands that are managed for timber harvest could lead to fewer acres in the late-successional stage forest and fewer snags. Habitat for this species would be conserved.

There are no known future activities which would impact mature forest habitat in the project area.

Meadow Jumping Mouse (SOLC)

This species is strongly associated with riparian habitats along small streams in meadows and habitats beneath forests with an understory of deciduous shrubs, grasses, forbs, and fallen logs; it is presumed to disperse primarily along stream corridors. The meadow jumping mouse is a profound and continuous hibernator, retreating to burrows in dry ground from October to May. Burrows are also used for nests (Luce et al. 1999).

Domestic animal overgrazing, which consistently removes dense vegetation along eastern creeks in Wyoming is thought to have contributed to this species' scarcity (WYNDD 2002). However, there is little evidence that the mouse is scarce relative to historic abundance. *Zapus* in general tend to occur at relatively low abundance and it is uncertain whether the current abundance is different than the past. Limits to abundance and distribution include reduction of understory shrubs, grasses, and forbs in low-to-mid elevation riparian areas (Luce et al. 1999, WYNDD 2002). Fragmentation of appropriate riparian habitat may limit this species' ability to disperse.

Meadow jumping mice range across Alaska through Canada, the northern and eastern United States, and across the Great Plains to the eastern foothills of the Rocky Mountains (WYNDD 2002, Whitaker 1972). The Bear Lodge meadow jumping mouse (*Zapus hudsonius campestris*) is a separate subspecies that occurs in the Black Hills region (Beauvais 2001) and is listed as rare in Wyoming (Luce et al. 1999). There are seven recorded occurrences of this species on the Bearlodge Mountains of the Black Hills, including the type specimen collected in 1864 (WYNDD 2002). Turner (1974) collected a total of 207 specimens from across the Black Hills and Bear Lodge Mountains in South Dakota and Wyoming. He collected the species as far south as Wind Cave National Park and characterized it as common throughout the study area (Black Hills and Bear Lodge Mountains). He did collect specimens from the Norwood project area in the vicinity of Beaver Creek.

ALTERNATIVE 1 – NO ACTION

No treatments in riparian areas would occur under this alternative. Livestock grazing would continue around many of the riparian corridors. Riparian grasses may continue to receive high seasonal use. Beaver Creek's exclosure fence would be kept intact to protect the riparian acres from livestock grazing and motorized use. Spruce along Beaver Creek would continue to die and fall due to natural causes. The No Action Alternative would not cause detrimental impacts to riparian areas within the Norwood project area. This species is likely to persist on the Forest.

ALL ACTION ALTERNATIVES

All three Action Alternatives propose the same riparian protection/enhancement projects (post harvest). These include planting willows, building more exclosure fencing, constructing road closures, installing new tanks and fencing new riparian areas, and re-locating existing stock tanks farther from riparian corridors (refer to wildlife, range, and hydrology post-harvest projects). The Beaver Creek and Cold Springs Creek corridors do not have any proposed commercial treatments nearby that would cause negative impacts.

These alternatives would not cause detrimental impacts to riparian areas within the Norwood project area. Timber treatments adjacent to perennial stream reaches are not proposed. Some fence projects are proposed, in the Action Alternatives, near riparian areas in order to protect the resource. Therefore the Action Alternatives would move the riparian areas to better condition overall in the project area. The post-harvest projects may enhance habitat for the meadow jumping mouse.

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

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

Past fire suppression, timber harvest, road use, recreation (motorized), livestock grazing, and natural events such as drought and flooding have caused impacts to riparian areas within the project area. Fire suppression has resulted in an increase of pine trees which may lead to a change in water tables. Drought conditions and livestock/wildlife use can also negatively impact the water level in the riparian areas. All of these activities would be expected to continue in the future. No adverse cumulative effects would be expected from the alternatives.

Past treatment of spruce on private lands, Cold Springs Creek, may have negatively impacted habitat for this species. Spruce was harvested along the creek in the 1990s. The riparian area does not show any signs of recovering shrubs and/or spruce trees. The private land is intensively grazed.

There are no known future activities which would impact riparian habitat in the project area.

ENDANGERED, THREATENED and R2 SENSITIVE Wildlife SPECIES

Refer to the Norwood Project Area BA/BE in the project file for a thorough analysis of these species and expected effects from the alternatives. The following table lists any threatened and R2 sensitive species that were analyzed in the Norwood BA/BE due to the presence of potential habitat in the project area. There are no Endangered Species which may be present in the project area. Determinations based on effects from the action alternatives are listed as well. R2 sensitive species not listed in the table below do not have habitat in the project area. The black-backed woodpecker and the mountain sucker are also Management Indicator Species. These 2 species have been addressed under the MIS section presented earlier in this Chapter.

Table 3.49 - Threatened, Endangered and R2 Sensitive Species with Potential Habitat in the Norwood Project Area.

Species	Status	Determination
Bald eagle (*Haliaeetus leucocephalus*)	Threatened	No effect
Fringed myotis (*Myotis thysanodes*)	R2 Sensitive Species	May adversely impact individuals, but not likely to result in a loss of viability in the 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 viability in the Planning Area, nor cause a trend toward federal listing
American marten (*Martes americana*)	R2 Sensitive Species	May adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing
Northern goshawk (*Accipiter gentilis)*	R2 Sensitive Species	May adversely impact individuals, but not likely to result in a loss of viability in the 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 viability in the 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 viability in the Planning Area, nor cause a trend toward federal listing
American three-toed woodpecker (*Picoides dorsalis*)	R2 Sensitive Species	May adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing
Northern leopard frog (*Rana pipiens)*	R2 Sensitive Species	May adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing
Black Hills redbelly snake (*Storeria occipitomaculata pahasapae*)	R2 Sensitive Species	May adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing
Mountain sucker (*Catostomus platyrhynchus*)	R2 Sensitive Species	No impact
Cooper's mountain snail (*Oreohelix strigosa cooperi*)	R2 Sensitive Species	May adversely impact individuals, but not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing

Bald Eagle (Threatened)

The bald eagle is the only federally listed species with potential habitat in the Norwood project area. Population trend for the bald eagle appears to be on the increase in the state according to the South Dakota Department of Game, Fish and Parks (SDGFP 2006a, 2006b). Nationally the trend is moving upward as evidenced by the consideration of removing the bald eagle from the Endangered Species List. Observations of bald eagles in 2003, by Forest Biologists, were at an all time high and observations in 2004 were higher than usual (USDA Forest Service 2004b and 2005b).

ALTERNATIVE 1 – NO ACTION

Under this alternative no large trees would be harvested. Wildfire and insect outbreaks would continue to cause mortality of potential roosting trees for the bald eagle in the Norwood project area. However, bald eagle roost sites would not be limited.

ALL ACTION ALTERNATIVES

These Action Alternatives would remove potential roosting trees for any bald eagles that may temporarily be in the project area.

A determination of 'No Effect' was made for this species. The removal of some large trees would not affect bald eagles due to the abundance of suitable large trees, perch/roost sites, remaining after treatment in the Norwood project area as well as the entire Black Hills National Forest.

CUMULATIVE EFFECTS

No cumulative effects from this project's alternatives are expected.

Region 2 Sensitive Species

Refer to the Norwood project area BA/BE for further information on habitat, distribution, project review, analysis of effects, determination and rationale for determination of each of the Region 2 sensitive species.

Fringed Myotis *(R2 sensitive species)*

This subspecies of fringe-tailed bat will roost during summer in caves, abandoned mines, tree cavities (snags) and man-made structures. Late successional 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).

There are no known caves, mines or documented roost sites within the Norwood Project Area. However, there are some exposed rock outcrops and snags within the area that have the potential for use as roost sites for bats. There is no evidence to suspect that a major hibernaculum (cave) site exists within this project area. Potentially suitable habitat is present in the Norwood Project Area. There was a fringed myotis captured southwest of Moon Campground in August of 1993. Historical records from the Wyoming Natural Diversity Database contain information on fringed myotis sightings in or near the project area.

ALTERNATIVE 1 – NO ACTION

Changes in habitat due to natural succession would occur. Stands would gradually become more dense and individual trees would become larger. Overstocked pine stands would become more susceptible to insect induced mortality. This condition may also increase the risk of stand replacing wildfires. There would be no change to caves, rock fissures or man-made structures. Forest Objective 221 is currently being met in the project area and would be met under this alternative.

ALL ACTION ALTERNATIVES

Under the action alternatives, bats may be directly affected due to timber felling if bats are roosting in trees or under bark. The removal of commercial wood could result in fewer future roost sites. Snag loss is also likely to occur at some level depending on hazard. Prey species may increase due to increases in grass/forb structural stage. The action alternatives would limit individual use of treated areas but 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 conserving and enhancing habitat for this species through cave, mine and snag management. In addition, the size of this project (roughly 3.5 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. Of the action alternatives, Alternative 3 would likely have the most impact on the bat species due to the larger acreage of treatment.

CUMULATIVE EFFECTS

Increased pine beetle activity and wildfire will create additional dead trees (for roosting) and grass/forb structural stage which could increase prey base for this species. Roosting habitat (large snags) will continue to be lost to timber harvest activities, such as hazard tree removal, in the Norwood Project Area. Alternative 1 would be most favorable to this species because no large trees would be removed and the potential for snag creation is the greatest with this alternative. Alternative 4 would be most favorable of the action alternatives, followed by alternative 2. Alternative 3 would be least favorable of all because it has the most potential to remove large trees.

Townsend's Big-eared Bat (*R2 sensitive species*)

This bat inhabits shrub-steppe, forest edge, pinyon-juniper, and moist forest types. This bat species usually roosts in caves or abandoned mines. Hibernacula and maternity roosts are usually caves, rock crevices, buildings and occasionally mine shafts. Caves with high humidity, cool temperatures, and numerous crevices and fractures are preferred for roosting. This species usually roosts on more open rock surfaces where they are more susceptible to disturbance. This species is active in the late evening and feeds mainly on small moths high in the forest canopy, occasionally gleaning insects from trees (Higgins et al. 2000, USDA Forest Service 2000).

Suitable foraging habitat and potential roosting/hibernating habitat is present in the Norwood Project Area. There are no known caves or abandoned mine adits in the project area. However, there are man-made structures, rock outcrops, and cliff-face crevices and fissures. There are no records of Townsend's big-eared bats in the Norwood Project Area.

ALTERNATIVE 1 – NO ACTION

There would be no direct or indirect impacts on this species as a result of this alternative. No change to man-made structures, rock outcrops or cliff-face crevices and fissures would occur and there would be no disturbance to roosting bats.

ALL ACTION ALTERNATIVES

Large colonial maternity or hibernacula roost sites are not suspected to occur in the Norwood Project Area. However, the species is likely present within the project area. Disturbance of rock outcrops by heavy equipment and/or tree felling could cause displacement of roosting bats or possible mortality. Vegetation treatment near rock faces could potentially change microhabitats, affecting use of these sites as roosting habitat. Loss of large diameter trees and dense forest conditions could affect prey numbers and distribution, and reduce day/night roost habitat potential. Loss of forest vegetation from pine beetle mortality may have a similar effect as the forest canopy is opened. Prey base could decrease initially, but may increase following tree removal and/or pine beetle mortality and the expected increases in deciduous regeneration, shrub, and grass/forb growth. Of the action alternatives, Alternative 3 would likely have the most impact on the bat species due to the larger acreage of treatment.

The action alternatives may limit individual use of treated areas but 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 conserving and enhancing habitat for this species through cave and mine management. In addition, the size of this project (roughly 3.5 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.

CUMULATIVE EFFECTS

Roosting habitat could be impacted by active timber sales. Since there are no caves in the Norwood Project Area it is unlikely that action alternatives would contribute to adverse cumulative effects.

American Marten (R2 sensitive species)

There is suitable habitat for marten in the Norwood project area. Spruce and mixed conifer stands are present, especially in the deep drainages and along Beaver Creek. Spruce regenerates under pine stands with even moderate canopy closure. From 2000-2002, the following areas were surveyed for marten presence using track plate boxes: Wet Parmlee Canyon, Bear Canyon, Beaver Creek, and Bear Run. In the fall of 2003 and the summer of 2004, marten bait/camera stations were set up in the following areas: north of Oatman Spring, Cold Springs Creek, Cold Creek, and Beaver Creek. No marten presence was detected during any of the above surveys.

In 1999, several survey quadrants, using track plate boxes, were set up within the project boundary in order to check for marten presence. No marten were detected. This was done as an ongoing study by Dorothy Fecske and the South Dakota Game, Fish and Parks Department (Fecske 2003). In the fall of 2005, a graduate student (Smith 2006) radio collared three marten captured along Beaver Creek. Their territories range from Beaver Creek in South Dakota over to Stockade Beaver Creek in Wyoming.

There are 3,023 acres of spruce designated in the Norwood project area. The majority of these acres are in structural stages 4A, 4B, and 4C. The majority of the spruce acres are in the north half of the project area. There are additional acres of spruce within designated ponderosa pine sites.

ALTERNATIVE 1 – NO ACTION

Changes in habitat due to natural succession would occur. Stands would gradually become more dense and individual trees would become larger. Overstocked pine stands would become more susceptible to insect induced mortality. This condition may also increase the risk of stand replacing wildfires. This species preferred habitat, spruce/riparian zones, would remain unmanaged. Spruce would continue natural mortality with the creation of pockets for new regeneration. Spruce along Beaver Creek, where marten were found in the project area, will continue to die and fall over creating layers of habitat. Alternative 1, no action, would provide the best habitat for marten because pine sites located next to spruce would become denser and more mature. Forest Objective 221 is currently being met in the project area and would be met under this alternative.

