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Forest
Service

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# Snyder
# Forest Management Project

## Environmental Assessment

**Bearlodge Ranger District, Black Hills National Forest**
**Crook County, Wyoming**

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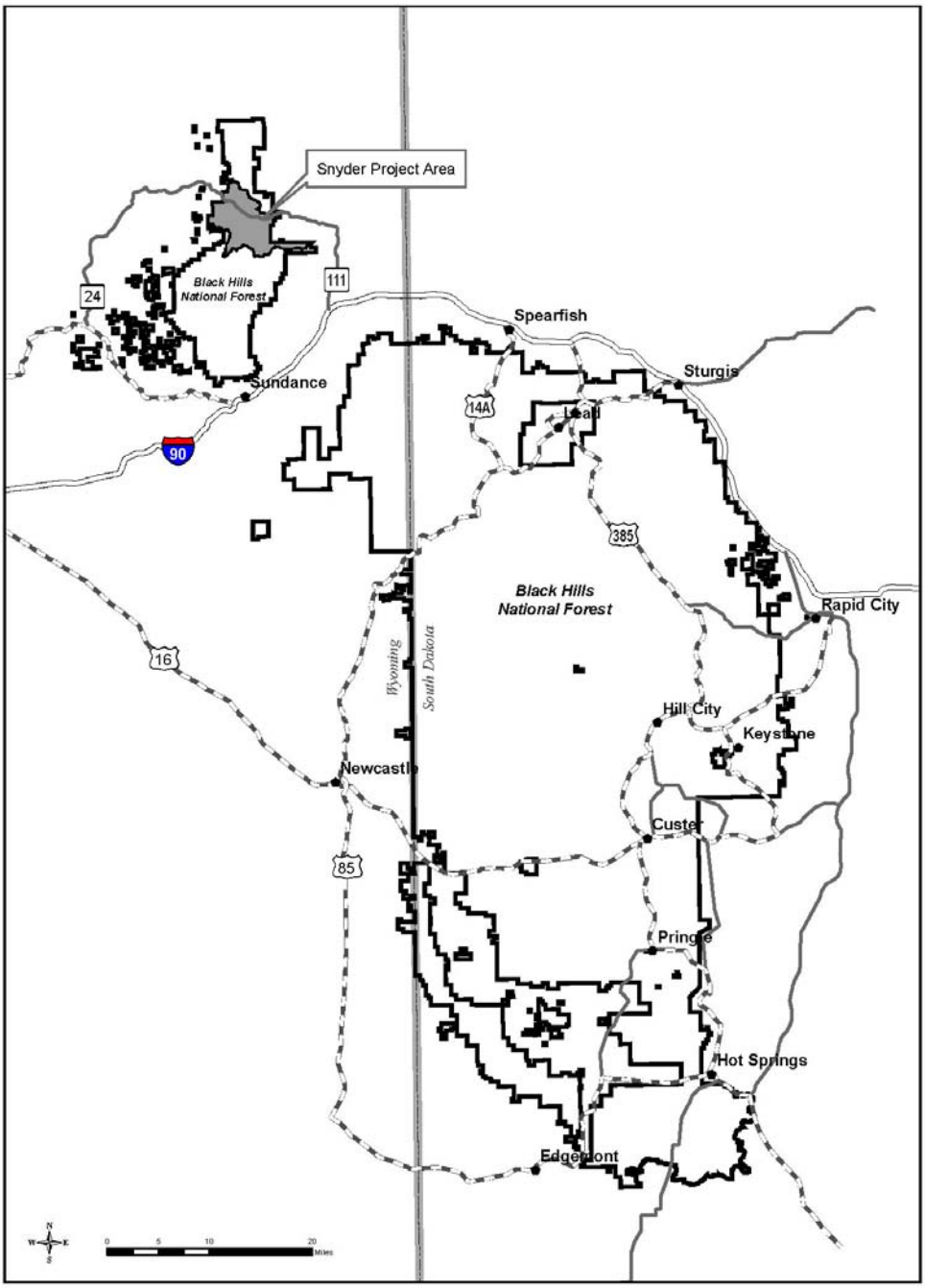
B. Forest Plan Direction, Regional Watershed Conservation Practices, and Noxious Weed Prevention Practices Applicable to Implementation of the Snyder Project
C. Public Comments on Draft Environmental Assessment and Agency Responses

**Figure 1. Snyder Project Area Vicinity**



# CHAPTER 1—PURPOSE AND NEED

## Introduction

This chapter presents the proposed action and explains the purpose of and need for the Snyder forest management project, decisions to be made, public involvement, and issue development. Site-specific needs in the Snyder project area and potential resource effects have been considered in the preparation of this environmental assessment (EA).

### Project Location

The Snyder project area is located approximately 15 miles north of Sundance, Wyoming (Figure 1). The project area includes approximately 19,369 acres, with approximately 13,084 acres of National Forest System (NFS) lands and 6,285 acres under non-Federal ownership. **Table 1** displays the legal description of the project area.

**Table 1: Project Area Legal Description**

| Township | Range | Sections |
|---|---|---|
| 53 North | 62 West | 3-9 |
| 53 North | 63 West | 1-3, 10 |
| 54 North | 62 West | 7, 17-21, 29-33 |
| 54 North | 63 West | 1-3, 10-16, 20-28, 34-36 |
| 55 North | 63 West | 34, 35 |
| 6th Principal Meridian | | |

Cliffs and steep slopes are common in the project area. Beaver, Little Beaver, Deer, Fawn, and Cub Creeks contain water most or all of the year. Main access to the project area is via National Forest System Roads (NFSRs) 830, 832, and 838. The Wood Canyon Walk-in Hunting Area is located in the western part of the project area and is closed year-round to motorized vehicle use by the public.

NFS lands in the project area are forested primarily with ponderosa pine (9,886 acres, or 76 percent of the NFS acres). Stands dominated by bur oak are found on 2,131 acres (16 percent). Grassy meadows cover 555 acres (four percent). Various hardwoods, including quaking aspen and paper birch, dominate 492 acres. Sixteen acres are unforested rock, and four acres are water. Aspen, birch, and especially oak are common understory components in many pine stands.

## Forest Plan Direction

The Black Hills National Forest Land and Resource Management Plan, as amended (Forest Plan [USFS 2005]) includes multiple-use goals and objectives for management of the National Forest.

The Forest Plan also assigns a management emphasis to each portion of the Forest. For each designated management area (MA), Chapter 3 of the Forest Plan describes goals and objectives that apply in addition to Forest-wide direction. The project interdisciplinary team reviewed MA designations and found them appropriate. MAs are summarized in **Table 2** and displayed on Map 1 (Appendix A).

**Table 2: Management Areas in Project Area**

| Designation | Acres in Project Area | Percent of NFS Land in Project Area | Management Emphasis |
|---|---|---|---|
| 3.32 | 50 | 0.4 | Backcountry non-motorized recreation |
| 4.1 | 5,017 | 38.3 | Limited motorized use and forest products |
| 5.1 | 2,850 | 21.8 | Resource production |
| 5.4 | 5,168 | 39.5 | Big game winter range |

Detailed information on these management areas can be found in Appendix B and Forest Plan chapter 3, pages 35-39, 45-50, 64-68, and 89-94.

## Purpose and Need

The purpose of the Snyder project is to move the project area towards Forest Plan desired conditions, as described below and summarized on page 5. This section compares relevant Forest Plan goals and objectives to the conditions that currently exist in the Snyder project area. The comparisons show where needs or opportunities for action exist.

### Forest Plan Goal 2

Goal 2 of the Forest Plan is to manage for biologically diverse ecosystems (Forest Plan, pages I-6 through I-11). The Snyder project can contribute toward meeting this goal by addressing needs related to forest structure, goshawk habitat, big game winter range, and hardwood communities.

#### Forest Structure

Objectives 4.1-203, 5.1-204, and 5.4-206[1] are to manage ponderosa pine in MAs 4.1, 5.1, and 5.4, respectively, for certain percentages of structural stages. These objectives apply to the entire MA across the National Forest and are not intended to apply at the project level. Forest management in the project area could contribute toward achieving the Forest-wide objectives. Relative to the desired condition, existing pine structural stage distribution in these MAs across the National Forest is skewed towards mature forest and deficient in both young and late-succession forest. Distribution is similar in the project area, with approximately 90 percent of the pine acres forested with mature trees. Stand structure is generally even-aged.

#### Goshawk Habitat

The northern goshawk is considered “sensitive” in Forest Service Region 2 (R2), which includes the Black Hills. Goshawks are known to nest in the project area. Forest Plan objective 221 states, “Conserve or enhance habitat for R2 sensitive species.” In the Snyder area, foraging habitat for this raptor lacks the diversity important to prey species. There is an opportunity to enhance foraging habitat by cutting and/or burning to increase within-stand diversity. In addition, some of the known nest stands have developed a dense understory, which is generally not considered optimal (Kennedy 2003). Understory treatment such as mulching or prescribed fire could help maintain the quality of these stands.

#### Winter Range

Forty percent of the Snyder project area is in MA 5.4, big game winter range. Management is to emphasize a vegetation mosaic, with natural and created openings and diverse sizes and ages of tree stands. Openings and young pine forest are scarce in MA 5.4 in the project area. There is an opportunity

[1] Forest Plan direction referenced in this document is defined in Appendix 2.

to improve the quantity and quality of winter forage by creating openings, young forest, and uneven-age or patchy stand structure. Off-road use of motorized vehicles is to be restricted in winter. There is currently no restriction. An opportunity exists to increase wildlife security by instituting a winter closure.

#### Hardwood Communities

Objective 201 is to manage for a minimum of 92,000 acres of aspen (double the current aspen acres), and 16,000 acres of bur oak (about a one-third increase) during the life of the Plan. The highest priority for hardwood restoration is where conifers (e.g., spruce and pine) have out-competed aspen adjacent to riparian systems that once supported beaver. Increases in bur oak are to be focused away from the Bear Lodge Mountains (Forest Plan, page I-7).

Aspen is the dominant vegetation on 379 acres in the project area and is present in the understory of many stands. Based on current conditions in the project area and the desired condition in the Forest Plan, there is an opportunity to improve aspen habitat in the project area. This would contribute to the Forest goal of a minimum of 92,000 acres of aspen habitat during the life of the Plan. Activities that could improve aspen habitat include removal of pine through cutting or prescribed burning.

### Forest Plan Goal 3

Goal 3 of the Forest Plan is to provide for sustained commodity uses in an environmentally acceptable manner (Forest Plan, pages I-13 through I-15).

> "Sustainable economic activity depends upon sustainable ecosystems… Congress has recognized the importance of sustainable commodity use in laws including the Multiple-Use, Sustained-Yield Act, the National Forest Management Act, the Organic Act…" (Forest Plan, page I-13)

The Snyder project can contribute toward meeting this goal by addressing needs related to production of timber.

#### Contribution to Forest ASQ

Objective 303 is to offer the following allowable sale quantity (ASQ) of timber on suitable and available timberlands in the next decade (Forest Plan, page I-14; **Table 3**).

**Table 3: Allowable Sale Quantity from Suitable Lands (per-decade total)**

| Product | Million Cubic Feet | Million Board Feet |
|---|---|---|
| Sawtimber | 181 | 838 |
| Roundwood | 21 | NA |
| **Total** | **202** | **838** |
| "Suitable lands": Lands suitable for timber production | | |

The ASQ for the first decade was 838 MMBF of sawtimber. The actual Forest offer for this period was well below that figure. Fiscal Year 2007 began the second decade of implementation of the Revised Forest Plan. Direction for the second decade is that timber harvest levels should not exceed 838 MMBF (181 MMCF). (USFS 2005a; Forest Plan, Guideline 2402).

Based on the desired condition in the Forest Plan, there is a need to provide outputs to contribute to the Forest ASQ. Cutting merchantable trees in the project area would contribute to the Forest Plan ASQ.

### Forest Plan Goal 10

Forest Plan Goal 10 is to establish and maintain a mosaic of vegetation conditions to reduce occurrences of catastrophic fire and insect and disease events, and facilitate insect and disease management and firefighting capability (Forest Plan, page I-35). The Snyder project can contribute toward meeting Goal 10 by addressing needs related to wildfire hazard and risk of mountain pine beetle infestation.