ALL ACTION ALTERNATIVES

Logging activities and fuel reduction treatments in pine sites adjacent to important connectivity habitat could effectively reduce canopy cover, prey habitat and future downed woody material desired by marten. Areas have been identified as important connectivity corridors for marten in all three Action Alternatives. The identified sites are the same under each alternative. Some of the sites deferred for marten connectivity also have R2 sensitive species land snail presence. A total of 2,844 acres are deferred for marten. This total is 78 percent of the designated spruce acreage within the Norwood project area. Of these, 483 acres are pine sites. Of the 2,844 acres, 969 of those are also deferred for snails. The one spruce site that is proposed for treatment in the project area is a SS 4A site. It has not been selected as a connectivity site. The Beaver Creek and Cold Springs Creek corridors of spruce are not proposed for any treatment in any of the three action alternatives.

Marten travel/dispersal could be impacted during vegetative treatment activity under any of the action alternatives. The density of the remaining canopy may also impact marten. Marten become easy raptor prey when in open forest conditions. Under the Action Alternatives piles for small mammals, marten prey species, would be created during mechanical vegetation treatments. Refer to the Design Criteria listed in Appendix B.

All but one designated spruce stand would be deferred from treatment in all Action Alternatives. There could be some impacts to possible marten habitat from logging activities in pine stands adjacent to spruce habitat. Of the Action Alternatives, Alternative 4 is the preferred option. It provides for the most canopy of the three Action Alternatives. Under all Action Alternatives, connectivity sites for American marten have been identified and marten habitat would be enhanced by creating marten prey habitat in the form of piles. Forest Objective 221 is currently being met in the project area and would be met under any of the three Action Alternatives.

CUMULATIVE EFFECTS

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

Spruce in this area has not been treated as heavily as the pine. Many of the spruce sites have not been entered for decades and do not receive much impact from roads, recreation, or grazing. Past and on-going fire suppression activities have allowed spruce to increase, at the expense of other forest types (USDA, Forest Service 2005). The past and present drought condition may be impacting the acres of spruce in the project area. The trees may be weakened in the long run. The project activities in all action alternatives in spruce are not expected to further reduce acres of spruce. The group selection harvest in the only treated spruce stand may offset some effects of the drought by reducing competition in that stand. There are no known foreseeable future activities which would impact spruce in the project area. Habitat for this species will be maintained.

Silviculture prescriptions that are designed to favor pine over spruce would limit the development of better marten habitat in areas managed primarily for timber production such as in Norwood project area. Mountain pine beetle mortality would also reduce forest canopy,

but would leave much more standing dead. This material would fall to the forest floor, increasing large down woody debris. Past activity, spruce removal, on private land along Cold Springs Creek would have impacted marten if present.

There are no known future activities which would impact riparian and/or spruce habitat in the project area.

Northern Goshawk (R2 sensitive species)

Refer to the Norwood BA/BE for habitat and distribution information on this species.

One-hundred forty-four sites, with potential suitable nesting habitat for northern goshawks, were surveyed within the Norwood project area in the summers of 2002-2004. No new nests or goshawks were observed.

At present, the area is limited in the amount of suitable goshawk nesting habitat it could provide. Natural conditions and past timber management are the primary reasons. In 2001, 2002, and 2004, there were sightings just outside the south end of the project boundary. In 2003, there was a northern goshawk sighting in the northern part of the project area in a spruce site. In 2004, there was a sighting south of Bear Canyon along Little Bear Run (Panjabi 2001, 2003, 2004, 2005). There is one historic goshawk territory in the project area, located in Bear Canyon. There are 15,080 acres of SS 4B/4C ponderosa pine in the project area.

ALTERNATIVE 1 – NO ACTION

Changes in habitat due to natural succession would occur. Stands would gradually become more dense and individual trees would become larger. Overstocked stands would become more susceptible to wildfire and insect induced mortality, increasing snag density over time. In the long-term, stands suitable for nesting would become more common. Mature stands would develop characteristics of late successional stands. Alternative 1 would provide the best habitat for goshawks.

ALL ACTION ALTERNATIVES

Under the Action Alternatives, 183 acres would be deferred for northern goshawk nesting habitat within the project area (see table 3.50 below) to be consistent with Forest Plan standard 3108. This would help improve Forest-wide goshawk distribution long-term. The stands selected are sites that provide the best potentially suitable nesting habitat for goshawks. The project area has been recently harvested under several project names and is primarily immature and mature forest stands.

Table 3.50 - Bear Canyon Goshawk Nest Area

Location	Site	Structural Stage	Acres
040903	179	4C- Pine	44
040903	182	4C- Pine	28
040903	183	4C- Pine	31
040903	198	4C- Pine	22
040903	199	4C- Pine	14
040903	201	4C- Spruce	28
040903	202	4B- Pine	16
Total Acres			183

Under all Action Alternatives, the preferred nesting habitat for the northern goshawk hawk, SS 4B and 4C pine, would decrease from the existing condition. If there are unknown nests in the project area, any of the Action Alternatives may disturb nesting if harvest occurs during the nesting season. This impact would be expected to be short-term affecting only one brood at most if harvest operations are conducted during the nesting season. Known nests would be protected from disturbance by implementing Forest Plan standard 3111.

All Action Alternatives would decrease some habitat components for this species, and increase others, such as foraging acreage. Of the Action Alternatives, Alternative 4 would be the preferred alternative due to the lowest harvest in mature dense pine. Sufficient nesting and foraging habitat should be maintained across the Black Hills National Forest by meeting or moving towards Objective 5.1-204 (refer to the Silviculture Report for more information on this Objective). Forest Objective 221 is currently being met in the project area and would be met under any of the three Action Alternatives, by conserving the Bear Canyon nest area. Efforts to annually monitor all known goshawk nest stands for breeding success on the Hell Canyon District as well as Forest-wide would continue.

CUMULATIVE EFFECTS

Past timber harvest has contributed to the loss of large mature trees and blocks of mature dense forested stands have been reduced in size so that they are no longer considered large enough to meet the nesting requirements for the goshawk. The Action Alternatives would continue to remove suitable (potential) raptor nest trees, but would provide one nest protection area for this species. There would be other suitable nesting habitat that would be deferred from treatment. Fires and insect outbreaks would likely continue to occur at some unknown scale. There is not expected to be any substantial habitat or management changes with regards to private land in-holdings. Activities proposed in the Action Alternatives may cause adverse effects to the northern goshawk within the next 10 years. However, there may also be adverse effects under the No Action Alternative. Dense forest conditions may lead to a higher chance of habitat destruction due to stand-replacing wildfires. Alternative 1 would be most favorable for this species because it would not directly result in opening forested stands. Alternative 3 would be the least favorable because it would result in the most opening of timber stands. Alternative 4 would be the most favorable of the action

alternatives because it would harvest the least acres and Alternative 2 is between Alternatives 3 and 4.

Flammulated Owl *(R2 sensitive species)*

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 established itself in the Black Hills.

Based on published information, and the recent Black Hills sightings it is reasonable to expect that suitable habitat for flammulated owls is present in the Norwood Project Area.

ALTERNATIVE 1 – NO ACTION

There would be no direct effects to this species as a result of this alternative. There may be additional opportunities for nesting habitat as additional beetle mortality is likely.

ALL ACTION ALTERNATIVES

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 to harvest operations). Alternative 3 would result in the most acreage of open park-like pine forest. Alternative 4, of the action alternatives, increases SS 4A the least amount from the existing condition. Aspen acreage would increase under any of the action alternatives. Increases in the owl's prey population may occur from activities that release under-story vegetation thus improving insect and small mammal habitat. Ground fuel (woody debris) is expected to be decreased in fuel treatment areas and this would reduce cover habitat for some small mammals, reptiles, amphibians, and some ground nesting birds.

The Forest Plan (Standard 2301) requires 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. If Forest standards and guidelines are followed, the alternatives are not likely to affect the colonization by or establishment of flammulated owls in the project area or on the Forest. The proposed alternatives would meet these standards and guidelines. Therefore, this species is likely to persist on the Forest.

CUMULATIVE EFFECTS

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, relatively open, park-like, stands are considered more suitable habitat. Timber harvesting that removes mature overstory and a loss of snags would reduce potentially suitable habitat. Alternative 1 would be most favorable to this species because it would not remove mature trees. Alternative 3 would be least favorable because it would potentially remove the most mature trees. Alternative 4 would be most favorable of the action alternatives.

American Three-toed Woodpecker (*R2 sensitive species*)

This woodpecker is similar to the black-backed woodpecker in regards to preferring areas recently invaded by insects (i.e. burned and beetle-killed areas). They are most commonly found in coniferous forests, especially spruce (USDA Forest Service 2000; Panjabi 2001, 2003; Tallman et al. 2002). Monitoring data from 2003 identified 35 three-toed woodpeckers in white spruce habitat and only one in ponderosa pine; although this stand did contain some spruce (Panjabi 2004). This species feeds on borers, insects, and beetle larvae underneath loose bark on dead trees. This species is a primary cavity nester, requiring large diameter hard snags and dense stands similar to the black-backed woodpecker.

There is potential suitable habitat within the Norwood Project Area. In 2003 one American three-toed woodpecker was observed near Parmlee Canyon, in spruce habitat. Several others were also observed summer of 2003, mostly in spruce habitat. In 2004 there were two sightings within the project area (Panjabi 2004, 2005). American three-toed woodpeckers were also observed along Cold Springs Creek in 2005 (Beason et al. 2006).

ALTERNATIVE 1 – NO ACTION

There would be no direct impact on this species as a result of this alternative. The expected increase of mountain pine beetles in the area may improve habitat for this species.

ALL ACTION ALTERNATIVES

There is a potential for accidental removal of snags/cavities being used by woodpeckers. Logging activities in pine sites adjacent to spruce stands and in spruce stands that are not deferred from treatment could effectively reduce prey species. Accidental removal or destruction of spruce by heavy equipment on pine sites adjacent to spruce stands and treated spruce stands could decrease desirable habitat. Only one spruce site is proposed for treatment in the project area. This site, a SS 4A stand, is 195 acres. The proposed treatment

would not change the cover type or structural stage of this site. There are 3,023 designated spruce acres in the project area. Additional inclusions of spruce occur within some pine sites. Spruce is treated the same under each action alternative.

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. Forest Service records indicate an increase in spruce over the last century. The Forest is conserving habitat for the American three-toed woodpecker (USDA Forest Service 2006c). Therefore, this species is likely to persist on the Forest.

CUMULATIVE EFFECTS

Any future timber sales that log spruce in the project area would reduce available habitat for the species. Spruce has potential to increase in acreage in this project area. It is encroaching into pine and hardwood sites. Pine beetle has and continues to open up more ground for spruce regeneration. Alternative 1 would be expected to result in the most spruce habitat and is therefore the most favorable alternatives for this species. The action alternatives would treat spruce the same, however, Alternative 3 would have the least potential for large scale wildfire and is therefore most favorable of the action alternatives.

Northern Leopard Frog (*R2 sensitive species)*

This species requires three types of habitat. Winter habitat, usually lakes, streams or ponds, is needed for winter torpor. High oxygen saturation is best in the winter waters. Summer habitat for this insectivorous frog is considered upland forage ground often near the breeding ponds. The third habitat is breeding/tadpole habitat. This is usually shallow bodies of water with little to no current, aquatic vegetation, good water quality, and little overhead canopy. Warmth from the sun is needed for proper development of the tadpoles. Larval development becomes an issue if water is too cold. This could explain why frogs are not breeding at springs in the Black Hills (Smith 2003).

Suitable habitat exists and this species is present in the Norwood Project Area. Breeding occurs at select ponds, catchments, and riparian areas. Surveys conducted in 2002-2006, at sites with a potential water source, confirmed presence and reproduction. Of thirty sites surveyed for northern leopard frogs in 2004, four had leopard frogs present. At three of the thirty sites, the pond basins were dry. In 2006, leopard frogs were found at two sites. Breeding was confirmed at one of these sites.

ALTERNATIVE 1 – NO ACTION

There would be no potential for direct impacts under this alternative. The potential riparian protection projects would not be implemented and therefore, existing impacts to this species would continue to occur.

ALL ACTION ALTERNATIVES

Any commercial, non-commercial and/or post-harvest activity near riparian sites could likely have direct adverse affects to the northern leopard frog, more so during the spring-summer breeding season. Potential habitat disturbance or loss may occur from road reconstruction and sedimentation in riparian areas. Reductions in canopy density may cause surface temperature and soil moisture (drying) changes that would not favor this species. The action alternatives would enhance habitat for this species by implementing post-sale projects which would provide protection to riparian areas from such things as motorized recreation and livestock grazing. Design criteria are included to protect riparian sites.

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. Therefore, this species is likely to persist on the Forest.

CUMULATIVE EFFECTS

Excessive livestock grazing at breeding sites (springs/catchments) will negatively impact this species. Available habitat could be supplemented if harvests increase spring/seep water yields, new springs/seeps surface, or if soil moisture levels are maintained. Decreasing soil moisture through timber harvest, slash/fuels disposal projects, and the disposal of existing down woody material (fuel treatments) will continue to reduce adult foraging habitat and adversely affect dispersal. Wildfires have removed canopy which can unfortunately increase ground temperatures, and may limit distribution of this species within the Norwood Project Area and across the Planning Area. Alternative 3 would have most potential for reduced fire risk and increased water yields which are beneficial to the frog, but would also have the most potential to decrease soil moistures by opening forested canopies. Alternatives 2 and 4 would have similar, but less pronounced potential effects. Alternative 1 would have the highest potential for a large scale disturbance event. At sites where there are introduced predatory fish leopard frog productivity has been adversely affected (Smith 2003).

Black Hills Redbelly Snake (*R2 sensitive species*)

This snake prefers woodlands and moist grassy meadows. Additionally, 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, SDGFP 2006c).

Suitable habitat may exist in the Norwood Project Area. Although there are no known records of this species occurring within this project area, there are historic records of two Black Hills redbelly snakes being found within 2 miles of the project boundary in Wyoming (WNDD, 2000-2002).

ALTERNATIVE 1 – NO ACTION

There would be no direct effects to the red belly snake as a result of this alternative. There may be increased downed woody material available in the project area as a result of mountain pine beetle mortality.

ALL ACTION ALTERNATIVES

Under the action alternatives this snake could be directly impacted by timber felling, harvest and fuel treatment equipment, road building and/or decommissioning, and prescribed burning. Currently they may be directly impacted by livestock grazing and recreationists. Potential habitat disturbance or loss (den sites) may occur from equipment and machinery used for road reconstruction, timber harvesting and fuel treatments. Removal of large diameter (≥10" DBH) trees, slash disposal, and fuel treatments in the action alternatives would decrease the amount of downed wood available as habitat for this species in the long term in the treated areas. Fuel treatments remain the same under each action alternative. Alternative 4 proposes commercial treating the least amount of acreage.

Any Activities in the project area may have or may cause impact to this ground dwelling species. Road reconstructions and decommissioning is the same under each action alternative. Alternative 4, of the action alternatives, proposes the least amount of commercially treated acreage. The Forest Plan Phase II Amendment has placed additional standards on management in riparian areas, streams, ponds, springs and other wet areas. Standard 3116 provides some protection for this species. While the habitat trend for the Black Hills redbelly snake appears stable across the Planning Area it has been negatively affected by recent large wildfires. FP Standards/Guidelines should be adequate to protect this species from any additional effects from the action alternatives if found to be present in the Norwood Project Area.

According to the Phase II Amendment to the 1997 Land and Resource Management Plan, implementation of Forest-wide objectives, standards and guidelines would conserve and enhance suitable Black Hills redbelly snake habitats. Although more needs to be done to clarify the species' distribution and abundance in the Black Hills, it appears to be reasonably common and widely distributed across the Forest. The proposed alternatives would meet standards and guidelines as well as enhance riparian and hardwood habitat for this species.

CUMULATIVE EFFECTS

Livestock overgrazing around springs and other wet areas will negatively impact this species. Timber harvesting, fuel treatments, and thinning where this species is present (den sites) may adversely alter site conditions (e.g. warming, drying, soil compaction, and den disturbance). Recent wildfires have contributed to this as well. Alternative 1 would not have the potential to change habitat conditions for this species, with the possible exception of potential fire risk. Alternative 3 would have the least potential for large wildfire impacts because the most acres are proposed for harvest. Alternative 2 and would have the 2nd greatest improvement in fire

hazard potential and Alternative 4 would have the least improvement in fire risk, of the action alternatives.

Cooper's Mountain Snail (R2 sensitive species)

Existing Condition
Refer to the Norwood BA/BE for habitat and distribution information on this species.

The following sites in the Norwood project area were surveyed in 2003 and 2004 by district biologists and technicians and Cooper's mountain snail was detected in the following sites: 40201-15; 40202-1, 19, 28, 29, 31, 32; 40203-40, 41; 40204-57, 60, 62, 63, 64, 68; 40301-47, 52; 40501-1, 15, 17, 19, 24, 25, 49, 50, 51, 58, 67; 40901-107, 117, 176, 184; 40903-129, 143, 144, 146-148, 202, 240. The shells were found in variable habitats in spruce, ponderosa pine, and grassland. Shells were more abundant on moist north-facing slopes in spruce habitats where limestone and moss were present. The following sites did not have any snails present: 40201-5, 11, 12, 16, 20, 24, 26, 27, 125; 40202-5, 6, 7, 17, 20, 26; 40204-13, 26, 34, 67, 76, 77; 40501-1; 40903-129.

ALTERNATIVE 1 – NO ACTION

Under this alternative no timber harvest would occur. Trees would become denser and provide more moist soil conditions for the Cooper's mountain snail. The risk with dense, mature stands of ponderosa pine is that they become more susceptible to insect infestation and fire. The spruce sites would continue with natural succession. Weak, older spruce may windthrow but new regeneration should be quick to grow. Limestone outcrops may be impacted by falling trees.

ALL ACTION ALTERNATIVES

All sites listed above with Cooper's mountain snail presence are deferred from commercial treatment under each Action Alternative. Therefore, the project is consistent with Forest Plan Standard 3103.

One of the sites, 40501-58, is proposed for fuel break treatment along private land. However, the known colony is not in this section of the site where the treatment would occur. Many of the other sites listed above with no snail presence are deferred from any treatment for marten connectivity habitat. Cooper's mountain snails may be present in sites not surveyed and therefore may be impacted by the Action Alternative treatments. Under the action alternatives, SS 3B, 3C, 4B, and 4C stands of pine would become more open SS 3A, 3B, 4A, and 4B stands. This would cause detrimental impacts to soil moisture content. One spruce site, SS 4A, would be treated in each Action Alternative. Group selection treatment, 505 acres, would remain the same under each Action Alternative.

Snails could be directly impacted by equipment and falling trees if present in or adjacent to RIS sites selected for treatment. Potential habitat disturbance or loss may occur from road work while creating good access for logging trucks. Closing roads could affect these snails negatively at first, due to heavy equipment, but would then be a positive effect for the snail. Generally the roads would be closed only at the beginning and would not be torn up over the entire length. Herbicide treatment of noxious weeds may potentially affect habitat. Timber

harvesting, cattle grazing, fire, herbicides, pine beetles, and road treatment where this species is present may adversely alter site conditions. Pine sites that have rocky moist outcrops could be affected by removal of the over-story and subsequent alteration of the micro-climate required for this species.

Unknown snail colonies could be affected by the Action Alternatives. One of the designated spruce sites would be treated. The potential for habitat alteration exists with timber harvest, thinning, fuel treatment, motorized recreation, livestock grazing, and maintenance of roads. Pine sites that have rocky moist outcrops could be affected by removal of the over-story and subsequent alteration of the micro-climate required for this species. Alternative 1 (no action) is the preferred alternative for this species. Of the Action Alternatives, Alternative 4 is the preferred option. It provides for the most canopy and would treat the least amount of acreage of the three Action Alternatives. Forest Objective 221 would be met under each of the Action Alternatives by conserving habitat where the Cooper's mountain snail has been found.

CUMULATIVE EFFECTS

Timber harvesting, motorized recreation, cattle grazing, fire, herbicides, pine beetles, and road treatment, where this species is present, may have and may currently adversely alter site conditions. These activities could continue to impact habitat for the Cooper's mountain snail in the project area. Activities proposed in the Action Alternatives may cause adverse effects to this snail species within the next 10 years. However, there may also be adverse effects under the No Action Alternative. Dense forest conditions may lead to a higher chance of habitat destruction due to stand-replacing wildfires. Alternative 1 would be most favorable for wildlife because it would not directly result in opening forested stands. Alternative 3 is least favorable because it would result in the most opening of timber stands. Alternative 4 is the most favorable of the action alternatives because it would harvest the least acres and Alternative 2 is between Alternatives 3 and 4.

Other Wildlife

Raptors

In August of 2003, a turkey vulture (*Cathartes aura*) nest was found in a cliff hole in RIS site 40301-1. One fledgling was present. The limestone cliff is on a south-facing slope that is mainly grass covered. In August of 2004, no fledglings were observed. However, that does not mean the nest was not active. A recommended no activity spatial buffer for nesting turkey vultures is 0.5 miles, from May 1 through August 15 (U.S. Fish and Wildlife Service-Utah Field Office, 2002).

During a field visit in June of 2003 to the project area, a red-tailed hawk (*Buteo jamaicensis*) nest was found. The nest was active with one hawk disturbed by our presence. The nest is located in a large ponderosa pine tree near the borders of RIS sites 40103-7 and 40103-26. Site 7 is currently a SS 1 aspen site. Site 26 is currently a SS 4A ponderosa pine site. The nest is in between an open meadow with regenerating aspen and a mature pine site that has been treated previously. A recommended spatial buffer for nesting red-tailed hawks is 0.5 miles with a seasonal buffer of March 15 through August 15 (U.S. Fish and Wildlife Service-

Utah Field Office, 2002). There is a raptor (suspected red-tailed hawk) nest in 40103-30 that was found in 1987.

The turkey vulture nest and two red-tailed hawk nests were checked for presence in May and August of 2006. None of the three nests had evidence of use.

ALTERNATIVE 1 – NO ACTION

In this alternative, the area remains "as is" and pine continues to encroach and take over meadows and hardwood stands. The area would become more vulnerable to insect infestations and wildfire. Those raptors that prefer heavily forested landscapes (e.g. Cooper's hawk [*Accipiter cooperi*] and sharp-shinned hawk [*Accipiter striatus*]) would benefit at the detriment of those preferring more open habitat such as the red-tailed hawk, American kestrel (*Falco sparverius*), and merlin (*Falco columbarius*) (DeGraaf et al. 1991, Tallman et al. 2002). Under the No Action Alternative, raptors requiring dense pine canopy may benefit but those species preferring open forest and grassland may in time have negative impacts.

ALL ACTION ALTERNATIVES

None of the sites containing the 3 raptor nests are proposed for any commercial treatment in any of the Action Alternatives. However, 040103-7 and site 26 are proposed for non-commercial fuel treatment (fuel breaks) along private land to the south. Treatment would be in a band 300 feet wide and would not be expected to reach the nest vicinity. All three known raptor nests have sites proposed for commercial and/or non-commercial treatments within the 0.5 mile spatial buffer. The number of sites to be treated near the nests would vary by alternative. All three Action Alternatives propose the same sites for non-commercial treatment (fuel breaks) within the 0.5 mile spatial buffer of the 3 nests.

All Action Alternatives must adhere to the recommended spatial and timeline buffers for these nest areas. Refer to Design Criteria in Appendix B.

The Action Alternatives could adversely affect nesting raptors during timber felling operations. Every effort should be made to educate timber markers and contractors to observe for stick nests in trees and defensive behavior by hawks/raptors. Despite these precautions, it is possible that raptor species could be adversely affected and active nests lost.

Although the Action Alternatives may decrease potential nesting habitat by removing large trees, habitat for some species may actually increase because of tree harvesting. All Action Alternatives propose to restore meadows and ground vegetation should increase in harvest units. Prey species habitat (i.e. small mammals and insects) for most raptors should subsequently improve.

CUMULATIVE EFFECTS

Past timber harvest has contributed to the loss of large mature trees often used by raptors as nest trees. The Action Alternatives would continue to remove suitable (potential) raptor nest trees. Little can be said about the possibility for future fires and insect outbreaks except that they would likely continue to occur. There would not be expected to be any substantial habitat or management changes with regards to private land in-holdings. Although there could be short-term adverse direct and/or indirect effects to raptor species due to the Action

Alternatives, adverse cumulative effects would not be expected. No adverse cumulative effects would occur from the No Action Alternative.

Turkeys

Turkeys are common in the Norwood project area in summer. Turkeys would remain in the area during mild winters. A popular game bird, it uses dense pine forest for winter foraging/cover habitat. These birds roost in larger diameter, horizontally branched ponderosa pine trees, usually in SS 4B or 4C stands that are within ½-mile of water. In summer months, hens with broods prefer more open forest conditions where insects are plentiful for poults to eat. The large parcels of private meadow within the Norwood project area provide forage opportunities for turkeys when the grasses are left to grow. Turkey populations on the Forest have been on a steady increase since 1998 (USDA Forest Service 2004a and 2004b).

The project area currently exceeds Forest plan direction for turkey roost tree groups. There are 15,080 acres of SS 4B/4C ponderosa pine in the project area.

ALTERNATIVE 1 – NO ACTION

No mature trees would be harvested under this alternative. There are more than 15,000 acres of mature ponderosa pine habitat with an average canopy density of at least 40 percent or more within the Norwood project area. Adequate roosting habitat is available. Under this alternative, pine will become more dense. This may increase the risk of stand replacing wildfires and beetle infestation in SS 4B and 4C stands, which may actually reduce available roosting and winter habitat. Under the No Action Alternative, turkeys would have the most roosting habitat opportunities and winter habitat. However, this may not be important if turkeys are not in the area during winter due to heavy snowfalls. Summer habitat may decrease under this alternative.

ALL ACTION ALTERNATIVES

Alternatives 2, 3, and 4 would increase summer habitat from the existing condition. All Action Alternatives decrease winter habitat for turkeys. Guideline 3205 could be met due to the number of 4B and 4C stands left untreated this entry. Table III-8 shows that all Action Alternatives would have far more acres of 4B and 4C pine habitat than required by Guideline 3205.

Any vegetative treatments and/or post-harvest projects proposed under the Action Alternatives may cause displacement of individuals; however, turkeys would be expected to come back to the affected areas in a short time period. If the area is thinned (commercial or non-commercial) and/or burned (through fuel treatment) it could still be of benefit as foraging ground.

Of the Action Alternatives, Alternative 3 provides the best summer habitat and Alternative 4 provides the better roosting and winter habitat for turkeys. All alternatives meet Forest Plan direction for turkey management.

CUMULATIVE EFFECTS

Past timber harvest, livestock grazing, recreation, and drought have impacted the turkey populations in the project area. Spring weather is probably the single most significant factor in determining turkey populations. Hunting pressure can also affect population levels. Livestock grazing in conjunction with or independent of drought can reduce herbaceous vegetation, which is important in maintaining a high quality summer brood habitat (Rumble and Anderson 1996). Although there could be short-term adverse direct and/or indirect effects to this species from the Action Alternatives, adverse cumulative effects are not expected. No adverse cumulative effects would occur from the No Action Alternative.

MIGRATORY BIRDS

In 2002, the US Fish and Wildlife Service published Birds of Conservation Concern. The purpose of that document was to identify migratory and non-migratory birds of the United States and its territories that are of conservation concern so as to stimulate coordinated and proactive conservation actions among Federal, State, and private partners. The concerns may be the result of population declines, naturally small ranges or population sizes, threats to habitat, or other factors.

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

Bird monitoring is conducted at the Forest-level to determine species distribution, abundance, and trend (Panjabi 2001- 2005, Beason et al. 2006). 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 will assist the Forest in determining whether additional conservation measures are necessary.

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, internal and public scoping efforts, and the BCC (USFWS Birds of Conservation Concern - 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 BCRs (Bird Conservation Regions). 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 were evaluated in the BA/BE if they have potential to occur in the Norwood project area. A summary account of these species can be found in the BCR Table. There are six

remaining species that could potentially occur in the Black Hills National Forest (planning area) but only three, the golden eagle, prairie falcon, and the red-naped sapsucker, have potential to be found within the Norwood project area or affected by the proposed actions.