### Wildland Fire Hazard

Objective 10-01 is to manage for 50 to 75 percent moderate to low fire hazard in the wildland-urban interface (WUI) and to manage the remainder of the Forest for 50 percent moderate to low fire hazard (Forest Plan, pages I-35 through I-36). There is no WUI in the Snyder project area according to the National Fire Plan definition (1.5 miles from an At-Risk Community with a Community Wildfire Plan in place; National Fire Plan 2000). The project area does contain about 36 miles of boundary between NFS lands and other ownership.

Approximately 38 percent of the NFS lands in the project area have moderate to low fire hazard. Based on conditions in the project area and the desired condition in the Forest Plan, there is a need to reduce the risk of wildland fire in the project area. Activities that could reduce fire hazard include thinning of dense pine stands, regeneration harvest to modify the age structure across the project area, prescribed fire, and mechanical fuel reduction.

### Mountain Pine Beetle Infestation Risk

Objective 10-07 is to reduce acreage of ponderosa pine stands that are at medium or high risk of mountain pine beetle infestation where beetle outbreaks could put management objectives at risk. (Forest Plan, page I-36).

In the Snyder project area, the combined area at medium or high risk of mountain pine beetle infestation is 6,698 acres, or 68 percent of the pine cover type on NFS lands. Management objectives, including timber production and wildfire suppression, could be threatened by high levels of beetle infestation. Based on current conditions in the project area and the desired condition in the Forest Plan, there is a need to reduce the risk of mountain pine beetle infestation in the project area.

Activities that could reduce the risk of pine beetle infestation include thinning of dense pine stands and regeneration harvest to modify age class distribution across the project area.

## Forest Plan Goal 4.1-401 and Guideline 9202; FSM 7700 – Transportation System

Forest Service Manual (FSM) policy is to determine and provide the minimum forest transportation system that best serves current and anticipated management objectives and public uses of NFS lands, as identified in the appropriate land and resource management plans (FSM 1920). Management direction is to:

> Emphasize maintenance and reconstruction of classified [FSR] roads to meet road management objectives… Unclassified [unauthorized] roads will be closed and made inaccessible where funding permits unless they are made part of the authorized forest road system as provided for in this policy… (FSM 7703.2)

There are unplanned, unauthorized, or unclassified travelways on NFS lands in the project area. In addition, Forest Plan direction is to reduce the long-term impact of roads on soils (Forest Plan, page II-80), emphasize non-motorized recreational opportunities in MA 4.1 (Forest Plan, page III-48), and minimize the effects of motorized vehicles on wintering big game in MA 5.4 (Forest Plan, page III-94). The Snyder project can contribute toward meeting this direction by addressing needs related to unnecessary or unauthorized roads and, in MAs 4.1 and 5.4, off-road motorized travel.

There are 59 miles of NFS roads in the project area and approximately 29 miles of unauthorized roads. NFS lands outside the Wood Canyon Walk-in Area are open to off-road motorized travel.

Based on current conditions in the project area and FSM and Forest Plan direction, there is a need to 1) decommission unauthorized roads in the project area to reduce effects on wildlife and soils, 2) provide non-motorized recreational opportunities in MA 4.1, and 3) reduce disturbance of big game in MA 5.4. Activities that could reduce total road miles effects of roads in the project area include decommissioning unauthorized roads and unneeded NFS roads, converting unauthorized roads for which there is a long-

term need to NFS roads or trails, and closure of MA 5.4 in winter to use of motorized vehicles off roads. Implementation of an area closure in the part of MA 4.1 not currently covered by the Wood Canyon closure would increase non-motorized recreational opportunities.

### Purpose and Need Summary

In summary, the purpose of and need for action in the Snyder project area is to move the project area towards Forest Plan desired conditions by reducing fire hazard and risk of mountain pine beetle infestation, producing a sustainable supply of timber, diversifying forest structure, improving wildlife habitat, and managing motorized use.

## Issues

### Public Involvement

Public involvement in this project began in April 2006 when the Snyder project was listed on the Black Hills National Forest's Quarterly Schedule of Proposed Actions. Public scoping began on October 17, 2006, when the project description and request for comments were mailed to 117 individuals, organizations, and agencies. See page 147 for a list of those contacted during scoping.

Bearlodge Ranger District received letters from six parties in response to scoping:

- A. Everett, Black Hills Forest Resource Association, Rapid City, South Dakota
- K. Dennis, Crook County Land use Planning and Zoning Commission, Sundance, Wyoming
- J. Batt, Pope and Talbot Inc., Spearfish, South Dakota
- J. Emmerich, Wyoming Game and Fish Department, Cheyenne, Wyoming
- J. Corra, Wyoming Department of Environmental Quality
- J. Griffith

### Tribal Consultation

The 1992 amendments to the National Historic Preservation Act (1966) require the Forest Service to consult with Tribes (defined as federally recognized Tribes and Alaska Native Corporations) regarding potential affects on historic and archaeological sites. Executive Orders 13084 and 13175 also require that Federal agencies consult with Tribes during planning activities.

Black Hills National Forest and Tribal representatives meet twice a year to discuss new and ongoing concerns, partnership opportunities, and issues that may affect high-profile sacred and spiritual sites. Forest representatives also meet with Tribal Historic Preservation Officers (THPOs) yearly to discuss potential projects that require the NHPA Section 106 consultation process. For the Snyder project, Tribes were sent a scoping letter requesting information regarding known sacred or spiritual sites/landscapes and gathering areas. The Forest Service received no responses regarding this project.

### Identification of Significant Issues

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

evidence. A list of non-significant issues and the reasons they were categorized as non-significant may be found in the project record.

To be considered a significant issue, a public comment must be:

- Specific to the Snyder project area, and
- Relevant to the Snyder project proposed action, showing a disagreement with the proposed action that cannot be resolved except through the development of an alternative to the proposed action.

Once a significant issue is identified, measures are selected to compare how alternatives respond to it. Where possible, measures are quantifiable and are chosen with regard to predictability, responsiveness to the issue, and link to the cause-and-effect relationship of the issue. A measure describes how the alternatives affect resources. Monitoring and mitigation of the anticipated environmental effects of the project were also designed to respond to significant issues.

The following significant issues were identified.

- Treatment of pine stands to produce uneven age structure could enhance stand diversity and value for a variety of wildlife species.

  *Measure:* Acres of uneven-age management proposed.

- Closure of more of the area to motorized vehicles off roads would limit motorized recreation opportunities.

  *Measure:* Acres open and closed to use of motorized vehicles off roads.

- Using prescribed fire without first mechanically treating the area could increase the danger of escape or excess damage to live trees.

  *Measure:* Acres of prescribed fire proposed with and without prior mechanical treatment.

- Bur oak exists in a brushy form in much of the project area. Transition of some of these areas to tree-form oak would benefit wildlife species that use tree cavities and acorns.

  *Measure:* Acres of oak treatment.

## Decisions to be Made

The scope of the analysis and the project decisions are limited to the Snyder project area. This EA will provide the Deciding Official (the Bearlodge District Ranger) with the information needed to make the following decisions regarding the Snyder project:

1. Selection of the alternative that would best move the Snyder project area towards the desired condition per Forest Plan direction and address the identified needs and issues.
2. Whether additional mitigation measures and monitoring requirements outside the Forest Plan would be applied to the proposed activities.

If an action alternative is selected, project implementation could begin in 2008 and would be expected to include multiple timber sales and other activities.

# CHAPTER 2—PROPOSED ACTION AND ALTERNATIVES

## Introduction

This chapter describes the proposed action, the no action alternative, two action alternatives, several alternatives not analyzed in detail, and site-specific design criteria and monitoring proposals. Finally, Chapter 2 compares the alternatives' environmental effects, response to significant issues, and achievement of Forest Plan goals and objectives.

## Alternative Development Process

The ID team developed the proposed action (Alternative 1) to address needs and take advantage of opportunities identified through comparison of existing conditions and Forest Plan direction (see Chapter 1). The team developed alternatives to the proposed action in response to concerns and ideas raised during public scoping.

## Proposed Action and Alternatives Analyzed in Detail

### No Action (Alternative 0)

Alternative 0 is the "no new Federal action" alternative. It serves as a baseline for comparison of the effects of the action alternatives.

Alternative 0 represents the existing condition. Under Alternative 0, ongoing management activities would continue. No new activities would occur at this time. Changes might result from current management direction (such as road maintenance), natural processes, or other management decisions in the future. This alternative provides a foundation for describing and comparing the magnitude of environmental changes associated with the action alternatives against those changes that would be expected to occur if no new actions took place at this time.

### Proposed Action (Alternative 1)

The proposed action includes activities to address the resource concerns and needs identified for the project area (see Chapter 1). Implementation of these activities would move the project area toward desired Forest Plan conditions as summarized in Table 5 (page 23). Alternative 1 is summarized in Table 4 (page 21) and displayed on Maps 2, 11, and 14 in Appendix A. The proposed action includes the following activities.[2]

#### Commercial Timber Harvest

Proposed commercial timber harvest treatments include thinning, shelterwood seedcut, overstory removal, patch cuts, aspen enhancement, and combinations of these treatments.

*Commercial Thin.* Thinning of mature pine would take place on 297 acres. Residual basal area would average 60 square feet per acre. After treatment, there would be about 32 feet between trees (assuming an average DBH[3] of 14 inches), though spacing would vary within stands to provide variety in habitat and scenery. Smaller, unhealthy, poorly formed, and decadent trees would be cut to increase growth of remaining trees. The primary objective of this treatment is production of wood fiber and increased growth and vigor of the remaining trees to reduce the risk of loss to pathogens. Another objective is to raise

[2] If an action alternative is implemented, actual amounts of activities accomplished on the ground (measured in acres, miles, or board feet) may differ slightly from these estimates. Any variance would be in accordance with Forest Plan Standards and Guidelines and any applicable laws and regulations, and would be documented in the project file.

[3] Diameter at breast height (4.5 feet above the ground on the uphill side of the tree).

canopy height, which would remove ladder fuels and decrease fire severity and rate of spread.

*Commercial/Products-other-than-Logs Thin.* This treatment is similar to commercial thin but includes thinning of trees 5 to 9 inches DBH (products other than logs, or POL). It would take place on 105 acres with a mix of large and small pine trees.

*Variable Density Thin.* This treatment is similar to commercial thin but would focus on producing a stand with density varying from 20 to 80 square feet of basal area per acre (with an average of 50). It would take place on 146 acres. Goals of the treatment are similar to those of conventional thinning with the additional objective of creating within-stand structural diversity.

*Shelterwood Seedcut.* This silvicultural treatment removes some of the mature pine to open the stand and allow pine seedlings to become established. This treatment would take place on 301 acres and would result in stands with about 45 feet between trees averaging 16 inches DBH. This treatment would retain enough large trees to provide a seed source and future large-diameter snags. The primary objective is establishment of pine regeneration.

*Commercial Thin/Shelterwood Seedcut.* This treatment would take place on 114 acres along NFSR 838. Parts of these stands are located on the remnants of old debris flows (landslides) from the adjacent steep slopes. There does not appear to have been movement for decades, but any movement would be detrimental to Beaver Creek, which is on the other side of NFSR 838 about 500 feet below the road, as well as to site productivity. The combination of thinning and seedcut would reduce fire hazard while retaining root systems with the intent of conserving soil stability.

*Overstory Removal.* Where pine seedlings and saplings have become established, most of the mature pine would be cut to allow maximum growth of the new stand. This treatment would occur on 254 acres.

*Shelterwood Seedcut/Overstory Removal.* This treatment would take place on 335 acres in stands with patches of pine regeneration. The majority of the stand would be treated with shelterwood seedcut, but in areas with sufficient regeneration, overstory removal would take place.

*Overstory Removal/Shelterwood Seedcut.* This treatment would take place on 1,156 acres. The majority of the stand would be treated with overstory removal, with seedcut taking place where regeneration is insufficient.

*Patch Cut.* All commercial pine would be cut in patches up to 10 acres in size. The patches would total about 30 percent of each treated stand. There would be no treatment between the patches. Post-sale treatment would remove non-commercial stems in the patches. This treatment provides a temporary opening in the forest and is a method of promoting pine regeneration. Adjacent trees provide a seed source for natural reforestation of the cut areas. Patch cuts would take place on approximately 24 acres in stands with a total area of 79 acres.