All of the alternatives would result in reduced stand densities across the project area. This may result in a change in bird species composition in those areas. However, sufficient foraging habitat, hiding cover, and nesting habitat exists within and adjacent to the project area for migratory birds and other landbirds. Although species composition may change, nesting attempts may fail, or individuals may be displaced to other areas as a result of project activities, overall numbers of migratory birds and other landbirds would likely not change.

WYOMING PARTNERS IN FLIGHT

The Wyoming Bird Conservation Plan, Version 2.0, was developed by Wyoming Partners in Flight as part of the international Partners in Flight effort. Birds of concern are placed in one of several levels. Level I consists of bird species that clearly need conservation action (Nicholoff 2003). Level I bird species will be analyzed in this report. Of the 20 bird species in Level I, fourteen are duplicated on the Regional Forester's Sensitive Species list, and are evaluated in the Biological Evaluation if they have potential to occur in the Black Hills. Of the six species remaining in the list, four are not expected to occur in the Black Hills due to a lack of habitat. Of the remaining two species, the upland sandpiper has been observed on the Forest but does not have habitat within the Norwood project area. The other species, Swainson's hawk, does have habitat in the project area, is not discussed in the BA/BE and therefore is discussed here.

Swainson's Hawk (PIF)

Typical habitat for this species includes mixed to short grassland habitats with scattered trees. Agricultural areas, including irrigated alfalfa fields and pasture, are also preferred for foraging of visible prey. Trees or bushes are preferred for nesting, however, ground, cutbank and cliff nests have been found (Nicholoff 2003). Swainson's hawks will construct their own nests or may use old magpies, crows or raven nests. These hawks usually hunt from perches or low level flight and typically capture prey on the ground. They have a variable diet that includes small mammals down to insects (Johnsgard 1990).

Swainson's hawks breed from Alaska and the Yukon through southwestern Canada south to Baja California. The eastern breeding limit covers the Dakotas, Kansas, Nebraska, and western Oklahoma and Texas. Breeding has occurred as far east as Illinois. They winter primarily in southern South America on the pampas. Some have been found wintering in Florida and Texas (Johnsgard 1990). The species is considered a rare summer resident in the Black Hills and a common migrant through South Dakota (Tallman et al. 2002). In 2001, a Swainson's hawk was sighted in Norbeck Wildlife Preserve. In 2002, there was one sighting of a Swainson's hawk in the Black Hills. It was observed in a transect near Englewood. There was an additional sighting in Government Valley in Wyoming, 2002, west of the project area (BBS 2001-2002, Sauer et. al. 2005).

No Swainson's hawks were observed in the project area during field visits. During breeding bird surveys in Weston County, Wyoming from 1968-2002 Swainson's hawks were observed (Nicholoff 2003). Neither the Wyoming nor the Black Hills, South Dakota (2001/2002) sightings are in the vicinity of the Norwood project area. There is potential nesting habitat in the project area. Draws with willow shrubs and meadows with scattered trees may be suitable for nesting Swainson's hawks. Foraging habitat is available and consists of meadows/grasslands, usually grazed, interspersed throughout forested sites.

Effects of Project on Habitat

Meadow restoration treatments proposed for the Norwood project would have a negligible positive effect on potential foraging habitat due to the small extent of the treatments that enhance open conditions. Removal of pine trees from meadows could have a negative effect by removing nesting sites. Proposed protection of willows in meadows may enhance nesting habitat for this species.

RANGE, NOXIOUS WEEDS and BOTANY

Affected Environment

The physiography of the area varies from nearly level parks and meadows to steep north facing slopes and drainages with elevation rising from 5,500 to 7,100 feet. Soil types vary from silty loam to fine sand with a few sites having some clay accumulation. Vegetation communities are adapted to moist conditions found in the 20 to 24 inch precipitation zone in the northern portion of the area and to the 15 to19 inch precipitation zone in the southern portion of the analysis area. The meadows and parks are dominated by a diverse forb component, while the moist draws and canyons commonly contain quaking aspen (*Populus tremuloides*) and white spruce (*Picea glauca*) communities. The large areas surrounding the meadows and parks consists mostly of ponderosa pine (*Pinus ponderosa*) habitat types.

The Norwood Analysis Area has a diverse topography, with gently rolling hills dissected by steep canyons running predominately east and west across the analysis area. White spruce is found on the slopes in many of canyons with meadows in the drainages and lower elevations; however, Ponderosa pine community types dominate the majority of the area. Quaking aspen is a major component in the northern portion of the analysis area.

The meadows are dominated by a diverse forb component, often with the shrub shrubby cinquefoil (*Potentilla fruticosa*) present in the northern portion of the area. Those in the southern portion have a larger graminoid component, predominately the introduced species Kentucky bluegrass (*Poa pratensis*) and timothy (*Phleum pratense*). (Figure 2) A species of local concern, pleated gentian (*Gentiana affinis*) is present in some of the meadows in the northern portion of the analysis area. These meadows may also be habitat for the R2 sensitive species Iowa moonwort (*Botrychium campestre*) and narrowleaf grapefern (*B. lineare*). No R2 sensitive species were found during the surveys of the analysis area.

Range

The Norwood Analysis Area includes portions of seven grazing allotments as follows: Castle Creek Allotment, portions of both units; Cold Creek Allotment, all of the West unit, and a portion of the East unit; Crows Nest Upper Beaver Allotment, all of units A, E, and Bald Hills, portions of 1, 3, 4, C, B, and Antelope; Dry Beaver Allotment, both units; Lower Beaver Allotment, portions of the Summit Ridge, Moon and Thompson Canyon units; Stovehole Allotment portions of the Hardy, Chapman, and Stovehole units; Soldier Creek, portions of Unit 1, East Unit 2, and West Unit 2.

Range condition, trend, and inventory for the analysis area were measured on the various allotments in 1978, 1981, 1985, and 1994. The data from these studies are located in the district 2210 files.

There are currently a total of 34 grazing permits, (10 private land permits, and 24 term permits) within the analysis area. There are numerous structural range improvements on federal land within the analysis area, including allotment boundary fences, unit division fences and water developments.

Noxious Weeds

The Norwood Analysis Area contains the past analysis areas of Mallo, Stateline, Canyon, and Moon. Those areas were surveyed during noxious weed treatment in 2000-2004. In 2003, a noxious weed inventory was conducted on the northern most portion of the analysis area (the former North Analysis Area).

Canada thistle (*Cirsium arvense*), musk thistle (*Carduus nutans*), and hound's tongue (*Cynoglossum officinale*) are the main invaders in this analysis area. Smaller infestations of common mullein (*Verbascum thapsus*), common tansy (*Tanacetum vulgare*) and yellow toadflax (*Linaria vulgaris*) are also present.

In the Norwood Analysis Area, it is known that there is at least 750 acres of noxious weed infestations. 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 percent per year when there is disturbance. Treatment, including biological control, would be required to achieve the desired condition as described in the above objectives. Timely treatment and constant monitoring (and re-treatment as needed) could reduce infestations of noxious weeds by 20 percent per year. Areas in the Norwood Analysis Area that are disturbed would need to be revegetated (as called for in Standard 1110) to meet Objectives 230 and 231 above.

Botany

Botanical surveys were conducted in 2002, 2003, 2004, and 2006 to collect information related to plant communities, assess sensitive species/ species of local concern habitat, and identify locations of target plant species (i.e. – R2 sensitive species, state-listed species, and Black Hills 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 determine survey areas within the analysis area.

The findings of the surveys have been incorporated into the Black Hills National Forest Plant Database.

No R2 sensitive species have been located in the Norwood Analysis Area. However, there may be habitat for two sensitive species in the open meadows. The species of local concern, pleated gentian (*Gentiana affinis*), has been located in the Norwood Analysis Area. There may also be habitat for another species of local concern in wet/riparian areas in the analysis area. Avoiding disturbance of those meadows and riparian areas, and therefore conserving the sensitive species and species of local concern habitat, could help meet Forest Plan direction.

The moist draws and canyons commonly contain quaking aspen and white spruce communities with intermingled paper birch (*Betula papyrifera*). Boxelder (*Acer negundo*) is found in the bottoms of several of the canyons. Two South Dakota state-listed species have been found in the well-shaded white spruce stands, low northern sedge (*Carex concinna*, SDS3), and squashberry (*Viburnum edule*, SDS3).

The mesic white spruce stands may also be habitat for these five R2 sensitive species, which are found in areas that have additional moisture, either riparian communities or mesic forested communities:

- leathery grapefern (*Botrychium multifidum*),
- foxtail sedge (*Carex alopecoidea)*,
- lesser yellow lady's slipper (*Cypripedium parviflorum*),
- trailing clubmoss (*Lycopodium complanatum)* and
- American cranberrybush (*Viburnum opulus* var. *americana).*

While it is believed that the habitat conditions for these species may be present in the mesic white spruce communities, no R2 sensitive species where located during the surveys for this project area.

Another South Dakota state-listed species, giant lousewort (*Pedicularis procera*, SDS2), has been found in the project area on the more xeric edge of a white spruce stand. (The list of species tracked by the state of South Dakota and key to state rank can be found at http://www.sdgfp.info/Wildlife/Diversity/rareplant2002.htm)

There are four main ponderosa pine community types present. They range from those having a strong graminoid component to those having stronger shrub components. Of those having an understory dominated by graminoids, the Ponderosa pine/Western wheatgrass (*Pinus ponderosa/Pascopyrum smithii)* Woodland (Figure 3) is found in the southern portion of the analysis area, while the Ponderosa pine/Rough-leaved ricegrass (*Pinus ponderosa/Oryzopsis asperifolia*) Woodland (Marriot and Faber-Langendoen 2000) is more common further north. Those with a stronger shrub understory range from Ponderosa pine/Common juniper (*Pinus ponderosa/Juniperus communis*) Woodland (Figure 4) to Ponderosa pine/Bearberry (*Pinus ponderosa/Arctostaphylos uva-ursi*) Woodland (Marriot and Faber-Langendoen 2000). One South Dakota state-listed species (Fendler's ceanothus, *Ceanothus fendleri*, SDS2) was found in a ponderosa pine community type. There were no R2 sensitive species found in the ponderosa pine community types.

Environmental Consequences

Direct and Indirect Effects

Range and Weeds

Impacts to the range resource would be mainly centered around 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 would vary as a result of the basal area and overstory density changes after timber and fuels management treatments were applied. Management activities that reduce the tree density of the forested stand would increase the amount of available forage. When there may be an increase in forage in an area, there may be a reduction of impacts from grazing in other areas as grazing pressure was reduced on those areas. However, the disturbance created by timber removal creates a seedbed for noxious weeds that could outcompete 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 – NO ACTION

The No Action Alternative would eventually result in a decrease of grassland communities in the area as forested stands become denser and ponderosa pine continues to encroach upon meadow areas.

The amount of available forage would decrease as grassland communities decline and the ponderosa pine became denser. This would make it more difficult to meet the Forest Plan guideline 2505 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 those rangelands. A decrease in condition of the rangelands would eventually lead to an additional decrease in the amount and quality of forage available.

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. Large-scale fire would be a threat to the sensitive plant species and plant species of local concern habitat in the area

Noxious weed populations would be limited to current infestations unless disturbance occurs from natural events, or large-scale fire. Noxious weed infestations are known to increase with large fire events. No treatment in the hardwood stands may lead to a decrease in the viability of those stands.

ALTERNATIVE 2 – PROPOSED ACTION

All of the Action Alternatives would help restore the grassland communities in the area by removing the encroaching ponderosa pine. In addition to maintaining existing meadows, one 7 acre historic meadow would be restored.

The Action Alternatives include removing conifers from the hardwood stands. As conifers were removed and the canopy became more open, additional available forage would be produced.

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 condition. There may be some short-term loss of grazing access during the timber harvest and/or thinning activities, but in the long term, grazing distribution would improve as more areas become accessible.

Under Alternative 2, 14,231 acres would have the potential for being disturbed as trees were dropped and skidded to landing decks and understory fuels were treated. Thus skid trails, landings, burn piles, and areas where machinery would be 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 would be dependent on the type of equipment used and the time of year the disturbance occurred.

Decreasing the ponderosa pine density would be expected to reduce the risk of wildfire, which would help protect sensitive plant species/species of local concern habitat and structural range improvements.

It would be critical that the proposed post harvest activity of using herbicides for noxious weed control be implemented 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 were infested. Monitoring of the effectiveness of treatment, and retreatment as needed, would be essential.

Closing roads (as proposed) could be beneficial when it comes to livestock management. The likelihood of gates being left open, which increases the chance of livestock being outside the permitted area, would increase as the number of roads increase and with off-road travel. Closing roads using an administrative closure would make access into areas for weed treatment possible while reducing use of those roads.

ALTERNATIVE 3

Alternative 3 would have the same effects on range or weed as Alternative 2 with the exception that an additional 1,676 acres of thinning and 309 acres of hardwood conversion would result in more available forage, increasing the likelihood of maintaining or improving the desired range condition.

ALTERNATIVE 4

If implemented, Alternative 4 would have the same effects as Alternative 2 except that 592 fewer acres of commercial thinning, 1,952 fewer acres of POL thinning, and 181 fewer acres of seedcut would occur. As a result, there would be less available forage, decreasing the likelihood of maintaining or improving the desired range condition.

Botany

Impacts to the sensitive plant species/plant species of local concern may be direct impacts, (i.e. trampling, exposure to grazing, mechanical damage), or the impacts may be more indirect such as a change in the microclimate, which may result in a loss of habitat.

ALTERNATIVE 1 – NO ACTION

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 increased due to mountain pine beetle infestation. Large-scale fire would be a threat to the sensitive plant species and plant species of local concern habitat in the area

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.

No treatment in the hardwood stands may lead to a decrease in the viability of those stands.

ALTERNATIVES 2 AND 4

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). Please see Appendix D displays a summary of the Biological Evaluation for the Norwood Analysis Area including determination of effects to sensitive species.