*Patch Cut/Aspen Enhancement.* In addition to the patch cuts described above, this treatment would remove pine from aspen clones and the area within 66 feet (one chain) of the clone. Patch cut/aspen enhancement would take place on approximately 270 acres in stands with a total area of 539 acres.

*Shaded Fuel Break.* Pine stands with high tree density and ladder fuels would be mechanically treated to reduce fuel loading and continuity. This treatment would be used on 85 acres along NFSR 832 (Fawn Creek) to create a fuel break 200 to 400 feet wide. The overstory would be thinned to 10-20 square feet of basal area per acre and all understory pine would be cut. All other material such as slash, pine reproduction, and oak brush would either be chipped or piled and burned. The fuel break is intended to reduce the potential for wildfire growth and provide defensible access and egress routes. The fuel break would exclude non-pine stands and inoperable areas, and would retain fire-resistant hardwoods such as aspen and birch. As pine and oak revegetate the area, continued maintenance would be required. Stands maintained as fuel breaks would no longer be managed for timber production and would therefore be removed from the base of stands suitable for timber production.

*Interface Thin.* Commercial thinning would take place on 170 acres of stands bordering non-NFS lands. The treatment would also include removal or amelioration of flammable understory such as pine, oak brush, and slash. The goal is to reduce the probability of wildfire spreading between ownerships.

*Sanitation.* Mountain pine beetle populations appear to be at relatively low levels in the Snyder project area, but potential for infestation is high. If an infestation occurs, cutting of green beetle-infested trees (sanitation) would take place where necessary in patches up to five acres in size. Total area treated would not exceed 250 acres. Sanitation would take place in areas accessible from existing or proposed roads and would comply with design criteria specified below. The objective of this treatment is to limit the spread of mountain pine beetle infestation.

*Yarding Methods.* Proposed log yarding methods include cut-to-length, whole-tree, and suspended (cable). Cut-to-length yarding leaves tree branches and tops in the stand. Whole-tree yarding moves the entire tree to a centralized landing, and requires relatively large spaces for landings. Cable yarding removes just the bole of the tree using a suspension system, and is generally used on slopes over 40 percent. Cable yarding is likely to be necessary in all or parts of stands 0103030152, 0103030164, 0103050031, 0103050075, 0104030023, and 0104030025.

### Non-commercial Vegetation Management

*Precommercial Thin.* Saplings would be thinned to improve growth on 1,611 acres. This treatment would reduce stand density through selective retention of the best-formed, healthiest trees within the spacing guidelines. Primary goals are to improve growth, preclude stand stagnation, and reduce continuity of fuels. Slash in excess of fuel guidelines would be piled and burned, chipped, or removed to reduce fire danger and pathogen habitat.

*Goshawk Nest Habitat Enhancement.* This treatment would cut non-commercial pine and oak brush in stands suitable for northern goshawk nesting to enhance uneven stand structure and improve open-understory foraging conditions. Resulting fuel would be burned or chipped.

*Prescribed Burning.* Broadcast burning would be used to reduce fuels and enhance wildlife habitat on 4,812 acres in two large blocks in the western part of the project area. The purpose of the treatment is to consume fuels on the ground and kill small trees and lower branches on larger trees, reducing the chance of a wildfire reaching the tree crowns. Burning is proposed in large blocks to increase efficiency and lower cost.

*Non-commercial Interface Thin.* Non-commercial thinning would take place on 553 acres of stands bordering non-NFS lands. The treatment would consist of cutting small-diameter pine and oak and removal or amelioration of slash. Non-commercial interface thin would take place in stands that have insufficient commercial pine to make a timber sale feasible.

*Non-commercial Aspen Enhancement.* Removal of non-commercial pine from aspen stands would take place on 20 acres. The goal is to reduce competition from pine.

### Other Proposed Actions

*Decommissioning* of 14.5 miles of unauthorized roads and 0.4 mile of NFSR 859.1 would take place as funding and opportunity allow. The highest priorities for decommissioning include the section of NFSR 859.1 and unauthorized roads U580047, U590062, U590064, U610025, and U610036, due to their watershed effects. Decommissioning would consist of permanently closing roads through various means and may or may not include removal of any existing road template. The section of NFSR 859.1 proposed for decommissioning is not needed for resource management access and is adjacent to a perennial stream (Cub Creek) and small ponds. Unauthorized road U590064, which parallels the upper, intermittent part of Cub Creek, is partly blocked. Decommissioning would include more complete blockage, relocation of a cattle trail where hoof shear has occurred, and stabilization of these eroded areas.

*Closure* of MAs 4.1, 5.4, and part of 5.1 to use of motorized vehicles off roads (Map 2, Appendix A). MA 4.1 south of Highway 24 (the Wood Canyon Walk-in Hunting Area) and MA 3.32 are currently closed to motorized vehicles year-round. Alternative 1 would also close the remainder of MA 4.1 south of Highway 24 (260 acres), MA 4.1 north of Highway 24 (1,289 acres), MA 5.4 (5,168 acres), and MA 5.1 north of Highway 24 (665 acres). A total of 10,905 acres (83 percent of NFS lands in the project area) would be closed, an increase of 7,382 acres over the current condition.

*Fence construction* in Lucky Gulch to exclude livestock from wet meadows.

*Easement acquisition:* Stands 0104020004 and 0104020006 would be harvested from NFSR 830.3 if an easement can be acquired across private land in southwest section 32, T54N, R62E.

## Connected Actions

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

### *Transportation System*

*Construction* of approximately 3.0 miles of new road would be necessary to carry out proposed vegetation management. The new roads would be stored (closed with barriers) after the project is complete. In addition, 2.1 miles of existing unauthorized roads would be converted to system roads, requiring the equivalent of major reconstruction.

*Major reconstruction* of approximately 7.0 miles of existing NFSRs would take place. Major reconstruction would include actions such as road widening and replacement or substantial improvement of basic drainage structures.

*Minor reconstruction* would occur on approximately 35.7 miles of existing NFSRs. Minor reconstruction would include actions such as blading and placement of spot gravel.

*Maintenance* would take place on 12.3 miles of NFSRs. These roads are currently in good condition and require only minor improvement prior to use.

*Temporary roads:* One and seven-tenths miles of temporary roads would be required. Temporary roads are essentially a path cleared to allow logging equipment to pass. The eight road segments would range from approximately one-tenth to four-tenths of a mile in length and would be located on relatively flat ground. Following use, the temporary roads would be revegetated and blocked.

Under all alternatives, any required permits, such as Army Corps of Engineers Section 404 (dredge and fill), would be obtained prior to implementation of relevant activities.

### *Release and Weed*

Cull trees would be cut following commercial thinning (approximately 832 acres).

### *Treatment of Activity Fuels*

Depending on individual site characteristics, commercial harvest may use whole-tree yarding. This method results in concentrations of tree tops and limbs at log landings. These slash piles would generally be burned, but may also be chipped. The resulting disturbed area would be scarified, seeded, and treated for noxious weed infestation if necessary.

Conventional yarding systems can result in tops and branches spread across a site rather than concentrated at a log landing. Where resulting fuel loading would exceed Forest Plan direction, fuels would be crushed, burned, or otherwise reduced.

### *Prescribed Fire Control Line Rehabilitation*

Lines constructed for control of prescribed fires would be rehabilitated to prevent erosion and weed

infestation. Methods may include construction of water bars, replacement of sod and brush, and seeding.

### *Noxious Weed Control*

Where proposed actions result in spread of noxious weeds, control treatments would be applied as necessary.

## Design Criteria and Mitigation

Forest Plan Standards and Guidelines, Regional Watershed Conservation Practices (WCPs, Forest Service Handbook 2509.25, USFS 2006c), and other management requirements apply to these activities. These requirements are listed in Appendix B and repeated here only if clarification is required. Site-specific design criteria applicable to activities proposed under Alternative 1 include the following and are described in detail in the Snyder Project Implementation Guide, located in the project file.

### *Revegetation of Disturbed Soil*

1. Native vegetation would be retained to the maximum extent possible during proposed activities. Disturbed soil would be revegetated in a manner that optimizes plant establishment on the site. Revegetation may include topsoil replacement, planting, seeding, fertilization, and placement of weed-free mulch as necessary. Revegetation would be initiated as soon as possible, generally not to exceed 6 months, after termination of ground-disturbing activities. All disturbed soils would be revegetated with native species when available using seed mixtures that are free of noxious weeds. On areas needing the immediate establishment of vegetation, non-native, non-aggressive annuals, non-aggressive perennials, or sterile perennials may be used until native perennials become established.
2. Timber sale roads would be seeded after construction but before timber harvest if any part of the gap between construction and harvest would occur between April and October. This may be accomplished under the road contract. If necessary, seeding would again occur after use of the road is complete. Seeding may be delayed until after completion of harvest if the gap between construction and harvest would be of short duration and hydrology, soils, engineering, and noxious weed specialists determine after field review that a delay would be acceptable.
3. Slash pile sites would be ripped and reseeded with an approved seed mix as soon as possible following pile disposal (burning, chipping, etc.).

### *Rare Species*

4. Road work proposed in or adjacent to suitable sensitive plant habitat would be coordinated with a botanist. Road work proposed in or adjacent to this habitat includes reconstruction of parts of NFSRs 834.1, 832.1V, and 859.1, and decommissioning of U580047, U580050, U590049, U590050, U590054, U590059, U590062, U590064, and U610004.
5. The steeper bottom parts of stand 0104010030 would be excluded from treatment due to birch/aspen habitat and damp soil.
6. The north-facing slope in the draw associated with Planting Spring (northwestern stand 0101060008) would be excluded from treatment due to birch/aspen habitat and damp soils.
7. The birch/aspen draws in stands 0103020023 and 0103020029 would be excluded from treatment.
8. No mechanical disturbance would take place in the southeastern edge of stand 0103030152 due to sensitive plant habitat and the Cub Creek water influence zone.
9. Activities are proposed in within one-half mile of goshawk nests. Timing restrictions apply (Forest Plan standard 3111). Specific locations can be found in the Snyder Project Implementation Guide.
10. Any new goshawk nests found during project implementation would be protected in accordance with

Forest Plan direction. Any other raptor nests found during project layout or implementation would be evaluated by a wildlife biologist on a site-specific basis to determine if special requirements are warranted to protect site integrity.

*Protection of Pine Regeneration*

11. In stands or portions of stands treated with overstory removal harvest, existing pine regeneration would be protected during all phases of harvest operations. Timber in these stands would be felled and skidded with mechanical equipment. In addition, contract provision C6.41 or CT6.41 (or equivalent felling and bucking measure) and C6.42# or CT6.42# (or equivalent whole-tree yarding measure) would be included in the timber sale contract. Skid trails within these stands would be at least 100 feet apart and their location approved by the sale administrator prior to commencement of logging. Log landings would, where feasible, be placed within the outer edge of stands (rather than in meadows – see item 28) in areas with no regeneration. Landings used for previous timber sales would be used where possible.

*Heritage Resources*

12. Known heritage sites would be protected. No activities would take place within 100 feet of these sites. Heritage sites would be avoided during all proposed activities. Leaders of proposed projects would review heritage maps and implement mitigation measures for sites listed in the heritage resources file.
13. If previously unknown heritage resources are discovered during project activities, project staff would stop ground-disturbing actions and notify the district archeologist before activities are resumed.
14. Heritage resource inventory would be completed in proposed burn units prior to implementation per USFS Agreement No. 01-MU-11020000-015 (Programmatic Agreement Among the Advisory Council on Historic Preservation, the Colorado, Wyoming, South Dakota, Nebraska, and Kansas SHPOs, and the USDA Forest Service Rocky Mountain Region Regarding Implementation of the Prescribed Fire Program).

*Improvements*

15. All Forest Service-authorized improvements, such as maintained fences, property corners, and water developments, would be shown as protected improvements on timber sale area maps and protected during all management activities.

*Noxious Weeds*

16. Noxious weed control activities would take place prior to ground-disturbing activities, when feasible, to reduce weed spread and establishment.
17. Review of the area for noxious weed infestations would continue during proposed activities. If new noxious weed infestations that could be spread by proposed activities are found during implementation, actions to minimize spread would be taken.
18. Prescribed burn plans would address control of known noxious weed infestations within burn blocks.
19. District staff responsible for the noxious weed program would, in coordination with the project engineer, inspect gravel pits for noxious weed infestation before transport and use of gravel and other material. Infestations would be treated to prevent spread.
20. District staff responsible for the noxious weed program would inspect stockpiled gravel annually for weed infestation in coordination with the project engineer.
21. Contracts and permits issued as part of this project would include measures to limit spread of noxious weeds. Heavy equipment used for timber harvest would be washed before entering the timber sale

area if the area it previously operated in is unknown or documented to be infested with noxious weeds. Where information is available, noxious weed infestations would be identified by district staff and designated on sale area maps for any timber sales associated with this project.

22. See also Noxious Weed Prevention Practices in Appendix B.

*Recreation and Public Safety*

23. Appropriate signing or other cautionary measures would be implemented in conjunction with all management activities to ensure public safety. Implementation of these measures would be the responsibility of the person initiating the action (e.g., logging contractor, prescribed fire manager).
24. The Cliff Swallow trail is just across 838.4B from southern stand 0103050074. Landings would not be placed on or within 100 feet of the trail.

*Range*

25. Managers of vegetation treatment projects would consult with district range managers to ensure alteration of natural barriers does not allow livestock to circumvent fences.
26. All pasture gates would be identified on timber sale area maps and kept closed during the grazing season (generally June through October).
27. If log hauling or movement of heavy equipment related to the proposed timber harvest causes damage to cattleguards, the timber purchaser would be responsible for repair.
28. Landings and slash piles would be located outside grasslands, meadows, and riparian areas where possible to protect vegetation and reduce loss of available forage.

*Snags*

29. Snags would be cut only for safety reasons, including when necessary to provide safe passage on roads, skid trails, fire control lines, and at log landings.
30. Where possible, any snags cut as safety hazards would be left on site rather than salvaged or skidded to landings. Timber sale contract provisions would be used to protect snags.
31. To ensure provision of down woody material, existing down logs and cut cull trees would be left on site following all commercial treatments.

*Soil and Water*

32. Heavy equipment would not enter the water influence zone along perennial or intermittent streams (100 feet on either side of the stream) (Standard 1301 and WCPH management measure 3) except to conduct road work at designated locations. No commercial treatment is proposed in water influence zones. Prescribed fire may occur in water influence zones but would not include direct ignition.
33. To reduce potential for erosion, skid trails would be waterbarred, seeded, and covered with logging slash on soil map units 93 (Lakoa-Butche, 10-60 percent slopes), 98 (Larkson-Lakoa, 10-60 percent slopes), 113 (McCaffery-Larkson, 10-60 percent slopes), and 155 (Rock outcrop-Vanocker). Stands to which this and other soil measures apply can be found in the Snyder Project Implementation Guide, located in the project file.
34. To reduce potential for compaction and/or rutting, the following measure applies on all soil map units: Heavy equipment would be operated for land treatments only when soil moisture is below the plastic limit[4], soil is protected by at least one foot of packed snow, or the top two inches of the soil

[4] Soil moisture exceeds the plastic limit if the soil can be rolled into 3-mm threads without breaking or crumbling (USFS 2006).

are frozen. (WCPH management measure 13/design criteria (b))

35. Ridgetop soils in stands 0103030073, 102, 103, 112, 158, and 164 are made up of gravelly shale. The soil is stable when a pine overstory exists but erodes readily when disturbed and seems to need the pine overstory for establishment of understory vegetation. Sufficient pine crown cover would be retained to provide shade for understory establishment, especially where there is existing ground disturbance.
36. Areas of steep, thin soils in stands 0103020029 and 0103020071 would be excluded from treatment.
37. The primary access to stand 0104020089 is via 832.1N. The northwestern part of the stand is closer to 832.1E, but there is a possible water influence zone between the stand and the road. Heavy equipment should generally not enter the water influence zone, but may in this case if a) it would cause less disturbance than skidding to 832.1N, and b) the site is reviewed in the field with a hydrologist prior to activity.
38. Cable logging systems that lift one end of the log would be used on sustained slopes steeper than 40 percent consistent with WCPH management measure 9/design criteria (g).
39. Roads, landings, skid trails, and other concentrated use sites would be restricted to designated sites consistent with WCPH management measure 12/design criteria (a).
40. On soil map units 92/93 (Lakoa-Butche) and 97/98 (Larkson-Lakoa), which have limited organic material, shelterwood seedcut, group selection, and patch cut treatments would be conducted in accordance with the following measures: a) Conventional harvest systems that retain the slash would be used; or b) If whole tree harvesting is used, fine slash (less than 3 inches in diameter) would be returned to the site in quantities identified in Forest Plan Standard 1102/Guideline(a).
41. Prescribed burns would be conducted to minimize the residence time on the soil while meeting burn objectives in accordance with WCPH management measure 13/design criteria (c).

*Travel Management*

42. While proposed projects are taking place, all gates that would normally be closed during big game hunting seasons would be kept closed during these seasons and one week before the seasons except to allow administrative traffic. Gates would be closed again immediately after the administrative traffic passes. Where feasible considering other limitations, projects would not take place during big game hunting seasons in the Wood Canyon Walk-in Hunting Area.
43. Timber sale units would be laid out to facilitate existing road restrictions (for example, trees around gates and other barriers would be left uncut to maintain obstructions and discourage driving around the gate or barrier).
44. All newly constructed roads would be closed following construction until needed for timber sale or related activities and stored on completion of use.

*Scenery*

45. Layout and marking of timber sale units would comply with forest-wide marking guides in effect at the time of implementation.
46. The north edge of stand 0104010125 is located about a third of a mile from Wyoming Highway 24 and is visible from the road. The northern part the stand is visible from the highway. Treatments should be laid out with irregular (not straight-line) boundaries to look natural from the road.

*Dust Control*

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

*Timber Harvest*

48. Whole-tree yarding would be prohibited in stands 0103060074 and 0103060099 due to lack of landing space.
49. Whole-tree yarding would generally not be used in stands where seedcut, group selection, or patch cuts are proposed due to potentially limited soil organic material and the need to retain slash on site. Specific sites are listed in the project file.

### Monitoring

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

- The district archeologist would monitor known heritage sites eligible or potentially eligible to the National Register of Historic Places before and after project implementation.
- Prescribed fire managers would establish photo points in prescribed burn units to compare pre- and post-treatment conditions and document fire behavior during implementation.
- Fuels staff would evaluate effectiveness of fuel treatments in reducing fuel loading.
- Project managers would monitor revegetation of disturbed and burned areas to determine need for additional measures and noxious weed control.
- Wildlife staff would monitor known and suspected goshawk nests for nesting activity annually or as funding allows.
- Engineering and hydrology/soils specialists would monitor effectiveness of erosion control measures (seeding, water bars, etc.) one and three years following installation as funding allows.
- Hydrology/soils staff would monitor soil compaction at a sample of timber sale landings and harvest units as funding allows.
- Timber sale administrators and hydrology/soils specialists would monitor application and effectiveness of Best Management Practices.
- The district planning team would monitor project implementation following completion of activities.

## Alternative 2

Alternative 2 is based on the proposed action and was developed to respond to the significant issues. It differs from the proposed action by adding oak enhancement, replacing patch cuts with uneven-age management, and replacing actions in goshawk nesting habitat with enhancement of goshawk foraging habitat. Alternative 2 limits prescribed burning to smaller blocks, and most would be preceded by mechanical treatment. Less of the area would be closed to off-road use of motorized vehicles. Alternative 2 is summarized in Table 4 (page 21) and displayed on Maps 3, 12, and 15 in Appendix A. The following actions are proposed.

### Commercial Timber Harvest

Proposed commercial treatments include thinning, shelterwood seedcut, overstory removal, combinations of thinning, seedcut, and overstory removal, shaded fuel break, individual tree selection, group selection, and goshawk forage cut. Silvicultural methods not described below are defined starting on page 7.

*Commercial Thinning:* 297 acres

*Commercial/Products-other-than-Logs Thin:* 163 acres

*Commercial Thin/Shelterwood Seedcut.* 114 acres

*Shelterwood Seedcut:* 337 acres

*Overstory Removal:* 168 acres

*Shelterwood Seedcut/Overstory Removal:* 472 acres

*Overstory Removal/Shelterwood Seedcut:* 1,364 acres

*Shaded Fuel Breaks:* 101 acres

*Interface Thin:* 259 acres

*Sanitation:* Maximum of 250 acres

*Individual Tree Selection.* This uneven-age management prescription would take place on 160 acres. Trees are selected on a tree-by-tree basis in each cutting cycle to create a uniformly stocked stand containing trees of a variety of sizes. Mechanical treatment would be followed by prescribed broadcast burning.

*Group Selection.* This treatment is proposed on 500 acres. Group selection would begin the process of creating uneven-age stand structure. Overstory pine would be cut from a third of the acreage (165 acres) in three- to five-acre patches to create younger forest. The remainder of each stand would be thinned from below. During the next harvest entry (15-20 years in the future), another third of the acreage would be treated with group selections. After the third entry, the stands would have developed uneven-age structure.

*Goshawk Forage Cut.* Stands proposed for this treatment are near goshawk nests but outside known and suitable nesting habitat. Literature indicates that goshawks are likely to use areas such as these when foraging during the nesting season. The goal of the treatment is to reduce overall stand density while leaving trees in clumps up to one-quarter acre in size. Retained trees would include all existing structural stages. The first priority for retention would be existing groups of trees with interlocking crowns. Goshawk forage cuts would take place on 180 acres.

*Yarding Methods.* Cable yarding is likely to be necessary in all or parts of stands 0103030152, 0103030164, 0103050031, 0103050075, 0103060055, 0104020056, 0104020101, 0104030023, and 0104030025.

### Non-commercial Vegetation Management

Precommercial thin, prescribed burn, and aspen enhancement are defined starting on page 9.

*Precommercial Thin:* 1,870 acres

*Prescribed Burn:* 825 acres

*Non-commercial Aspen Enhancement:* 60 acres

*Mulching.* Non-commercial pine and oak fuels would be mechanically mulched on 59 acres.

*Oak Enhancement.* Non-commercial pine would be cut on 111 acres of bur oak stands dominated by brush-form oak to stimulate growth of tree-form oak.

### Other Proposed Actions

These activities are defined starting on page 9.

*Decommissioning*: 14.5 miles of unauthorized roads and 0.4 mile of NFS road

*Area Closures:* In addition to the existing closures in MA 4.1 south of Highway 24 (the Wood Canyon Walk-in Hunting Area) and MA 3.32, Alternative 2 would close the rest of MA 4.1 south of Highway 24 (260 acres) and MA 4.1 north of Highway 24 (1,289 acres) to off-road motorized use. MA 5.4 (5,168

acres) would be closed in winter as required by Forest Plan Standard 5.4-9101. A total of 5,072 acres (39 percent of NFS lands in the project area) would be closed to off-road motorized use year-round, with an additional 40 percent closed in winter (Map 3, Appendix A).

*Fence construction* in Lucky Gulch.

*Easement acquisition:* Stands 0104020004 and 0104020006 would be harvested from NFSR 830.3 if an easement can be acquired across private land in southwest section 32, T54N, R62E.

#### Connected Actions

The following activities would take place to facilitate the proposed actions described above. Descriptions start on page 10.

##### *Transportation System*

*Construction* of approximately 2.5 miles of new road and conversion of 2.1 miles of existing unauthorized roads

*Major reconstruction:* 7.0 miles

*Minor reconstruction:* 37.8 miles

*Maintenance:* 12.3 miles

*Temporary roads:* 1.7 miles

##### *Release and Weed*

Cull trees would be cut following commercial thinning (approximately 1,168 acres).

##### *Treatment of Activity Fuels*

See page 10.

##### *Prescribed Fire Control Line Rehabilitation*

See page 10.

##### *Noxious Weed Control*

Where proposed actions result in spread of noxious weeds, control treatments would be applied as necessary.

#### Design Criteria and Mitigation

Forest Plan Standards and Guidelines, Regional Watershed Conservation Practices (Forest Service Handbook 2509.25), and other management requirements apply to these activities. These requirements are listed in Appendix B and repeated here only if clarification is required. Site-specific design criteria applicable to activities proposed under Alternative 2 are listed starting on page 11 and are described in detail in the Snyder Project Implementation Guide.