The species of local concern present in the project area, pleated gentian, is primarily reported to occur in areas without tree canopies, or in areas of full or almost full sun conditions. Therefore, conifer encroachment would be expected to present a risk to this species (USDA Forest Service 2005). The 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.

Pleated gentian is present in an area proposed for mechanical fuel treatment. This species of local concern occurs within an exclosure on the edge of the identified treatment unit. As there are very few ponderosa pine trees present within the exclosure, the thinning process should not impact the gentian habitat. However, there would be the potential for individuals to be directly impacted during the treatment if the exclosure was not avoided.

Giant lousewort (*Pedicularis procera*, SD state listed species) is present in a location 040903, site 174, in which a sanitation treatment is proposed. The giant lousewort is located

on the edge of the site along the existing trail. Removing ponderosa pine with mountain pine beetle (the sanitation treatment) should not have an impact on the giant lousewort habitat. The area surrounding the plant would be flagged as an area to avoid so the plant would not be subjected to trampling during the removal of any infested pines.

Fendler's ceanothus (*Ceanothus fendleri*, SD state listed species) is present in location 040902, site 180, in which a commercial thinning treatment is proposed. The commercial thinning treatment should not have a detrimental effect on the ceanothus habitat, as the plant is located in an open woodland. Direct impacts to the plant by equipment could be prevented by flagging the area to be avoided.

Low northern sedge (*Carex concinna*) and squashberry (*Viburnum edule*), both SD state listed species, are present in sites that are identified for deferment under this alternative. These individuals, and the habitat in these locations, should not be impacted by the proposed action.

Alternative 2 proposes 180 acres of hardwood conversion and 1,544 acres of hardwood release. Both of these treatments are designed to enhance the hardwood stands. Management to retain/conserve these hardwood stands may result in an enhancement/conservation of habitat for sensitive plant species and plant species of local concern.

The post harvest activities such as fencing, water development, thinning, signing, and noxious weed control activities would be beneficial to the range resource.

ALTERNATIVE 3

If implemented, Alternative 3 would have the same effects as Alternatives 2 and 4 except that the additional acres of hardwood conversion may be expected to enhance more acres of sensitive species and/or species of local concern habitat.

CUMULATIVE EFFECTS

The cumulative impact area for this analysis is the Norwood 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 in to the future, which allows for an adequate length of time to record vegetative changes.

Past, present, and reasonably foreseeable activities within the Norwood project area include timber harvest, timber thinning, mining, wildfire, grazing, road construction, and maintenance, noxious weed control, wildlife habitat improvement projects, winter recreational use (ski trail and snowmobile trail), and dispersed recreational use on both the public land and private land in the area. Private lands in the area are likely to see more subdivision and development. A list documenting known past and planned future activities for this area is included in Appendix D.

Past timber harvest/thinning may have created, and any future timber harvest/thinning may create, transitory range in the area. Transitory range is an area that 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 level of livestock utilization, which can lead to maintaining or improving the satisfactory condition of the rangeland vegetation. Removing timber and thinning existing stands of ponderosa pine may reduce the chance of large-scale fires that may 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-disperse, spore-producing *Botrychium* species, if the associated mycorrhizal species and other 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 could also be detrimental to sensitive/species of local concern plants if the individuals were inadvertently exposed to the herbicides.

When properly managed, livestock grazing can have positive impacts on the rangeland vegetation. The grazing in the Norwood project area would continue as identified in the Allotment Management Plans for the Castle Creek, Cold Creek, Stovehole, and Crows Nest Upper Beaver allotments signed by the District Ranger in 2001, and the Allotment Management Plans for the Lower Beaver, Soldier Creek, and Dry Beaver allotments, signed by the District Ranger in 1991. In the Norwood area, the known 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 utilize those locations more heavily, grazing may impact the pleated gentian.

Aside from the direct impact on the vegetation (i.e. removal of vegetation, soil compaction, introduction of invasive species), road construction would have the indirect impact of making formerly inaccessible areas available to both humans and grazing animals. Opening a new area to grazing could have a positive impact, by helping to distribute grazing animals. It could 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) would increase as the number of roads increase.

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 in the area could 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 and/or their habitat if they occur in those specific development locations.

In the Norwood area, the primary impacts from recreational use to the rangeland vegetation resource are the negative direct impacts to the vegetation (i.e. removal of vegetation, soil compaction, introduction of invasive species) that result from off-road travel. Off-road travel could also indirectly impact 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 would increase the likelihood of plant collecting which could 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 cumulative impacts to the rangeland vegetation, nor to the sensitive plant species/plant species of local concern habitat.

Recreation

Affected Environment

Recreation is an approved use in this management area and this area is designated as a Roaded Natural area in the Recreation Opportunity Spectrum. Numerous open roads provide commercial access and roaded recreation opportunities, while closed roads provide non-motorized recreation opportunities. Activities such as hunting, hiking, and biking occur along roads closed to vehicle traffic. Some roads and nearby areas are available for year-round motorized vehicle use. Some motorized vehicle use may be restricted for management area purposes.

The Norwood Analysis Area provides mostly unfragmented and undeveloped public lands for recreating in a forested setting. There are no commanding new custom homes or sub-divisions and very limited commercial services. Past, recent, and on-going evidence of the continuing management actions to the recreating public, mainly timber harvesting and grazing, that blends with the natural setting. The Norwood area is a “step back in time” compared to the relatively developed nature of the rest of the forest. It is more representative of larger and less fragmented public lands further west in the United States.

The Norwood Project limestone plateau sees heavy winter snowfall. This makes it an excellent winter play area but limits passenger vehicle, residential, and timber harvesting during this time. It is relatively easy to find a remote backcountry setting in this area during the winter months as well as offering the best consistent conditions for the groomed snowmobile trail system.

Primary recreational use of this area is dispersed in nature and includes hunting, fishing in Beaver Creek, horseback riding, cross country skiing at Beaver Creek Ski Trails, OHV (off highway vehicle) riding, mainly snowmobiling in the winter on groomed trails and ATV’s during the summer, mountain biking, car-camping, and pleasure driving.

Developed Recreation

The USFS Beaver Creek Campground is located near the northern boundary of the project area on the banks of Beaver Creek. This fee campground has eight sites, a well, and vault toilet. The USFS Moon Campground is located near the middle of the sale area. This non-fee campground has a vault toilet and three campsites. Redbank Springs is also a non-fee Forest Service campground lying one mile east of the sale area. It has four campsites and a vault toilet. Summit Ridge Cabin is an historic fire lookout tower and a two-room cabin available for public rental located near the southern edge of the project area. It has no water, an outside toilet, and no electricity.

From fee receipts, it has been determined that Beaver Creek Campground has a 30 percent occupancy rate during the Memorial Day to Labor Day season of operation. It is assumed that the same holds true for nearby Moon and Redbank Springs Campgrounds, although no fee collection data is available as no fees are collected here. Other data collected from fee envelopes at Beaver Creek Campground suggest that the month of July sees the highest occupancy of the summer and the majority of use is from Wyoming residents. These campgrounds are “a little off the beaten path” compared to most Black Hills National Forest campgrounds and are accessed only by gravel roads. They provide more of a semi-primitive setting for camping and associated activities such as fishing in Beaver Creek due to their remoteness. These three campgrounds are some of the only ones open to the public on the forest that are still operated by the agency and not by a private business. Many campers at these campgrounds trailer OHVs to day-ride on Forest Service Lands (FSL). All three of these campgrounds have some campsites occupied, primarily on the weekends, during the non-snow off-season, even though they receive no maintenance services. This is especially true for spring turkey and fall turkey/big game hunting seasons. Deep winter snow precludes any winter campground use other than winter camping in early spring by local Scouts.

Summit Ridge Lookout Cabin is an historical primitive two-room cabin available for rent with a permit to the public during snow free periods. It is located in the southern-most portion of the project area. From past permit data, it typically rents to small groups of friends and families from 20 to 24 times each year with most of the use occurring during the summer. The lookout cab on the tower itself is still staffed if needed during periods of extreme fire danger but is closed to the public.

Mallo Camp and Motel is a full service resort owned and operated by Weston County, Wyoming, that lies just outside of the northern edge of the project area. According to its brochure, it consists of a lodge that accommodates up to 250 people during the summer, 13 separate cabins, 160 acres of camping and outdoor game areas, and a snack shack with gasoline sales. It is located on snowmobile Trail 11. Mallo Camp caters to a variety summer groups, family campers, fall and spring hunters, and winter snowmobilers. From field observations, users of this resort frequent nearby forestland for their motorized and non-motorized recreation activities.

Dispersed Recreation Use and Trails

Sections of snowmobile Trails 1 and 11 pass through the northern part of the project area and utilize Forest Development Roads (NFSR) 111, 109, 110, 117, and U160054. Off-trail

winter riding occurs as well in open areas and unplowed roads particularly along Boles Canyon Road. According to South Dakota State Trail employees, off-trail riding use is low but does occur regularly. These folks also report that the project area offers some of the best and most consistent snow in the Black Hills for grooming and therefore, quality snowmobile riding. The snowmobile trail system is closed for protection from passenger vehicle, plowing and logging operations, from December 15th to March 31st annually. Typically, there are no conflicts with theses dates and activities in the project area as this is heavy snow country which precludes plowing, logging, and passenger vehicle traffic anyway.

The only motorized restriction currently in the project area is during the winter, from December 15 to March 31 annually, for the Beaver Creek Ski Area. This approximately 3,262 acre non-motorized winter ski area located on the north end of the project area is specifically closed to snowmobile use. The Beaver Creek Ski Area was developed and is maintained in partnership with the Weston County Mallo Camp Board of Directors and the Northern Lights Ski Club based in Newcastle, Wyoming. The majority of the 12.9 miles of ski trails is located on existing roads. Use of the area is relatively low according to the trailhead registration book, averaging 12 twelve skiers weekly. The ski experience is "backcountry" meaning there is no mechanical grooming, requiring breaking one's own trail, or following in others ski tracks. There are excellent hills located in the northeast portion of the ski area for off trail skiing and telemarking. The ski area marked trails are popular with OHV (ATV type) riders particularly from nearby Mallo Camp and Resort and the Forest Service Beaver Creek Campground during non-snow periods. Some resource damage is occurring in this area on cross-country travel, steep slopes.

Hunting and fishing are popular dispersed recreation activities. Trout fishermen are frequently observed in Beaver Creek, one of the few trout fisheries in this part of the Black Hills. The area is popular with big game and turkey hunters during the spring and fall that typically overnight at Mallo Camp, one of the developed Forest Service campgrounds, or on road pull-outs. The abundance of system and non-system roads from past timber harvesting activities in the area provides mostly roaded hunting opportunities. A long-term hunting outfitter for this area terminated his permit in 2003 with the stated reason that the abundance of OHV noise and traffic over his last couple of years guiding in the area made for a poor quality experience for his patrons. This incidence shows a high level of OHV use during hunting season and a respective decrease in quality for a non-motorized hunting experience for most of the project area. The future of OHV use during hunting season may change due to current planning efforts at higher levels of management to actively manage motorized recreational use on all FS lands. There is one motorized travel closure area in the project area for the Beaver Creek cross-country Ski Trails during the winter.

The Norwood project area provides abundant and popular OHV travel opportunities on FS roads and trails. The most common type of OHV observed in the project area is the All Terrain Vehicle (ATV) and use of the area is considered high. During summer, it is common to observe several multi-place ATV trailers in FS owned campgrounds. At times, all sites at Moon and Redbank campgrounds are occupied by campers with ATVs. Other OHV traffic originates at nearby Mallo Camp and Trails End Lodge, private resorts located near the north end of the project area.

The relatively flat limestone plateau topography in the eastern portion of the project area is excellent for OHV riding. There is high road density including many unclassified roads that in essence become user defined motorized trails. There are no motorized closure areas in the summer and little private in-holdings or residential development that in turn provides many miles of interconnecting routes. The western third of the project area becomes much steeper and rockier as it drops to limestone canyon bottoms. Cross-country travel becomes difficult but existing roads provide access through this area as well.

Most of the area roads can accommodate OHV ATV type travel and receive minimal impacts from their large low-pressure tires and narrow wheelbase. OHV four-wheel drive vehicles have caused rutting especially in wetter areas such as Thomson Springs. Most of this travel occurs during hunting seasons when wetter conditions are common in the spring and fall. Off road rutting caused by ATVs was observed in the project area in several locations during field visits. It was caused specifically by OHV ATVs, the highest type of OHV use in the area, on slopes greater than 20 percent, during cross country travel. Thomson Springs is a wet area below Moon Campground that shows rutting around and through the springs from OHV ATV type as well as high clearance passenger type vehicles. This area should be fenced to prevent resource damage from motorized traffic.

Overall, the Norwood area is heavily used by the motorized recreation public. Resource damage is occurring but not yet to a large extent. The area is an excellent candidate for developing an open and closed motorized recreation plan.

Recreation Special Uses

There are three hunting outfitter and guides authorized in the project area. Fall big game day hunting is conducted on all Hell Canyon District Wyoming Lands by Rocky Outfitters. They have 200 priority service days authorized for day big game hunting. Rocky Outfitters caters to world class big game hunters.

Seven J Outfitters is authorized for Spring turkey hunting for 25 service days in all sections of T2N, R1E in the project area. This is only for South Dakota lands north of a line approximately from Mallo Camp due east to the sale boundary. Seven J Outfitters base-camps out of a cabin on private land and day hunts this area. Fall guided hunts are offered for this same area by Mattson Hunting Guides special use permit for 20 service days. Both permits are administered by the Northern Hills Ranger District.

Environmental Consequences

Direct and Indirect Effects

ALTERNATIVE 1 – NO ACTION

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, AND 4

The effects of the proposed treatments on the recreation resource are the same for the Action Alternatives. None of the alternatives propose to implement any specific changes to the recreation resource. The main impacts would be indirect and would occur as a result of closing roads, visual changes, and short-term disturbances from logging and burning activities.

In addition, proposed treatments would reduce the potential for wildfire or insect infestation and provide a healthy forested ecosystem for quality recreational experience.

Open road density would decrease from 3.7 miles per square mile to 2.1 miles per square mile in the winter months. This would improve non-motorized recreation opportunities and lessen motorized opportunities. Improvements to the transportation system and reducing the amount of open roads would help protect sensitive cultural, wildlife, and plant community areas while still leaving an adequate resource for motorized recreational travel. This would result in a more balanced and mixed spectrum of motorized, non-motorized dispersed, and developed recreational opportunities for the area benefiting a larger population of users.

Short-term adverse effects (less than 5 years) from the Norwood project such as noise, dust, smoke from burning, and logging traffic would result in shifts of recreational use from disturbed areas to nearby undisturbed areas. Other short-term impacts may include temporary re-routes of Beaver Creek Ski Trails and the Snowmobile System of Trails to accommodate logging.

No change to recreation special uses would occur.

CUMULATIVE EFFECTS

The cumulative effects boundary considered for this analysis is the project area and Redbank Springs Campground, located just outside of the project area. Time boundary for cumulative effects is from 10 years ago in the past, to the present, to five years in the future. The reason this area was chosen was because it would be most affected by the project. Appendix D lists past, present, and future activities considered in this analysis.

The No Action Alternative would have no cumulative effect on recreation because it does not have direct or indirect effects.

The Action Alternatives would have minimal direct or indirect effects on recreation, some positive, some negative, depending upon the specific use being considered. There would be no adverse cumulative effects to recreation from any of the Action Alternatives.

Visual Quality

Affected Environment

Landscape Character

Landscape character gives a geographic area its visual image and consists of the combination of physical, biological, and cultural attributes that make each landscape identifiable or unique. Landscape character embodies distinct landscape attributes that exist throughout an area. This project is located within the Mountainous / Mixed Forest Landscape Character Unit – Limestone Plateau Portion. Landscape use patterns in this area are primarily natural appearing – pastoral/recreational. Evidence of management activities - primarily vegetation management, are evident in this area, suppression of wildland fires has resulted in a denser forest, which is helping to hide other activities (roads, vehicle access/movement). (USDA Forest Service, 1996a - Appendix B-47 thru B-54)

Domal uplift and subsequent erosion have exposed an extensive sequence of sedimentary rocks that encircle the Central Crystalline Area. Rock types of this area include sandstones, shale, siltstone, dolomite, and limestone. Limestone is the predominate rock type present, justifying the name, Limestone Plateau.

The Limestone Plateau is roughly 15 miles wide. Relief is relatively low, generally less than 200 feet on the top of the plateau. Overall elevation varies from more than 7,000 feet in the western portion to 5,000 feet along its eastern edge. Streams have etched deeply into the eastern side of the plateau, and combined with erosion and variation in rock type, have produced an array of topographic settings from gently sloping valleys to steep sloped bluffs. The eastern edge of this side of the plateau is comprised of steep escarpments, rising as much as 800 feet overlooking the Central Crystalline Area. The summit along this eastern edge is considered the main divide for the Black Hills. West of this divide, the plateau is young, with small streams only slightly entrenched in wide, grassy valleys. At greater distances to the west, near the exterior of the plateau, streams cutting through slightly more resistant rocks have created canyons 400 to 600 feet deep. The western edge of the plateau dips steeply downward, dropping 400 to 1000 feet in a mile or less. Flag Mountain, White Gate/Red Gate and Bald Mountain are representative of the variation in topography of the Limestone Plateau.

The Norwood planning area is within the western portion of this plateau where the landscape character is predominantly made up of small streams in deep narrow canyons, with low rounded ridges extending approximately 400 to 1000 feet above the drainages. Ponderosa pine and aspen covers drier south facing slopes, while spruce is the predominant tree species on the moister, north-facing slopes. Wildflowers in the spring and hardwoods in the fall present a flush of vibrant colors in the landscape.

Inventoried Scenic Classes

Scenic Classes measure the relative importance of or value of discrete landscape areas having similar characteristics of scenic attractiveness and landscape visibility. Scenic Class is used to compare the value of scenery with the value of other resources. The components of Scenic Class are Scenic Attractiveness (based upon human perceptions of the intrinsic beauty of landform, water characteristics, vegetative pattern, and cultural land use) and Landscape Visibility (based upon the distance zones from the observer and the concern level for scenery).

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. 2 percent of Norwood area is designated as Scenic Class 1, 42 percent in Class 2, 41 percent in Class 3, and 15 percent in Class 4.

Scenic Attractiveness

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.

Scenic attractiveness classifications are Class A – Distinctive; Class B – Typical; and Class C - Indistinctive. Class A refers to unusual, unique, or outstanding scenic quality. Class B refers to ordinary or common scenic quality. Class C refers to low scenic quality. Approximately 15 percent of the Norwood area is in the A - Distinctive classification, 43 percent in the B – Typical, and 43 percent in the C – Indistinctive.

Landscape Visibility

Travelways and use areas are identified and classified during the Forest-wide planning process, in order to determine which observer locations, and their importance, to use in the landscape visibility analysis. Sensitivity Level 1 travelways that lead to important scenic features, residential areas, resorts, recreation areas, unique natural phenomena, wilderness trailheads, national parks, and state and county parks attract higher percentage of users having high concern for scenic quality, thus increasing the importance of those travelways.

Approximately 3.8 percent of the planning area is visible from the U.S. Highway 85 and Wyoming State Highway 585 which are Sensitivity Level 1 corridors. From the Sensitivity Level 2 corridors 48.6 percent of the planning area is visible. This includes numerous Forest Arterials such as National Forest System Roads (NFSR) 109, 110, 111, 117, 231, 265, 284, 294, 301, 384, and 809, which provide access from the Newcastle, Wyoming, and Deerfield / Hill City, South Dakota areas to Beaver Creek Campground, Mallo Camp, Moon Campground, Redbank Spring Campground, and Summit Ridge Lookout. From the

Sensitivity Level 3 corridors, 58.2 percent of the planning area is visible. This includes NFSRs, cross-county ski trails, and snowmobile Trails 1, 3, 6, and 11.

Scenic Integrity Objectives

Scenic Integrity Objectives (SIO) are the management objectives that were adopted from the scenic class values. SIO 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. Areas with a High SIO should appear natural and management activities should not be visually evident. Areas with a Moderate SIO should only appear slightly altered from the more naturally appearing forest. Area with a Low SIO should appear moderately altered from a natural state.

Within the Norwood project area, approximately 2 percent has a High SIO, 32 percent a Moderate SIO, and 66 percent a 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. 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 pockets of Aspen and other hardwood trees. Forested areas are predominantly populated by ponderosa pine communities on south aspects and spruce communities on north aspects. 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 existing scenic integrity of the Norwood area is generally moderate to low. Past vegetation management activities have occurred, but the landscape appears slightly altered (Moderate SIO) along the main roads; however, the vegetation in remainder of the area appears slightly altered (Moderate SIO) to moderately altered (Low SIO).

When viewed from U.S. Highway 85, the vegetation generally appears intact. The only deviation visually evident is where a large group of trees were killed across the landscape during the Sheldon fire of 2002 where this is readily apparent in the background.

Environmental Consequences

Direct and Indirect Effects

ALTERNATIVE 1 – NO ACTION

Under the No Action Alternative, the only changes to scenery would be those occurring from natural disturbance processes (i.e., insects, fire, wind) or natural growth processes of trees growing and regenerating. This alternative would have the highest potential for insect or fire killed areas of dead trees.

In areas with a High or Moderate SIO, should fires occur or insect activity levels increase beyond natural levels, killing large areas of trees, the forested landscape would move away from the desired future condition for more open park-like stands. In small areas, such as 1 to 3 acres where trees have been killed, a mosaic of tree sizes and openings would be maintained that would move toward the desired future condition. In some areas where the insect attacks dominate the landscape, large open areas exceeding the size of opening normally found in this area could be created, dramatically changing the appearance of the forest as viewed from private land interspersed through out the planning area. In these areas, we could expect a large amount of downed trees, a greater amount than natural levels that would dominate the landscape.

Small openings interspersed with forested areas would provide an opportunity to see into the forest, which in turn would increase the potential to view wildlife, wildflowers and flowering shrubs. In addition, an everchanging kaleidoscope of light and shadow, as well as a variety of sizes of vegetation, would create an interesting and diverse visual landscape.

In areas where no disturbance occurs, the vegetation would grow into a thick dense forest, with competition for light, water, and nutrients. 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 which would reduce visual diversity.

ALTERNATIVE 2 – PROPOSED ACTION

How well commercial treatments blend into the characteristic landscape, and meet the Scenic Integrity Objective (SIO), is based upon the slope, aspect, and vegetation remaining on the site. Reducing soil disturbance, uneven spacing of the trees remaining in the landscape, and cleaning up the slash (branches and tree tops left when trees are commercially removed from the forest) to natural levels, can result in an appearance that is in harmony with the landscape character, often resulting in a higher SIO being achieved.

Vegetation Treatments

This alternative would treat approximately 33 percent of the project area. The proposed treatments would result in a variety of tree densities and textures, from dense to open, across the landscape. The current dense, continuous, layer of trees currently covering the forested landscape would have a diverse appearance across the planning area. These prescriptions

should create a textural pattern, similar to that found in a ponderosa pine ecosystem where periodic fires have thinned the forest.

Slash and stumps resulting in form, texture and color contrasts would likely be evident throughout the treatment areas. Soil disturbance resulting in color contrasts from logging equipment may occur. Skid trails which could result in lines being created on the landscape from vehicles moving logs through the forest would be evident until clean up activities are completed. On gently rolling terrain, disturbance would be kept to a minimum and often would not be evident one year after the completion of activities. The size of log landings and amount of disturbance would vary from location to location. Once logging were completed, these sites would be cleared of debris and reseeded. The length of time before the site would appear as a natural opening would generally be 1 to 4 years, depending upon the level of disturbance.

Seed Cuts (1,907 acres) and Overstory Removals (1,652 acres) would have the greatest potential to create forms on the landscape when viewed from a distance, as often can happen when most of the vegetation is removed. Seed Cut treatments would create evenly spaced tree stands that would be more evident on the hill sides. Overstory removals would quickly create openings with few remaining large trees, similar to the effects of a large MPB outbreak. However, the overstory removal units would have small trees already established, moving toward a forested appearance more quickly than after a MPB outbreak.

The overstory removals along the northwest side of the planning area (Sites 040204-16; 040203-45; 040301-38; 040304-12, -13, -30, -47, -48, -49 -53, -54, -78, -79) would be evident from private lands to the west. These treatments, from a scenery standpoint, would create large open areas in the landscape much larger than any typical natural openings. These forms, visible in the middleground, would dominate the view from the surrounding areas. However, they would be most evident in the winter when snow covered them and snow was not on the trees on the surrounding hillsides. In addition, due to the unit locations along the property lines, there would be a potential to create straight lines between treated and untreated areas. Project design criteria would be included to feather the edges of these sites to meet an assigned SIO of Moderate. Without this design criteria, these treatments would meet a Low SIO.

Overstory removals in other areas would run parallel to the contours or along the tops of ridges. In these cases, the units would mimic natural open patterns in the landscape and expose hidden rock formations. These treatments should meet the assigned SIO.

Due to the rolling nature of the topography within the planning area, prep cuts (23 acres), commercial thinning (including CT50, CT60, & CT70 is 7,576 acres), and POL thinning treatments (commercial of 76 acres and a maximum non-commercial of 7,576 acres) should appear less obtrusive in the landscape. However, these units would often result in a more open and managed appearing landscape when viewed close up from forest roads. These treatments should meet the assigned SIO.

Special Cuts (317 acres) would be located within the foreground of US Highway 85 (High SIO), with the remaining large vegetation in clumps/groups being evident in the landscape. These units were designed to mimic natural patterns. Due to the proximity to the highway at

these specific locations, the slash cleanup and the unit edge treatment would be the greatest scenic concern. With careful attention to detail, it would be expected these treatments will meet a High SIO; however, it would be important to monitor these treatments to determine the success of the design and follow through on planned activities to meet the assigned SIO of High.

Individual tree selection (81 acres), hardwood release (1,544 acres), pine encroachment (76 acres), meadow restoration (7 acres), sanitation (271 acres), aspen cleaning (1,724 acres), and group selections (505 acres) would mimic natural patterns in the landscape. Aspen and other hardwood trees should become more visible in the landscape, as the conifers that compete with or screen them were removed. Natural openings may be created in sanitation treatment areas, as trees that have been attacked and killed by MPB before treatment began and MPB-infested trees would be cut as part of this treatment. These treatments may slow MPB activity, reducing the potential for large-size openings that they could create. These treatments would meet the assigned SIO.

Hardwood conversion (180 acres) is a restoration effort to return hardwoods in the landscape where they have been out-competed by conifers. It may take 3 years for the hardwoods to have a natural appearance across the treated area from a scenery standpoint. Areas with a prescribed SIO of Moderate (Units 040301-6; 040204-5; and 040501-43, -84) may not meet the SIO within 1 year after treatment would be completed. However, once the hardwoods started to fill in, there would be a flush of sprouting that would surpass the original condition and would likely meet a High SIO in 3 to 5 years. There would be a potential for hardwoods to emerge, creating a greater amount of fall color in these landscapes, as a result of the removal of conifers within these hardwood stands.

Precommercial treatment prescriptions would result in the removal of understory trees within a stand. Those treatments that leave an uneven spacing between remaining trees and a variety of tree sizes could generally blend into the characteristic landscape the best. When activities were completed, precommercial thin treatment methods generally would meet a Moderate to High SIO.