#### Monitoring

Proposed monitoring activities are described on page 15. The following additional measure applies to Alternative 2:

- Wildlife staff would monitor effectiveness of oak enhancement.

### Alternative 3

Alternative 3 is also based on the proposed action and was developed to respond to the significant issues.

It differs from the proposed action and Alternative 2 by the substitution of group selection and patch cuts for various even-age silvicultural treatments, particularly in winter range. It lacks a fuel break and goshawk habitat management. There is an overall decrease in treatment acres. Area closed to off-road use of motorized vehicles would be between Alternatives 1 and 2. Alternative 3 is summarized in Table 4 (page 21) and displayed on Maps 4, 13, and 16 in Appendix A. The following actions are proposed.

### Commercial Timber Harvest

Proposed commercial treatments include thinning, overstory removal, seedcut/overstory removal, patch cut, group selection, and interface thin. Silvicultural methods not described below are defined starting on page 7 or page 15.

*Commercial Thinning:* 84 acres

*Commercial/Products-other-than-Logs Thin:* 175 acres

*Shelterwood Seedcut/Overstory Removal:* 100 acres

*Overstory Removal:* 94 acres

*Patch Cut:* 520 acres (156 acres of cutting)

*Sanitation:* Maximum of 250 acres

*Group Selection:* 1,089 acres (359 acres of groups, remainder thinned)

*Interface Thin:* 20 acres

*Yarding Methods.* Cable yarding is likely to be necessary in all or parts of stands 0103030164, 0103050031, 0103050075, 0103060055, 0104020056, 0104020101, and 0104030025.

### Non-commercial Vegetation Management

Precommercial thin, prescribed burn, aspen enhancement, and interface thin are defined on page 9. Mulching and oak enhancement are defined on page 16.

*Precommercial Thinning:* 1,220 acres

*Prescribed Burning:* 894 acres

*Non-commercial Interface Thin:* 18 acres

*Non-commercial Aspen Enhancement:* 40 acres

*Mulching:* 71 acres

*Oak Enhancement:* 111 acres

### Other Proposed Actions

These activities are defined starting on page 9.

*Decommissioning:* 15.2 miles of unauthorized roads and 0.4 mile of NFS road.

*Area Closures:* In addition to the existing closures in MA 4.1 south of Highway 24 (the Wood Canyon Walk-in Hunting Area) and MA 3.32, Alternative 3 would close MAs 4.1 and 5.1 north of Highway 24 (1,954 acres) to off-road motorized use. MA 5.4 (5,168 acres) would be closed in winter as required by Forest Plan Standard 5.4-9101. A total of 5,729 acres (43 percent of NFS lands in the project area) would be closed to off-road motorized use year-round, with an additional 40 percent closed in winter (Map 4, Appendix A).

*Fence construction* in Lucky Gulch.

*Easement acquisition:* Stands 0104020004 and 0104020006 would be harvested from NFSR 830.3 if an easement can be acquired across private land in southwest section 32, T54N, R62E.

## Connected Actions

The following activities would take place to facilitate the proposed actions described above. Descriptions start on page 10.

### *Transportation System*

*Construction* of approximately 1.3 miles of new road and conversion of 1.3 miles of existing unauthorized roads

*Major reconstruction:* 3.2 miles

*Minor reconstruction:* 27.8 miles

*Maintenance:* 12.3 miles

*Temporary roads:* 1.7 miles

### *Release and Weed*

Cull trees would be cut following commercial harvest on 1,009 acres.

### *Treatment of Activity Fuels*

See page 10.

### *Prescribed Fire Control Line Rehabilitation*

See page 10.

### *Noxious Weed Control*

Where proposed actions result in spread of noxious weeds, control treatments would be applied as necessary.

## Design Criteria and Mitigation

Forest Plan Standards and Guidelines, Regional Watershed Conservation Practices (Forest Service Handbook 2509.25), and other management requirements apply to these activities. These requirements are listed in Appendix B and repeated here only if clarification is required. Site-specific design criteria applicable to activities proposed under Alternative 3 are listed starting on page 11 with the following change. Measures are described in detail in the Snyder Project Implementation Guide.

### *Rare Species*

4. Road work proposed in or adjacent to suitable sensitive plant habitat would be coordinated with a botanist. Road work proposed in or adjacent to this habitat includes reconstruction of parts of NFSRs 834.1 and 859.1, and decommissioning of U580047, U580050, U590049, U590050, U590054, U590059, U590062, U590064, and U610004.

## Monitoring

Proposed monitoring activities are described on page 15. The following additional measure applies to Alternative 3:

- Wildlife staff would monitor effectiveness of oak enhancement.

### Treatment Timing

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

Alternatives 1, 2, and 3 would harvest some stands before their maximum potential growth rate has been reached. These harvest treatments are consistent with the exceptions provided in 16 U.S.C. 1604(m2), and include the following: precommercial thinning, commercial thinning, variable density thinning, pine removal from aspen, group selection, individual tree selection, fuel break, wildlife habitat improvement treatments, sanitation, and fuel treatments. These treatments are proposed to meet the Forest Plan multiple-use objectives stated in Chapter 1.

### Stewardship Contracting

Alternatives 1, 2, and 3 may result in opportunities for stewardship contracting, whereby goods are exchanged for services. These activities are a means for Federal agencies to contribute to the development of sustainable rural communities, restore and maintain healthy forest ecosystems, and provide a continuing source of local income and employment.

## Alternatives Considered but Eliminated from Detailed Analysis

The ID team considered the following alternatives but eliminated them from detailed analysis.

**Reduce oak brush competition with pine.** In this part of the Bear Lodge Mountains, bur oak often grows as a dense, shrubby understory in open pine stands, impeding pine regeneration. Commenting parties requested action to reduce oak brush competition with pine. This alternative was not analyzed in detail because stand data show that pine does regenerate in stands with an oak understory (though it may take longer than in other stands). In addition, oak is difficult to effectively control. Burning and cutting encourage sprouting. Cutting in conjuction with herbicide application may be effective but is labor-intensive, and widespread use of herbicide to control a native species is not desirable. Thinning of oak to allow development of larger trees is proposed under Alternatives 2 and 3.

**Locate patch cuts away from roads.** The Wyoming Game and Fish Department (WGFD) suggested that patch cuts be placed away from roads. Patch cuts included in Alternatives 1 and 3 would not be located on main roads, but primitive road access would be required to remove the timber.

**Aspen regeneration to improve wildlife habitat and provide natural fuel breaks.** WGFD also suggested regeneration and enhancement of aspen. Alternatives 1, 2, and 3 include removal of non-commercial pine from aspen. Alternative 1 also includes commercial removal of pine from aspen clones and the area within 66 feet of each clone. This would be expected to result in aspen regeneration and expansion around the edges of the aspen clone. Regeneration of entire aspen clones is not included in any of the alternatives analyzed in detail because current aspen age class distribution is fairly balanced, proposed low-density treatments in pine stands are likely to result in rejuvenation and possibly expansion of some aspen inclusions, and hardwoods are already distributed throughout the project area in areas that could serve as fuel breaks.

**Emphasize reduction of pine in hardwoods, meadows, and riparian areas.** A commenting party suggested an alternative that would remove pine from these habitats. This alternative was not analyzed in detail because removal of pine from aspen is proposed in Alternatives 1, 2, and 3 where opportunities

exist. Other aspen stands were not noted as being substantially encroached by pine. Bur oak stands in the project area are not in danger of being overtaken by pine. Paper birch stands also were not noted as being encroached, and removal of pine from these stands is generally avoided due to moist soils and potential for presence of rare plant species. In addition, recent projects such as the Cub timber sale and North Bearlodge fuel reduction have conducted pine encroachment treatments in aspen stands and meadows. Removal of pine along Beaver Creek and Fawn Creek was considered, but was not included in the proposals due to the difficulty of conducting commercial timber harvest in these locations without unacceptable environmental effects, and the limited effectiveness of strictly non-commercial removal.

## Comparison of Alternatives Analyzed in Detail

**Table 4** displays proposed activities by alternative. **Table 5** displays how these activities would address the purpose of and need for this project, and **Table 6** compares the response of the alternatives to the issues identified in Chapter 1.

Vegetation treatments and other actions are defined on pages 7 through 16.

**Table 4: Comparison of Actions by Alternative**

| | Alternative 0 (No Action) | Alternative 1 | Alternative 2 | Alternative 3 |
|---|---|---|---|---|
| **Commercial Timber Harvest (acres)** | | | | |
| *Commercial Thin* | 0 | 297 | 297 | 84 |
| *Commercial/POL Thin* | 0 | 105 | 163 | 175 |
| *Commercial Thin/Shelterwood Seedcut* | 0 | 114 | 114 | 0 |
| *Fuel Break* | 0 | 85 | 101 | 0 |
| *Goshawk Forage Cut* | 0 | 0 | 180 | 0 |
| *Group Selection (groups)* | 0 | 0 | 165 | 359 |
| *Group Selection (thinning between groups)* | 0 | 0 | 335 | 730 |
| *Individual Tree Selection* | 0 | 0 | 160 | 0 |
| *Interface Thin* | 0 | 170 | 258 | 20 |
| *Overstory Removal* | 0 | 254 | 168 | 94 |
| *Overstory Removal/Shelterwood Seedcut* | 0 | 1,156 | 1,364 | 0 |
| *Patch Cut** | 0 | 24 | 0 | 156 |
| *Patch Cut/Aspen Enhancement** | 0 | 270 | 0 | 0 |
| *Shelterwood Seedcut* | 0 | 301 | 337 | 0 |
| *Shelterwood Seedcut/Overstory Removal* | 0 | 335 | 472 | 100 |
| *Variable Density Thin* | 0 | 146 | 0 | 0 |
| **Total Commercial Timber Harvest** | **0** | **3,256** | **4,113** | **1,719** |
| **Non-Commercial Vegetation Management (acres)** | | | | |
| *Aspen Enhancement* | 0 | 20 | 60 | 40 |
| *Goshawk Nesting Habitat Mgmt* | 0 | 149 | 0 | 0 |
| *Interface Thin* | 0 | 553 | 0 | 18 |
| *Mulch* | 0 | 0 | 59 | 71 |
| *Oak Enhancement* | 0 | 0 | 111 | 111 |

| | Alternative 0 (No Action) | Alternative 1 | Alternative 2 | Alternative 3 |
|---|---|---|---|---|
| *Precommercial Thin* | 0 | 1,611 | 1,870 | 1,220 |
| *Prescribed Burn* | 0 | 4,808 | 825 | 894 |
| **Total Acres Treated**** | **0** | **7,089** | **4,757** | **3,438** |
| **Other Proposed Actions** | | | | |
| *Decommission Unauthorized Roads (miles)* | 0 | 14.5 | 14.5 | 15.2 |
| *Decommission NFS Roads* | 0 | 0.4 | 0.4 | 0.4 |
| *Area Closure, year-round (acres closed to off-road motorized use)* | 3,775 | 10,897 | 5,067 | 5,729 |
| *Area Closure, winter only (acres closed to off-road motorized use)* | 0 | 0 | 5,168 | 5,168 |
| **Connected Actions** | | | | |
| *Road Construction (miles)* | 0 | 3.0 | 2.5 | 1.3 |
| *Conversion of Unauthorized Road* | 0 | 2.1 | 2.1 | 1.3 |
| *Major Road Reconstruction (miles)* | 0 | 7.9 | 7.0 | 3.2 |
| *Minor Road Reconstruction (miles)* | 0 | 35.7 | 37.8 | 27.8 |
| *Road Maintenance (miles)* | 0 | 12.3 | 12.3 | 12.3 |
| *Weed and Release (acres)* | 0 | 832 | 1,168 | 1,009 |
| *Noxious Weed Control* | 0 | As needed | As needed | As needed |

*Treated acres are shown. Total stand acres are greater.
**Total acres treated is less than the sum of individual treatments because some activities overlap.