Fuels Treatments

Fuels treatments are listed in four different categories. The mechanical slash and burn method employs the use of machinery to crush, masticate, chop, and flail the slash into small pieces down to ground level. Broadcast burning would also be used. Usually no tree cutting occurs with this method. The mechanical thin and burn method is similar to the slash and burn method above; however, the precommercial trees are thinned prior to treatment. Mechanical thinning of WUI (Wildland Urban Interface) no burn areas would be similar to the method above, however, no broadcast burning would occur. Slash would be piled and burned to reduce the potential of the prescribed fire creeping onto private land. Trees would be thinned to a 24-foot spacing. Mechanical thinning of non-WUI (not in the Wildland Urban Interface) no burn areas would be similar to the method above, however, precommercial trees would be thinned to a 16- to 18-foot spacing. The pre-commercial trees would be thinned at the start of the treatment. Within 1 year of treatment, each of these fuel treatment areas would meet the assigned SIO.

This alternative would reduce the potential for a large increase in brown, insect-killed or fire-killed trees evident in the landscape. When treatment areas were viewed from less than ½ mile, large individual trees would be easily identified, as the view into the forest was increased. When viewed from beyond a ½ mile, textural differences would be more prevalent, however, these differences would be within the normal range currently found within the planning area.

As the thinned forest continued to grow and pine trees increase in diameter, leaving the "black bark stage", the orange bark of larger diameter ponderosa pine trees would likely become more visible in the landscape. Wildlife browse should increase in commercially thinned and burned areas, resulting in greater opportunities to view wildlife in their natural setting. Flowering plants may also increase, providing more spring/summer color in the landscape. A greater variety of native plants could be more evident in the landscape.

ALTERNATIVE 3

This alternative would treat more acres by commercial thinning, hardwood conversion, Aspen Cleaning and POL Thinning, than Alternative 2. This would result in reduced potential for MPB activity being visible in the landscape and a greater visual variety of tree densities and textures across the landscape, as compared to Alternative 2. The fire hazard rating would also be reduced, thereby reducing the potential for large-scale wildfires and the resulting visual impact. The increase in commercial thinning and POL treatment would increase visual penetration into stands and large trees would be more visible in the landscape, than in Alternative 2.

There would be a potential for a greater number of hardwoods emerging in the landscape and creating a greater amount of spring and fall color in these landscapes, as compared with Alternative 2. As a result of the increased amount of commercial thinning, there would be a greater potential for the orange bark of larger diameter ponderosa pine trees becoming visible in the landscape than in Alternative 2.

Wildlife browse should increase in commercially thinned and burned areas, resulting in greater opportunities to view wildlife in their natural setting. Flowering plants may also increase, providing more spring/summer color in the landscape. A greater variety of native plants could be more evident in the landscape.

Other treatments and effects would be the same as Alternative 2.

ALTERNATIVE 4

This alternative would treat less acres by Commercial Thinning, seedcut or POL treatments than either Alternative 2 or 3. As a result, more insect (MPB) activity may be visible in the landscape and a reduced variety of tree densities and textures may be evident in the landscape, as compared to Alternative 2 or 3.

As a result of the decreased amount of commercial thinning, there is a less potential for the orange bark of larger diameter ponderosa pine trees becoming visible in the landscape than in

Alternative 2. Wildlife browse and wildlife viewing opportunities should increase in commercially thinned and burned areas when compared to current conditions, although it would be less than in Alternative 2. Flowering plants may also increase, providing more spring/summer color in the landscape, however it is expected to be less than Alternative 2. A greater variety of native plants could be more evident in the landscape, but at a level lower than Alternative 2.

Other treatments and effects would be the same as Alternative 2.

Cumulative Effects

The boundary on the ground for analyzing cumulative effects is primarily that of the planning area. This identified area is the landscape that is evident in the foreground and middle ground from the main travel routes. The additional areas allow the viewed landscape to be evaluated as a whole, such as when traveling along the bottom of a drainage with both visible sides included in the analysis.

The time boundary for this analysis extends from 1980 to 2017 including known management activities and activities that are planned but have yet to be accomplished. Although fire suppression over the past century has played a role in the increased density of the vegetation on the forest, we have limited data specific for this planning area. The past, present, and future activities considered in this analysis are summarized in Appendix E.

ALTERNATIVE 1 – NO ACTION

The potential for adverse cumulative effects to scenery under this alternative would occur from further conifer encroachment into meadows and hardwood stands and a steadily increasing potential for future disturbance events to occur because no active management would occur. Both insect and wildfire potential would be the greatest under this alternative.

Although conifer encroachment would continue to occur, it is not expected to result in a pronounced change of visible cover types during the analysis period being analyzed. Wildfire hazard would remain the same during this timeframe as well. The most likely cumulative effect would occur from visual changes resulting from increased MPB-caused tree mortality. The silvicultural analysis concluded that there was a potential for an adverse cumulative effect to ponderosa pine stands as a result of MPB under this alternative. This Alternative would have the potential for adverse cumulative visual effects, due to the ongoing Mountain Pine Beetle outbreak.

ALL ACTION ALTERNATIVES

The proposed activities would have effects on the scenery resource. These alternatives 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 large trees, hardwoods, and wildlife. However, given that project design criteria and management direction were followed, the area would meet the stated Scenery Integrity Objectives. The potential for disturbance events to occur, such as

fire or MPB caused mortality, would be reduced under each of the action alternatives. Alternative 3 would result in the greatest potential reduction, followed by Alternative 2, then Alternative 4. Due to the reduced potential for large-scale mortality on the landscape and the dispersed locations of Overstory Removal treatments in the rolling landscape, there would be no adverse cumulative effects to scenery as a result of these alternatives.

HERITAGE RESOURCES

Affected Environment

Between August 2003 and September 2004, two large block Level III heritage resource inventories were conducted in the Norwood project area (Sherwood Analysis Area and the North Analysis Area). A total of 85 cultural resources occur within the project area; 50 newly identified sites, and 35 previously recorded sites. Fourteen are considered eligible to the National Register of Historic Places (NRHP).

All identified historic and prehistoric properties will 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, which describes the compliance process. All timber harvests, fuels treatments, maintenance and re-construction of roads are designed to protect eligible sites by avoidance as identified by the District Archeologist. During implementation, the District Archeologist will be consulted on site locations, avoidance, and measures required to protect heritage resources.

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 forty one (141) previous adequate Level III cultural resource surveys were conducted within the proposed project area, covering all but 23,172 acres. A Level III inventory was conducted for the remaining 23,172 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).

Environmental Consequences

ALTERNATIVE 1 – NO ACTION

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 (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 Norwood analysis area are eligible for listing on the 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.

ALL ACTION ALTERNATIVES

Management actions include timber harvest, fuels treatments, burning, road maintenance, and road construction while minimizing adverse effects to natural and cultural resources. Associated actions include noncommercial thinning to reduce the risk of wildfires, further insect infestations, and to increase forest diversity. Proposed activities within the project area would also include landing construction, mechanical slash piling and burning, and wildlife habitat improvements.

Pursuant to Section 106 of the National Historic Preservation Act of 1966 (as amended), the Office of the South Dakota State Historic Preservation Officer (SHPO) concurs with the determination of No Adverse Effect for the proposed undertaking on the non-renewable cultural resources of South Dakota. 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 are uncovered, the project must be temporarily stopped until the SHPO has been notified and had a chance to comment. Concurrence of the SHPO does not relieve the federal agency official from consulting with other appropriate parties, as described in 36 CFR Part 800.2(c).

Cumulative Effects

Archaeological resources are non-renewable. Due to both natural and human processes, the loss of archaeological resources has occurred in the past and will happen in the future. One cumulative effect is that over time fewer archaeological resources will 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.

LANDS and SPECIAL USES

Affected Environment

Within the Norwood project area, there are a total of twenty-five private parcels of land. The private in-holdings are surrounded by federal land administered by the Forest Service. There are several isolated parcels of National Forest System Lands (NFSL) located in Wyoming which are surrounded by Bureau of Land Management (BLM) or private land. The private parcels are isolated homesteads or raw land parcels primarily used for pasture or grazing,

with the exception of one long narrow tract, Whispering Springs Subdivision. It is subdivided into six smaller tracts and some of these tracts have small vacation cabins. Access to private land is provided through system and/or non-system forest roads.

An attempt to start a town was made in the 1930s at the Moon campground area, but failed. Eight of the private parcels are separated from another private parcel by narrow strips of NFSL. These narrow strips qualify under the Small Tracts Act for purchase by the adjacent landowners. There have been several land exchanges in this area, beginning as far back as 1913 and the most recent in 1990.

The specific objectives outlined in the Forest Plan are identified in Objectives 502 and 503 to provide timely response to landowners for access across National Forest land and acquire right-of-ways to improve Forest Service access. There are landowners without legal access to their parcels, and/or multiple accesses to their parcels, although the Forest Service will only grant one ingress/egress per parcel. However, these issues are outside the scope of this project.

There are 9 Special Use easements and 6 Right-of-Ways granted in the project area (refer to the Lands Specialist report for further information). The special use easements include road access to private land, permission to remove snow and maintain a NFSR which accesses private land, operation of a weather station and seismic station by other Government agencies, an overhead powerline, and buried power and phone lines.

Two parcels of detached National Forest land in Wyoming in the project area do not currently have legal access across private lands.

Environmental Effects Analysis

Direct and Indirect Effects

ALTERNATIVE 1 – NO ACTION

This alternative would not have any effect on the lands resource. There would be 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 would also be a possibility of an increase in bug infested trees and subsequent mortality. No additional right-of-ways would need to be acquired. We would continue to consider Small Tracts Act applications, special use permit applications, easement applications, and opportunities to acquire right-of-ways through the Lands and Special Uses programs.

ALL ACTION ALTERNATIVES

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 were kept open for access to permit holders, including utility and seismic and weather monitoring sites. Short-term effects would include dust and noise from increased traffic during harvest operations. Increased log hauling traffic could impact roads that the public is

utilizing. Reduction in stand density could help reduce fire intensities, making it easier to control should a fire start on forest and endanger private property. There would be a need to acquire up to ten (10) identified right-of-ways for action alternative implementation.

Cumulative Effects

The Norwood 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 special uses.

Transportation

Affected Environment

The overall transportation network within the Norwood Analysis Area is comprised of approximately 1.7 miles of US highway, 215.5 miles of National Forest System Roads (NFFR), 70.5 miles of undetermined or user defined roads, and 9.1 miles of system trails. Of the 215.5 miles of NFSR, 48.0 miles of road were identified as having aggregate surfacing with a stable template and adequate linear and cross drainage. The remaining 106.5 miles of NFSR have native surfacing with a high degree of stabilization from native grass within the road corridor and the appropriate numbers of drainage facilities. There are, however, a number of native surface roads that have road segments that are either located in drainage bottoms, have inadequate cross drainage, poor alignment or poor soil composition that contribute to surface pooling, excessive rutting and transfer of sediment during spring breakup, and prolonged periods of wetted conditions.

As indicated above, there is a considerable portion of the existing transportation network that includes undetermined roads. These unsanctioned user-defined roads, in most cases, do not have an engineered road prism with a crown or established drainage structures. Due to a lack of cross drainage, coupled with unfavorable alignments, scanty locations, and unstable soils, these undesirable routes may sustain and potentially contribute to resource damage even during periods of sporadic traffic and minimal wet weather conditions. Table 3.51 displays road mileages which currently exist in the project area.

Table 3.51 - Existing Conditions of Roads and Trail Mileages in the Norwood Project Area

Road Miles – Total	**287.7 mi**
System Roads	215.5
Undetermined Roads	70.5
US Highway	1.7
System Roads - Total	**215.5 mi**
System Roads Open Yearlong	142.7
System Roads Administrative Closure (gated)	10.5
System Roads Seasonal Closure	62
System Roads Physically Closed as Storage	0.3
Gates - Existing	6 gates
Undetermined Roads - Total	**70.5 mi**
Undetermined Roads – Open Yearlong	46
Undetermined Roads - Administrative Closure (gated)	0.2
Undetermined Roads - Seasonal Closure	17.1
Undetermined Roads – Physically Closed	7.2
Road Density - Total	**4.0 mi/sq mi**
Open Road Density *April 1 through December 14*	3.7
Open Road Density *December 15 through March 31*	2.6*
Existing Trails	**9.1 miles**

* Open road density is reduced during the winter months due to snowmobile and x-country ski area seasonal closures.

Environmental Consequences

Direct and Indirect Effects

ALTERNATIVE 1 – NO ACTION

The No Action Alternative maintains the current transportation system as is, with no new roads added to the system, leaving the open road density of 4.0 miles of road per square mile, virtually unchanged. However, roads scheduled for closures from past decisions, from timber sales and local projects, would still be closed or obliterated.

Road maintenance would continue to be performed on a five year cycle for all maintenance Level 1 and 2 roads, while maintenance Level 3, 4, and 5 roads would be on the annual maintenance cycle in priority as determined by the Hell Canyon District Ranger and Engineering. However, these maintenance activities would not address the effects resulting from the unmanaged creation of unclassified or user defined roads. By the same token, with no specific construction or reconstruction, roads that have poor alignment or are located in drainage bottoms, that experience poor soil stabilization, or have inadequate cross drainage would likely continue to degrade over time. This would likely contribute to increased sediment delivery into adjacent drainages, surface destabilization and rutting, and potential catastrophic road failure due to slides and loss of embankment material. In the end, this would limit the ability of the Forest Service to manage natural resources and diminish public recreation opportunities.

ALL ACTION ALTERNATIVES

All of the Action Alternatives would have the same transportation system following implementation. Total road mileage would decrease even though 2.7 miles of new construction would occur. All undetermined roads would either be converted to system roads, trails, or removed from inventory. Additional administrative closures would be implemented with 18 new gates. As a result the open road density in both summer and winter months would decrease. Table 3.52 displays the post-implementation road and trail mileages in the project area.