**Table 5. Response to Purpose and Need by Alternative**

Needs are described starting on page 2.

| Need | Alternative 0 (No Action) | Alternative 1 | Alternative 2 | Alternative 3 |
|---|---|---|---|---|
| Diversify pine forest structure | No immediate change | Generally would increase younger and more open structural stages while decreasing dense, mature forest; no change to late succession | Would increase seedling/ sapling and open, mature forest the most; no change to late succession | Would increase grass/forb the most and decrease dense forest the least; no change to late succession |
| Conserve or enhance northern goshawk habitat | All known and potential nesting habitat would remain intact except in case of fire or beetle infestation; foraging habitat would become more densely forested over time | Enhancement of known nesting habitat by reducing understory (149 acres); potential nesting habitat would decrease by 27%; | Small acreage of mulching and burning in known nesting habitat; potential nesting habitat would decrease by 31%; enhancement of foraging habitat outside nest stands (180 acres); begin development of uneven-age stands (660 acres) | Slightly larger acreage of mulching and burning in known nesting habitat; potential nesting habitat would decrease by 12%; begin development of uneven-age stands (1,089 acres) |
| Conserve or enhance winter range<br>*Changes in MA 5.4* | No immediate change | Year-round closure to off-road use of motorized vehicles; largest increase in aspen | Winter closure to off-road use of motorized vehicles; smallest increase in pine grass/forb, largest increase in pine seedling/sapling forest; begin development of uneven-age stands | Winter closure to off-road use of motorized vehicles; largest increase in pine grass/forb stage; patch cuts for immediate grass/forb instead of starting uneven-age management |
| Conserve or enhance hardwood communities | No immediate change | Removal of non-commercial pine from 20 acres of aspen; 270 acres of patch cuts/aspen enhancement; largest acreage of burning | Removal of non-commercial pine from 60 acres of aspen | Removal of non-commercial pine from 40 acres of aspen |
| Contribute to ASQ<br>*Sawtimber output* | No contribution at this time | 12,313,400 board feet (2,462,680 cubic feet) | 15,200,400 board feet (3,040,080 cubic feet) | 7,540,300 board feet (1,508,060 cubic feet) |
| Reduce wildland fire hazard<br>*Percent of project area NFS acres in each fire hazard class* | Very high: 32%<br>High: 30%<br>Medium: 30%<br>Low: 8% | Very high: 19%<br>High: 26%<br>Medium: 45%<br>Low: 10% | Very high: 23%<br>High: 18%<br>Medium: 50%<br>Low: 9% | Very high: 28%<br>High: 27%<br>Medium: 34%<br>Low: 11% |

| | | | | |
|---|---|---|---|---|
| Reduce mountain pine beetle infestation risk<br>*Percent of project area NFS pine acres in each risk class* | High: 24%<br>Medium: 44%<br>Low: 32% | High: 17%<br>Medium: 38%<br>Low: 45% | High: 17%<br>Medium: 37%<br>Low: 46% | High: 19%<br>Medium: 43%<br>Low: 38% |
| Provide the minimum transportation system | 92 miles of road on NFS lands in the project area (37 miles open) | 79 miles of road on NFS lands in the project area (22 miles open) | 79 miles of road on NFS lands in the project area (22 miles open) | 78 miles of road on NFS lands in the project area (22 miles open) |

**Table 6. Response to Issues by Alternative**

| Issue and Measure | | Alternative 0 (No Action) | Alternative 1 | Alternative 2 | Alternative 3 |
|---|---|---|---|---|---|
| Issue: Treatment of pine stands to produce uneven age structure could enhance stand diversity and habitat value for various wildlife species.<br>*Measure: Acres of uneven-age management proposed* | | 0 acres | 0 acres | 660 acres | 1,089 acres |
| Issue: Closure of more of the area to off-road use of motorized vehicles would limit motorized recreation opportunities.<br>*Measure: Acres closed and open to off-road motorized use* | Open year-round: | 9,561 acres | 2,179 acres | 2,843 acres | 2,179 acres |
| | Open May 15-Dec. 15: | 0 acres | 0 acres | 5,168 acres | 5,168 acres |
| | Closed year-round: | 3,523 acres | 10,905 acres | 5,072 acres | 5,737 acres |
| Issue: Using prescribed fire without first mechanically treating the area could increase the danger of escape or damage to overstory trees.<br>*Measure: Acres of prescribed fire without mechanical treatment* | | 0 acres | 3,072 acres | 381 acres | 543 acres |
| Issue: Bur oak exists in a brushy form in much of the project area. Transition of some of these areas to tree-form oak would benefit various wildlife species.<br>*Measure: Acres of oak treatment* | | 0 acres | 0 acres | 111 acres | 111 acres |

# CHAPTER 3—DIRECT, INDIRECT, AND CUMULATIVE EFFECTS

## Introduction

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

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

The Forest Plan and Phase 2 Amendment FEISs discuss the short and long-term effects, irreversible and irretrievable commitment of resources, and adverse environmental effects associated with implementing management practices in the Black Hills forest environment. The projects and effects described in this EA are the same as those anticipated by the FEISs and are not repeated here. This EA is tiered to the FEISs to avoid repetition and to allow this description to focus on the site-specific effects that would result from implementation of the proposed action and alternatives. Methodologies used for analysis of individual resources that follow in this chapter can be found in their respective specialist reports in the Snyder Forest Management Project Analysis File.

## Past, Present, and Reasonably Foreseeable Future Activities Relevant to the Snyder Project

Various activities have already occurred, are occurring, or will occur in the future within the project area. Past activities contributed to the current condition of resources as described in this chapter. Ongoing and future activities may contribute to effects on resources that would also be affected by the proposed project. The need to include these activities in the cumulative effects section of each individual resource analysis depends on the extent of the cumulative effects analysis area and the duration of effects on each resource. Future activities described in this section are not part of the decision to be made for this EA. Most have already been approved by other decisions or would require separate environmental analysis and public involvement. These activities are described below and displayed on Map 17 in Appendix A.

### *Past Activities*

North Bearlodge Stewardship Project, activities completed 2006-2007:

- Commercial removal of pine from aspen: 40 acres
- Fuel break: 69 acres
- Commercial thinning: 43 acres
- Mechanical fuel reduction: 120 acres

Precommercial thinning completed 2005-2006: 312 acres

Truck Trail Timber Sale, cutting units completed in 2005:

- Fuel break: 100 acres

Cub Timber Sale, cutting units completed in the Snyder project area 1999-2007:

- Commercial thin: 22 acres
- Hardwood restoration: 62 acres
- Meadow restoration: 23 acres

- Pine encroachment: 65 acres
- Shelterwood seedcut: 118 acres
- Overstory removal: 32 acres
- Seedcut/overstory removal: 94 acres
- Seedcut/pine encroachment: 19 acres
- Seedtree cut: 199 acres
- Seedtree/commercial thin: 102 acres
- Seedcut/meadow restoration: 22 acres

Cub Timber Sale, cutting units completed outside the Snyder project area but within one mile of the boundary, 1999-2007: 454 acres

Puma Timber Sale, cutting units completed in 2004:
- Commercial thin: 11 acres
- Seedtree cut: 60 acres

Fires:
- Puma prescribed burn/wildfire (2003): 55 acres in the Snyder project area, 475 acres total

### *Present Activities*

Hemler Timber Sale cutting units within one mile of the project area, to be completed by 2011:
- Shelterwood seedcut, overstory removal, commercial thinning, and hardwood restoration: 445 acres

Planting Timber Sale, cutting units within one mile of the project area, to be completed by 2012:
- Shelterwood seedcut and commercial thinning: 231 acres

North Bearlodge Stewardship Project, to be completed by 2010:
- Prescribed fire: 1,120 acres
- Firewood removal: 53 acres

Stabilization of Wyoming Highway 24 landslide: Approximately 25 acres

Private land in and adjacent to the project area: Used primarily for agriculture, mostly cattle pasture.

The Forest Service is currently analyzing travel management across the National Forest. Analysis is scheduled for completion in 2008. The decision could change management of motorized vehicle access in the project area and across the National Forest.

### *Foreseeable Activities*

Chicago Timber Sale, to be sold in 2008:
- Seedtree cut: 143 acres
- Shelterwood seedcut: 15 acres
- Overstory removal: 9 acres

Cub post-sale activities:
- Noxious weed treatment

Group selection is proposed on 500 acres under Alternative 2 and 1,089 acres under Alternative 3. This treatment would begin the process of creating uneven-age stand structure. A third of the acreage would be regenerated now in small patches. During the next harvest entry (15-20 years in the future), another third of the acreage would be treated with group selections. After the third entry, the stands would have developed uneven-age structure. These future entries would be

subject to separate NEPA analysis.

Fuel breaks proposed under Alternatives 1 and 2 would require periodic maintenance to reduce understory pine and oak. It is estimated that cutting, mulching, or burning would be required every 10-15 years.

## Physical Elements

### Soils

The objective of soil resource management is to improve or maintain long-term soil productivity. Soil productivity is the inherent capacity of a soil to support the growth of specified plants, plant communities, or a sequence of plant communities. In order to improve or maintain long-term soil productivity, soil disturbance should be minimal and adequate measures taken to protect the surface soil, keep the soil in place, reduce compaction, and maintain nutrient and organic matter levels (USFS 1996).

#### Affected Environment

There are 22 soil map units on NFS lands in the Snyder project area. Seven soil map units make up 96 percent of the project area (**Table 7**; Map 5, Appendix A). All other soil map units comprise less than one percent of the project area individually.

**Table 7: Soil Map Units in the Snyder Project Area**

| Soil Name | Description | Percent Slope | Acres in Project Area | Percent of Project Area |
|---|---|---|---|---|
| 44 | Cordeston loam | 1 - 6 | 254 | 2 |
| 92 | Lakoa-Butche complex | 3 - 10 | 184 | 1 |
| 93 | Lakoa-Butche complex | 10 - 60 | 1,040 | 8 |
| 97 | Larkson-Lakoa loam | 3 - 10 | 3,490 | 27 |
| 98 | Larkson-Lakoa loam | 10 - 60 | 5,481 | 42 |
| 155 | Rock outcrop-Vanocker complex | 50 - 75 | 743 | 6 |
| 209 | Work clay loam | 10 - 30 | 1,245 | 10 |

*Soil Health Assessment*

Forest Service crews conducted soil health assessments in 11 stands in the project area in 2006. Most of the stands were on Larkson-Lakoa soil map units. The majority of the stands were selected because they are on soils sensitive to disturbance and represent a worst-case scenario in terms of past disturbance. Most of the stands were harvested under either the Cub Timber Sale (2001-2008) or the Truck Trail Timber Sale (2005). Survey methodology is summarized in USFS 2006a.

**Table 8** summarizes results of the survey. Surveyors reviewed the stands for soil compaction, soil displacement, presence of severely burned or eroded soils, and whether enough effective ground cover exists. Definitions for these variables can be found in the Snyder Project Area Soil Health Monitoring Assessment (USFS 2006a).

**Table 8: Soil Health Assessment Results**

| Stand | Compaction | Soil Displacement | Severely Burned | Eroded | Effective Ground Cover | Land Use History | Overall Rating |
|---|---|---|---|---|---|---|---|
| 0103040051 | FP | FP | FP | FP | Yes | Cub TS | FP |
| 0103040052 | FP | FP | FP | FP | Yes | Cub TS | FP |
| 0103050024 | FP | FP | FP | FP | Yes | Cub TS | FP |
| 0103060011 | FP | FP | FP | FP | Yes | None | FP |
| 0103060019 | FP | FP | FP | FP | Yes | Cub TS | FP |
| 0103060021 | FP | FP | FP | FP | Yes | Cub TS | FP |
| 0104010048 | FP | FP | FP | FP | Yes | Cub TS | FP |
| 0104020005 | FP | FP | FP | FP | Yes | Cub TS | FP |
| 0104020017 | AR | FP | FP | FP | Yes | Truck TS | AR |
| 0104020023 | FP | FP | FP | FP | Yes | Truck TS | FP |
| 0106040047 | FP | FP | FP | FP | Yes | Cub TS | FP |

*FP=Functioning Properly, AR=At Risk*

Ten of the 11 stands were rated as "Functioning Properly". One unit was rated as "At Risk". This rating was due to old skid trails that were compacted with little revegetation. Even though this stand is at risk, level of detrimental soil disturbance remained within the 15 percent limit set by Forest Plan Standard 1103.

### *Soil Erosion*

Natural Resource Conservation Service (NRCS) ratings of soil map units for soil erosion potential are displayed in **Table 9**.

**Table 9: Erosion Potential of Major Soil Map Units in the Snyder Project Area**

| Soil Map Unit | Hazard of Off-road or Off-trail Erosion[1] | Hazard of Erosion on Roads and Trails[2] |
|---|---|---|
| Cordeston loam (1-6% slopes) | Slight | Moderate |
| Lakoa-Butche complex (3-10% slopes) | Slight | Moderate |
| Lakoa-Butche complex (10-60% slopes) | Moderate | Severe |
| Larkson-Lakoa loam (3-10% slopes) | Slight | Moderate |
| Larkson-Lakoa loam (10-60% slopes) | Moderate | Severe |
| Rock Outcrop-Vanocker complex (50-75% slopes) | Very Severe | Severe |
| Work clay loam (10-30% slopes) | Moderate | Severe |

*Source: NRCS Soil Data Mart (2007)*

*1 Soil loss caused by sheet or rill erosion in off-road or off-trail areas where 50 to 75 percent of the surface has been exposed*

*2 Unsurfaced roads and trails*

Erosion potential off of roads and trails is generally slight to moderate except on rock outcrop-Vanocker soils, which make up six percent of the project area.

### *Soil Heating*

NRCS ratings for potential damage to soils by fire show that hazards are generally low to moderate assuming fires of moderate intensity (116-520 BTUs/second/foot). These fires are hot enough to remove the duff layer and consume soil organic matter in the surface layer.

### *Soil Compaction*

Four soil map units (44, 97, 98, 209) in the project area have components that result in greater susceptibility to compaction than other soil map units. These soil map units make up approximately 80 percent of the project area. Forest Plan monitoring of soil compaction has occurred across the National Forest since 1999 (USFS 2007). Though there are a limited number of sites available on which to base conclusions, there is evidence that Black Hills soils can compact when timber harvest occurs on moist or wet soils, and that harvesting when soils are dry can be expected to prevent or limit increases in soil bulk density. There is also evidence that soil bulk density increases can reverse relatively quickly. As described above, surveys in the project area estimated detrimental soil disturbance, including compaction, and found one area with residual compaction above four percent.

### *Nutrient Removal*

Two soil map units (92 and 93) have major soil components that may have an effective rooting depth of less than 15 inches. In both cases, the limitations occur in Butche soils, which commonly have a lithic bedrock restrictive layer at 10-20 inches in depth (NRCS 2007). Soil map units 92 and 93 comprise about nine percent of the project area.

Additionally, two soil map units (97 and 98) have a major component that may have less than two percent organic matter in topsoil. Soil organic matter is about 1.25 percent in Larkson-Lakoa soils in these map units (NRCS 2007). Soil map units 97 and 98 comprise about 69 percent of the project area.

### *Regeneration Hazard*

Soils in the project area have low potential for seedling mortality (NRCS 2007).

### *Mass Movement*

Mass movement (landslides) involves the downslope movement of soil and rock materials. Most landslides involve earth materials with low shear strength, groundwater saturation of materials, an interruption of the slope by natural causes or human activities, or a combination of these (NRCS 2004). Landslides can occur on unstable slopes if roads overload or undercut them, vegetation is removed from them, or runoff is directed onto them. The type and scale of disturbance, soil type and water content, climatic conditions, and design criteria are factors in whether and to what extent soil mass movement may occur.

The Snyder area is mostly located in a belt of tilted sedimentary rocks surrounding the core of the Bear Lodge Mountains. This geology can be unstable, notably where shale or claystone of the Jurassic Sundance and Morrison Formations are overlain by thick sandstone beds of the Sundance Formation or the Lower Cretaceous Inyan Kara Group (Radbruch-Hall et al. 1982). Several of the soil map units found in the project area have potential for mass movement (USFS 1991). At the east end of the project area, a landslide affecting Wyoming Highway 24 is undergoing a long-term stabilization project. A landslide occurred at Cook Lake, just south of the Snyder area, in the mid-1990s. There are no other known instances of recent or ongoing mass movement in the area.

Wyoming Geological Survey landslide data indicate a number of historic areas of mass movement within the project area. Most are in the southwest part of the project area and consist of multiple block slides or flows. On-site slope stability examinations conducted in 2007 on approximately 750 acres in the project area found no indications of recent movement (USFS 2007e). Surveys did locate additional areas of historic or developing instability, and the proposed action and alternatives were subsequently modified to exclude these areas from treatment and road construction (USFS 2007a).

## Direct and Indirect Effects

The discussion of effects on soils addresses erosion, compaction, nutrients, heating, geologic hazards, and regeneration hazards. The Forest Plan provides direction relevant to the Snyder project for soil productivity (Standards 1101 and 1102), slope stability (Standard 1108), soil disturbance (Standards 1103, 1104, 1105, and 1106), reclamation and revegetation (Standards 1109, 1110, and 1111), and surface water runoff (1112, 1113, 1114, 1115, and 1116). Site-specific design criteria are discussed in the direct and indirect effects section below. Additional information and design criteria are provided in the Watershed Conservation Practices Handbook (Appendix B). Effectiveness of WCPs and BMPs is addressed on page 43.

### *Soil Erosion*

Depending on site conditions and extent, varying percentages of erosion can result in a loss of the fertile soil surface layer, thereby contributing to reductions in organic matter and site productivity. This can reduce the ability of native vegetation to be established, and the growth of biomass (trees, forage) can be decreased.

The effect of mechanical forces (surface-disturbing activities) on soil movement are similar to, but may be greater than, natural soil erosion effects. Disturbances can be expected to contribute to the removal of soil surface cover (vegetation and litter) and various depths of upper surface layers of the soil (USFS 2005, page III-448).

Under Alternative 0, no new activities associated with this project would occur to alter existing soil conditions in the project area. Existing soil erosion concerns associated with use of roads would be expected to persist or could potentially increase over time if roads are not effectively closed or decommissioned. Hazard of high-intensity, stand-replacing fire events would generally be expected to increase over time. As has been observed after high-intensity Black Hills fires that have occurred since 2000, extensive areas of soil erosion can occur. This could occur in the Snyder project area in the event of a stand-replacing fire and site productivity would be expected to be altered in those areas where extensive erosion events occur.

All action alternatives propose commercial, non-commercial, and road-related activities that may result in varying amounts of erosion depending on site conditions and activity extent. Generally, the harvesting of timber itself is not a source of soil disturbance (Megahan 1976, in USFS 1996, page III-89). Soil health assessments conducted within the project area in 2006 classified soil erosion in the surveyed units in the zero to seven percent category for all units and photographs taken to supplement the information display that erosion conditions were likely at the lower end of that category range. None of the areas investigated were identified to have severe erosion conditions. Ground cover estimates were documented on soil health assessment and slope stability assessment forms. Most of the areas investigated had ground cover ranging from 85 to 95 percent.

Logging systems and unit design may affect the degree and extent of ground cover alteration, which contributes to the level of soil erosion experienced in harvest units.

Erosion to the level that long-term soil or site productivity may be impaired (described as detrimental erosion) is possible, but this condition was not observed during any of the surveys in the Snyder project area during on-site soil health assessments. Soil map units with soil components or site characteristics with the greatest likelihood of potential for erosion associated with activity disturbance to increase to the level that it may become detrimental include 155 (Rock outcrop-Vanocker complex). This soil map unit comprises six percent of the project area. Under all action alternatives, commercial harvest and precommercial thinning are proposed on this soil complex (summarized in Table 10). The following design criteria, to be implemented under all action alternatives, would be expected to minimize effects associated with erosion on

these soils: (1) Heavy equipment use on areas where Vanocker soils present a severe erosion hazard, such as immediately below rock outcrops in map unit 155, would be avoided consistent with WCPH management measure 9/design criteria (e); and (2) cable logging systems that lift one end of the log would be used on sustained slopes steeper than 40 percent and on moderately to severely burned slopes greater than 30 percent consistent with WCPH management measure 9/design criteria (g).

Road construction, reconstruction, pre-use maintenance, and decommissioning would occur under all action alternatives and would be expected to contribute to varying degrees to erosion of the road itself and erosion of soils located near the road. Erosion occurs on cut and fill slopes, the surface of the road, and the ditch paralleling the road. The amount of erosion is affected by road surfacing, cross-drainage off the road surface, and soil material of the road and cut and fill slopes (USFS 1996, page III-303).

It is estimated that one-third to one-half of road erosion occurs during the first year after construction, dropping quickly to near background levels within 2 to 3 years if continued use is not allowed (EPA 1976, *in* USFS 1996, page III-88). Roads continually used will continue to produce sediment, especially when use is allowed during wet weather (USFS 1996, p. III-88).

Under all action alternatives, road construction, reconstruction, pre-use maintenance, and decommissioning are shown by GIS analysis to cross soil map units that may present a potentially severe erosion hazard associated with on-road/on-trail activities. According to the Engineering Design Guidelines (Analysis File section E005), various measures can be used to protect highly erodible soils or road surface material, such as the placement of aggregate on the roadbed and using culverts; water diversion structures are generally considered for grades steeper than 10 percent, and cut/fill slopes are to be seeded as soon as possible following completion of the road template. These practices would generally be expected to keep erosion on new and reconstructed roads to a minimum in the Snyder project area. These measures, along with implementation of WCPH management measure 11/design criteria (d) (determining maximum cross-drain spacing) would be expected to further reduce concentration of surface runoff on highly erodible soils, thereby limiting erosion at those sites.

Year-round closure of newly constructed roads following harvest activities is included in the design criteria for all action alternatives. Reclamation and revegetation would occur in accordance with Forest Plan Standard 1109/WCPH management measure 12 and Forest Plan Standard 1110. Depending upon the closure and reclamation methods chosen, a short-term increase in erosion may occur immediately after road reclamation due to soil disturbance from recontouring, placement of water drainages, and/or scarification of the road surface. Once drainages are in place and vegetation has become established on road surfaces, erosion from these roads would generally be expected to be eliminated or reduced to background levels.

Road decommissioning may also be expected to result in a short-term increase in erosion due to ground disturbance if practices such as ripping, placement of drainage structures, or recontouring are used. Once drainage features are in place and vegetation becomes established at disturbed locations, erosion of road surfaces would be expected to be reduced or eliminated. This could result in a net reduction in erosion compared to the existing condition for some of the project area roads.

Types of effects would likely be the same under all action alternatives, but would be expected to vary by activity extent and location. **Table 10** compares the amount of timber harvest and roadwork proposed under each alternative on soils rated as having severe or very severe erosion hazard.

**Table 10. Timber Harvest and Roadwork on Soils Rated with Severe or Very Severe Erosion Hazard**

| Activity | Amount | | |
|---|---|---|---|
| | Alternative 1 | Alternative 2 | Alternative 3 |
| **Harvesting (acres)** | | | |
| Commercial | 128 | 155 | 46 |
| Non-commercial | 147 | 47 | 173 |
| **Roadwork (miles)** | | | |
| Construction | 0.8 | 0.8 | 0.5 |
| Conversion | 1.2 | 1.2 | 0.6 |
| Major Reconstruction | 2.2 | 2.2 | 1.9 |
| Minor Reconstruction | 11.1 | 12.8 | 8.9 |
| Decommissioning | 8.0 | 8.0 | 8.6 |

Table 10 displays vegetation management and road work activities proposed on soils with a high erosion hazard regardless of slope. Proposed vegetation management would avoid slopes over 40 percent on rock outcrop-Vanocker soils (see design criteria section, page 14). Slopes of 40 percent or less are generally associated with lower water runoff velocities and increased ease of maintaining or reestablishing ground cover. Application of this design criterion would be expected to keep erosion within levels observed during surveys.

The initial proposed action included road construction on steep slopes on soils with severe erosion hazard. These proposals were dropped after analysis identified the problem.

While hazard of stand-replacing fire would be expected to be lower under the action alternatives as compared to Alternative 0, fires and associated soil erosion may occur under any alternative. The assumption is that fuel reduction treatments would reduce fire intensity and the severity of effects on soils. Therefore, any wildfires that occur following implementation of the action alternatives would be expected to have less potential to cause erosion and negative effects on soils and site productivity than wildfires occurring under conditions that would result if no actions occur.