Table 3.52 - Road and Trail Mileages Resulting from Implementation of Any Action Alternative in the Norwood Project Area

	Post Implementation: All Action Alternatives
Road Miles – Total	**233.7**
System Roads (includes 2.7 miles of new construction)	232
Undetermined Roads	0
US Highway	1.7
System Roads - Total	**232**
System Roads Open Yearlong	99
System Roads Administrative Closure (gated-includes 0.8 miles of new construction)	52
System Roads Seasonal Closure	51.2
System Roads Physically Closed as Storage (gated-includes 1.9 miles of new construction)	29.8
Gates	24
Undetermined Roads - Total	**0**
Road Density - Total	**3.2 mi/sq mi**
Open Road Density *April 1 through December 14*	2.1
Open Road Density *December 15 through March 31*	1.4**
Existing Trails	**9.9 miles**

** Open road density is reduced during the winter months due to snowmobile and x-country ski area seasonal closures.

ECONOMICS

The economic analysis for this project was conducted using the software package QUICKSILVER (QUICKSILVER v. 5.003 - USDA Forest Service Economic Analysis Tool, 1997). The financial analysis only includes direct costs and revenues to the Forest Service. The analysis only includes those actions connected to the project that will occur over the next 5 to 10 years. The financial analysis does not include an estimate of non-monetary values for recreation, wildlife, and forage.

The following sections describe costs and revenues that are used in the analysis and their source. In addition, any assumptions that may affect the analysis are presented. Most assumptions are designed to simplify the analysis. 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 situations where actual economic returns are an issue and decision criteria, it would be necessary to do a more exact analysis. In this analysis, the most important information is relative differences between alternatives. In most cases where assumptions depart from what would normally be expected, the assumptions result in a lower economic value than what would be expected, or are designed to be consistent with other assumptions in the analysis. Scheduling of activities that follow the sale is based upon a 5-year sale length and current district experiences in the timing of activities.

Costs

Sale preparation/administration costs are based upon a 3-year average of costs for the Forest. Normally, all of the administration portions of costs are spread out over the contract period. Rather than trying to develop specific assumptions on what costs occur in what year, all the costs are lumped in year 1. This assumption results in a lower economic value than if the costs were spread out.

Road costs are based upon the estimated costs given the amount of work that needs to be done.

Costs for pre-commercial thinning, fuels treatments, and weed control are all based on the recent planning costs used in recent timber sales. The costs include district administration and overhead. Also, some design criteria costs have been added in.

Benefits

The stumpage values are the average experienced on the forest as documented by the Regional Office. The revenues are assumed to occur all at one time. This assumption simplifies the situation that would normally occur with the revenues occurring throughout the life of the sale. This assumption by itself would tend to raise the economic value of the project, but it is consistent with the assumption on sale administration costs, which tend to lower the economic value of the project.

All cost and benefit values are 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 Table 3.53 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.

The only benefits included in this analysis were those revenues associated with the sale of sawtimber.

Table 3.53 - Financial Analysis Results by Alternative for the Norwood Project.

Financial Measure	Alternative 1 – No Action	Alternative 2	Alternative 3	Alternative 4
Present Value Costs	0	-$12,250,507	-$12,973,014	-$11,457,083
Present Value Benefits	0	$3,131,370	$3,550,049	$2,930,753
Present Net Value	0	-$9,119,136	-$9,422,964	-$8,526,330
Benefit/Cost Ratio	0	0.26	0.27	0.26

ALTERNATIVE 1 – NO ACTION

As documented in this EIS, Alternative 1 poses the greatest risk of large scale, high intensity wildfire within the project area. Although potential costs associated with such an occurrence is not integrated into this financial analysis, the actual cost of no action could potentially be much higher than the Action Alternatives in both economic and environmental terms. Recent large wildfires on the Black Hills have experienced costs in the millions of dollars for suppression alone. For example, suppression costs for the 2003 Battle Creek fire on the Mystic Ranger District are estimated at $6.5 million and the 2000 Jasper fire on the Hell Canyon Ranger District at approximately $11.5 million. Costs of rehabilitation, economic loss of resources and property values are significant additional costs of these wildfires.

There would not be any costs or benefits associated with the No Action Alternative.

ALTERNATIVE 2 – PROPOSED ACTION

For this project, the only benefit included in the economic analysis is the expected timber revenues. This project includes considerable costs associated with pre-commercial vegetation and fuels treatments. These treatments would be included in the project to reduce the potential for wildfire, particularly around private lands, to manage stand density, or to maintain meadows and hardwood stands. These pre-commercial treatment costs are a contributor for the negative PNV (Present Net Value) in this alternative. Management of understory fuels is labor intensive and, therefore, costly.

A significant amount of the present value costs (56 percent) are attributed to proposed fuels treatments in the project area. These fuels treatments benefit the resources in the project area by providing reduced fire hazard, but do not provide a tangible dollar benefit to include in the economic analysis. These treatments are the same for all Action Alternatives. If the fuels treatments were to be deferred, the Benefit/Cost ratio for this alternative would rise from .26 to .65.

This alternative has a moderate level of costs and benefits compared to the other action alternatives.

ALTERNATIVE 3

The main factors leading to the differences in financial measures between Alternatives 2 and 3 are the volume of timber harvested (benefits) and differences in the number of acres treated (costs). Alternative 3 would harvest more timber than Alternative 2, resulting in greater revenue. In addition, costs associated with the timber sale and post sale activities would be greater than Alternative 2. The benefit/cost ratio for Alternative 3 would be slightly higher (.27) than that of Alternative 2 (.26) because the increased benefit would not be completely offset by the additional costs associated with more acres of treatment.

The fuels treatment costs would be the same as in alternative 2. If these costs were deferred, the benefit/cost ratio for Alternative 3 would increase from .27 to .64.

This alternative would provide the best benefit/cost ratio of all the alternatives, although just slightly greater than alternative 2 or 4.

ALTERNATIVE 4

The main factors leading to the differences in financial measures between Alternatives 2 and 4 are the volume of timber harvested (benefits) and differences in the number of acres treated (costs). Alternative 4 would harvest less timber than Alternative 2, resulting in less revenue. In addition, costs associated with the timber sale and post sale activities would be less than Alternative 2. The benefit/cost ratio for Alternative 4 is calculated to be the same as Alternative 2 (.26) because the reduced benefit would be offset by the reduced costs associated with less acres of treatment.

The fuels treatment costs would be the same as in Alternative 2. If these costs were deferred, the benefit/cost ratio for Alternative 4 would increase from .26 to .72.

This alternative would provide the same benefit/cost ratio as alternative 2, although the present net benefit would be slightly improved over Alternative 2.

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 a discussion related to short-term uses and long-term productivity. The proposed actions in this project include

design features which will 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 Action Alternatives. Project design criteria is included (see Appendix B) which will lessen these effects as much as possible. For further discussion of the effects on the resources listed below, see Chapter 3 under the respective resource topics.

Wildlife Habitat: Certain species of wildlife would 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 on the snowmobile and ski trails may 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. With 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 the resources listed below, see Chapter 3 under 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 CFR 1502.25(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.

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CHAPTER 6. LIST OF PREPARER'S

Interdisciplinary Team

Michael Lloyd	District Ranger - Bachelor of Science, Outdoor Recreation, Colorado State University, 1973; minors in soil science and forestry. Twenty-two 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.
Kelly Honors	ID Team Leader – 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 years of Forest Service experience at the district level in timber and planning; seventeen years of those years at Black Hills National Forest. Sixteen years experience in writing NEPA documents.
Tracy Clark	Graduated from the University of Wisconsin-Stevens Point in 1990 with a B.S. in Wildlife Management and a minor in Environmental Law Enforcement. Eight seasons (1989-1994, 2000-2001) of wildlife experience as a Biological Technician with the Forest Service, Park Service and BLM in South Dakota, Idaho and Oregon. From 1994-1996 worked as a private consultant with the Minnesota DNR writing land stewardship plans and performing forest inventory. From 1996-2001 worked as a contractor performing stand exam on the Black Hills National Forest. Have been a Wildlife Biologist on the Black Hills National Forest for the last five years.
Nancy Bayne	Silviculturist – Bachelor of Science, Forest Resources with an emphasis in Silviculture, University of Minnesota, 1986. Nineteen years of Forest Service experience in timber at the district level on the Black Hills National Forest. Four years in current silviculturist position
Don Boone	Silviculturist – Bachelor of Science, Forest Science, University of Wisconsin-Madison, 1979. Twenty-seven 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.
Margaret Farrell	GIS/Database Management Specialist – Bachelor of Science, Geology, University of Wyoming, 1985. Sixteen years of Forest Service experience in database management, including nine years experience in ESRI GIS products.
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. Four 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.
Don Weiand	Civil Engineering Technician – Bachelor of Science, Industrial Technology, Black Hills State University, Spearfish, SD, 1996. Associate of Science, Drafting, Black Hills State University, Spearfish, SD, 1994. Eleven years Forest Service experience in surveying, road design and layout. Five years Forest Service experience in Infrastructure database management and GIS related applications.
Les Gonyer	Hydrologist – Bachelor of Science, Forestry minor in Hydrology, University of Minnesota, 1977. Thirty 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.
David Pickford	Recreation - Bachelor of Arts in Outdoor Recreation from Eastern Washington University, 1984. Seventeen years of Forest Service experience as 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.

Lori A. Bell	Lands – Bachelor of Science in Natural Resource Management, University of Wisconsin-Stevens Point, 1982. Twenty-three years of Forest Service experience at the district level in Colorado, Wyoming, California, Idaho, Florida, and South Dakota as a backcountry ranger, park ranger, reforestation/timber stand improvement forester, pre-sale forester, timber sale administrator, and land specialist.
Meagan Buehler	Lands Specialist-Bachelor of Science, Forestry, minor in Wildlife & Fisheries Biology, University of Massachusetts-Amherst, 1997. Ten 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.
Matthew Spring	Fire/Fuels Specialist – Sixteen years of Forest Service experience in fire suppression and prescribed fires. This includes eight years on a wildfire engine, two years with helitack, four years as an Assistant Fire Management Officer for Fuels on the Black Hills National Forest. Two years as the Assistant Fire Management Officer for Fuels on the Chippewa National Forest. Red-carded firefighter as Fire Behavior Analyst Level II, Ignition Specialist Level II, Engine Boss, Helicopter Manager, Division Group Supervisor, Task Force Leader, Strike Team Leader. Certified in the use of Fire Regime and Condition Class software and scorecard use. Education includes BEHAVE, S-490 Intermediate Fire Behavior Calculations, S-491 National Fire Danger Rating System, RX-410 Smoke Management, RX-310 Fire Effects, and environmental education through Colorado and Utah State Universities.
Gwen Lipp	Fuels Technician - Bachelor of Science, Environmental Engineering, South Dakota School of Mines and Technology, 2004. Eight years of Forest Service experience at the district level in timber, fire and fuels on the Rio Grande and Black Hills National Forests.
Angie Henn	Fuels Technician – Bachelor of Science, Forestry with emphasis in Forest Management and Fuels Science, 2005. Six years of Forest Service experience on the Black Hills National Forest as SCEP.

Stephen Keegan	Landscape Architect - Bachelor of Science, Landscape Architecture & Environmental Studies, State University of New York - College of Environmental Science and Forestry (ESF), 1980; Bachelor of Science, (dual degree with ESF), Syracuse University 1980; Associates of Arts, Humanities, State University of New York - Onondaga Community College, 1978. Twenty-two years of Forest Service experience at the forest and zone level in Oregon, South Dakota, Montana, Idaho conducting Scenic Resource Assessments for: vegetation and fuels management, watershed analyses, recreation construction and reconstruction, 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 New York, Idaho, Oregon and South Dakota.
Cynthia Buckert	Rangeland Management Specialist – BS in Range Science from SD State University, 1985; Qualified for OPM 430 series (Botany) in 2003; Eleven years of Forest Service experience as a Rangeland Management Specialist on the Nebraska, Toiyabe and Black Hills National Forests; Four years experience conducting plant surveys and sensitive plant surveys on the Black Hills National Forest
Carol Kjar	Editor – Bachelor of Science, Mathematics, Black Hills State University, 1990, Bachelor of Science, Math Education, Black Hills State University, 1991; Three Years experience in technical writing, editing, and newsletter publication; Three years of Forest Service experience at the District level in the Black Hills of South Dakota in timber sale accounting systems. Two years of Forest Service experience as a seasonal and volunteer archaeological technician in the Black Hills.
Betsy Koncerak	Editor – 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. Twelve years service at the District level: nine as a biological technician (wildlife, botany and fisheries), two as a fisheries biologist, and one as NEPA planner. Fisheries technician for Colorado Division of Wildlife, 1997 and for Idaho Fish & Game, 1998-1999.

CHAPTER 7 – FINAL ENVIRONMENTAL IMPACT STATEMENT DISTRIBUTION LIST

NATIVE AMERICAN TRIBES

Tribal Chairman, Yankton Sioux Tribe
Tribal Chairman, Crow Creek Sioux Tribe
Tribal Historic Preservation Officer, Northern Cheyenne Tribe
President, Northern Cheyenne Tribe
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Cheyenne-Arapaho Tribes of Oklahoma
Tribal Chairman, Santee Sioux Nation
Kiowa Ethnographic Endeavor for Preservation
Sicangu Lakota Treaty Council Office
Tribal Chairman, Mandan Hidatsa and Arikara Tribes

Federal Agencies which received a Hardcopy of the EIS:

US Fish and Wildlife Service, Pierre, SD
USDA, National Agricultural Library
US Environmental Protection Agency, Office of Federal Activities
Environmental Protection Agency, Region VIII EIS Review Coordinator
US Department of Interior, Director, Office of Environmental Policy and Compliance

Federal Agencies which received a Written Notice that the EIS was available on the Web:

US Coast Guard, Environmental Management
Director, Planning and Review, Advisory Council on Historic Preservation
Natural Resources Conservation Service, National Environmental Coordinator, USDA
US Army Engineers, Northwestern Division
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)
Federal Highway Administration, Division Administrator, Wyoming
US Department of Energy, Office of NEPA Policy and Compliance
USDA APHIS, PPD
Wyoming Department of Environmental Quality
Wyoming Game and Fish Department
Wyoming State Forestry Division
Crook County Land Use Planning and Zoning Commission

State, Local, and County Agencies:

South Dakota Department of Game, Fish & Parks
South Dakota Wildland Fire Suppression
South Dakota Department of Environment and Natural Resources
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