### *Soil Compaction*

The compaction of soil can increase soil bulk density levels and can reduce large pore spaces within the soil profile, which can lead to impairment of water absorption and root growth at those specific locations. Fine-textured soils (loam soils or those with high levels of clay) can generally compact more than sandy soils. In addition, soils can typically compact more when soil moisture exceeds the plastic limit[5]. Detrimental compaction may occur with a few passes of harvest or activity equipment over moist soils, but may not occur or may take many passes of equipment over soils that are dry (USFS 2006c). To the degree that compaction contributes to vegetation growth reduction, increases in soil erosion and water runoff may occur to varying degrees.

Under Alternative 0, no new activities associated with this project would occur to alter existing conditions of soils within the project area. In the absence of further activities on compacted soil areas, existing levels of bulk density could be expected to decrease over time through various natural processes, such as root development, freeze/thaw cycles, or wildlife activity (e.g., gopher excavation).

[5] Soil moisture exceeds the plastic limit if the soil can be rolled into three-millimeter threads without breaking or crumbling (USFS 2006).

The Forest has conducted soil bulk density sampling periodically since 1998 (USFS 2007). Various Black Hills soils can compact if heavy equipment use occurs when soils are wet or exceed the plastic limit. In order to prevent detrimental soil compaction and remain within Regional soil quality standards (USFS 1992), the following design criteria from the Region 2 WCPH (USFS 2006c) are included in the action alternatives (see Chapter 2) and would be implemented in association with project activities, including post-sale activities:

- Roads, landings, skid trails, and other concentrated use sites would be restricted to designated sites consistent with WCPH management measure 12/design criteria (a); and
- Heavy equipment use for land treatments would be operated only when soil moisture is below the plastic limit or soil is protected by packed snow or frozen soil consistent with WCPH management measure 13/design criteria (b).

All action alternatives propose commercial and non-commercial activities that may result in varying amounts of soil compaction, depending on site conditions and activity extent, due to the weight of vehicles and equipment on the ground. The majority of these activities would take place on soils that were identified in the Soil Inventory Notebook for Crook County (USFS 1991) as having soil map unit components that may be prone to compaction if activities occur during wet conditions. Soil health assessments, which included observation of visible characteristics of compaction and extent within the surveyed units, indicated compaction on zero to three percent of most units, with one unit at four percent and another at 10 percent, primarily associated with old skid trails.

Types of effects would be expected to be similar under all action alternatives but would be expected to vary by activity extent and location. Map 5 in Appendix A shows the location of soil map units 44, 97, 98, and 209, which are identified in the Soil Inventory Notebook as having characteristics that indicate a greater likelihood of becoming compacted in excess of Regional soil quality standards if soil moisture conditions exceed the plastic limit. All action alternatives propose activities on these soil map units. Alternative 3, which proposes the fewest acres of treatment overall, would result in the smallest area with potential to experience detrimental compaction, followed by Alternatives 1 and 2. It is expected that activities proposed under these alternatives may result in varying levels of soil compaction, but increases in bulk densities would not be expected to exceed Regional soil quality standards. Specifically, this conclusion is based on the following assumptions:

1) That the WCPH design criteria specified above for the action alternatives would be applied or implemented as written for all proposed activities that occur on soil map units 44, 97, 98, and 209.
2) That soil health assessments (USFS 2006a) generally identified compacted areas to be zero to three percent at most of the sites visited in 2006 within the project area where mechanized activities had taken place within the last five years, with one site at four percent and one at 10 percent.
3) That soil bulk density sampling completed in June and July 2007 in areas with evidence of past timber harvest (stumps and/or decomposing slash) at two sample locations demonstrated similar soil bulk density levels to undisturbed condition bulk density levels obtained from the Natural Resources Conservation Service. The average soil bulk density for the first site, located on soil map unit 97, was 1.24 gm/cc as compared to the representative value of 1.23 gm/cc acquired from the Natural Resources Conservation Service Web Soil Survey (NRCS 2007). The average bulk density for the second site was 1.26 gm/cc as compared to the representative value of 1.23 gm/cc for the major soil map unit components listed for that area (Larkson-Lakoa loams). The sampling was not conducted in or adjacent to the Snyder area, but was on Bearlodge District and on a soil map unit that occurs in the project area.

4) That Forest-level soil bulk density monitoring (USFS 2007) of pre-harvest and post-harvest conditions provides evidence to support statements made in the WCPH regarding soil compaction during dry conditions. Harvest activities that occurred during dry soil moisture conditions within the Black Hills caused no increase or limited increases in soil bulk densities, and average increases were within those specified in the Regional Soil Quality Standard Handbook (USFS 1992). Effects of proposed activities conducted in accordance with Forest Plan Standards and Guidelines and Watershed Conservation Practices are expected to be similar to effects of activities completed at locations sampled for Forest Plan monitoring, and average changes in soil bulk density would also be expected to be similar to changes documented at those locations.

#### *Soil Nutrients*

Under Alternative 0, nutrient levels may increase over time. Soil nutrients could be impacted in the event of a stand-replacing fire. Such a fire could occur under any alternative, but potential for large fires with severe effects would be expected to be highest under Alternative 0.

Reduction in the level or availability to vegetation of soil nutrients may result from soil erosion, displacement, or compaction, or reduction of soil organic matter. All of these factors could be expected to contribute to lower site productivity by reducing nutrients available for plant growth (USFS 2005). Organic matter and nutrients may be lost when leaves, limbs, litter, and humus, are moved off-site.

Under the action alternatives, loss of organic matter and nutrients would generally be expected to occur where whole-tree yarding is used. Whole-tree yarding is estimated to remove 75 to 85 percent of the activity-generated slash from the stand and put it into mechanical harvester piles, leaving approximately 15 to 25 percent of the slash in the stand. This may be desirable in areas where reduction of fuel loading is necessary to target the reduction of high-intensity fires that may result in severe effects to the soil resource, but it may contradict Forest Plan Guideline 1102a in instances where specific treatments are located on soil map units 92, 93, 97, and 98. In the case of the Snyder project, these treatments include shelterwood seedcut, group selection, and patch cut. In order to comply with Forest Plan Standard 1102 in locations where these soils exist and seedcut, group selection, or patch cut is proposed, the following design criteria would be implemented (see Chapter 2):

- Conventional harvest systems that retain the slash would be used within the specified soil map units; or
- If whole tree harvesting is used, fine slash (less than 3 inches in diameter) would be returned to the site in quantities identified in Forest Plan Standard 1102/Guideline(a).

#### *Soil Heating*

Severe soil heating effects, such as complete consumption of ground cover vegetation, litter, and duff, development of water repellency, extensive soil erosion, decreased soil biological activity, and disturbance of the soil nitrogen pool, could occur in the event of a stand-replacing fire. These effects could occur under any alternative, though the potential for large, stand-replacing fires would be expected to be less under Alternatives 1, 2, and 3 as a result of proposed actions. Altered soil conditions resulting from intense fire may affect long-term productivity of sites (USFS 2005).

To keep soil heating effects to a minimum, prescribed burning proposed under the action alternatives would be conducted to minimize the residence time on the soil while meeting burn objectives in accordance with WCPH management measure 13/design criteria (c).

While Alternative 1 proposes 4,808 acres of prescribed burning, no burning is proposed on soils with high potential for impacts from fires of moderate intensity (116-520 BTUs/second/foot). Fires of this intensity provide the heat necessary to remove the duff layer and consume organic matter in the surface layer. A mosaic of burning conditions would be expected within the project area during a prescribed burn due to differences in factors such as vegetation type, wind speed, soil moisture, and relative humidity. The majority of areas receiving prescribed burns would not be expected to reach 115 BTUs/second/foot. An estimate from the Bald-Carnegie burn conducted on Bearlodge District in 2005 showed burning occurred at the highest level of the prescription approximately 20 percent of the time. Prescribed burning would therefore be expected to contribute to a reduction in the potential for high-intensity wildfires while causing only very limited hydrophobicity (water repellency) and soil erosion. Hydrophobic soil would be expected to break down enough to no longer affect hydrologic processes within five years (USFS 1996) and ground cover vegetation would be expected to recover within three to five years, even in the case of a wildfire (Driscoll et al. 2004, Keyser et al. 2006). Additionally, prescribed burns of low intensity would also be expected to consume some of the fuels, releasing some of the associated nutrients to the soil.

#### *Regeneration Hazard*

Under Alternative 0, no new activities would occur that would be expected to affect regeneration on forested sites.

Ponderosa pine regeneration may be impeded on marginal sites due to seedling mortality, plant competition, and other factors. Activities proposed under Alternatives 1, 2, and 3 would take place on soil map units classified as having as having low potential for seedling mortality. Based on that classification and the Forest Vegetation section in this EA, which states that pine regeneration has occurred and is occurring in the project area, and that there is a need for thinning, seedling mortality is not expected to generally be of concern under any of the action alternatives.

#### *Mass Movement*

Slope stability surveys conducted in 2007 in areas meeting the conditions of Forest Plan Guideline 1108 identified areas of past and potential movement. The proposed action and alternatives were subsequently modified to exclude these areas from treatment and road construction (USFS 2007a). Surveys did not locate any active slides.

Under Alternative 0, no new activities are planned on slopes with characteristics indicative of mass movement potential. Soil mass movement may be expected to continue at existing levels or may increase if high-intensity fire occurs and results in extensive tree mortality on these soils.

Alternatives 1 and 2 propose timber harvest on debris from old slides along NFSR 838, as described on page 8. Both alternatives propose a mix of commercial thin and shelterwood seedcut in these stands, which would be expected to retain sufficient canopy and root systems to reduce the likelihood of further movement (Sidle et al. 1985, NRCS 2004). None of the alternatives propose activities on other identified areas of past or potential mass movement.

None of the action alternatives propose new roads crossing Lakoa or Larkson soils on slopes over 30 percent or on any slopes exceeding 55 percent.

### Cumulative Effects

The cumulative effects area for soils is the project area. This area was selected because direct and indirect effects on soils would be limited to this area. The time span for the cumulative effects analysis of soils is from 1998 to 2018 to take into account recent activities and to allow for completion of all proposed activities.

### *Soil Productivity*

No long-term adverse effects on soil productivity would be expected as a result of implementation of any of the action alternatives due to incorporation of Forest Plan Standards and WCPH design criteria. Elements of soil productivity are discussed below.

**Soil Erosion:** Proposed activities may result in additional limited, site-specific soil erosion and soil displacement. Soil would be moved during road construction under all action alternatives. Proposed road reconstruction and decommissioning have the potential to result in short-term increases in erosion, but design is targeted at reducing existing limited erosion in some locations by stabilizing currently disturbed areas and targeting the establishment of vegetation that would be expected to prevent or limit erosion in the long term. Soil health assessments that were conducted in the Snyder project area in 2006 overlapped the Cub and Truck Trail timber sales. Site information collected in 2006 on the soil health assessment forms for the area identified each of the sites to be in the "seven percent or less" category at each of the observed locations for soil erosion. Ongoing and future projects (such as the North Bearlodge stewardship activities, fuel break maintenance, and future uneven-age entries) that could affect soil erosion levels in the project area are also expected to incorporate design criteria (Forest Plan Standards and WCPH direction) to prevent erosion from becoming detrimental. Through application of site-specific design criteria intended to prevent or minimize soil erosion on soils that would be expected to be more susceptible to detrimental erosion (Chapter 2) WCPs, and other measures, it could be expected that any erosion that occurs would be minimal and within the limits of Forest Plan Standard 1103.

**Soil Compaction:** Soil health assessments conducted within the Snyder project area in 2006 at locations that overlapped the Cub and Truck Trail timber sales indicated that most surveyed sites had zero to three percent soil compaction at the observed locations, except one area at four percent and another at 10 percent; this compaction was located within past skid trails. No additional activities are proposed in the unit that was at 10 percent (stand 0104020017), so no additional incremental effects would be expected to occur in this stand. Based on Forest-level monitoring (USFS 2007), implementation of site-specific design criteria, including operation on dry or frozen ground (Chapter 2), WCPs, and other measures, total soil compaction would be expected to be below five percent in all activity areas, and any increase in levels may be expected to decrease over time depending on various site and climatic conditions. Ongoing and future projects such as the North Bearlodge stewardship project, future uneven-age management entries, and post-sale activities that could compact soil in the project area would be expected to incorporate and implement similar WCPH design criteria to result in no to low levels of compaction that are within those specified in Regional soil quality standards and would not be considered to be detrimental. Because these various project activities would take place over several decades, and Forest-level monitoring (USFS 2007) has documented bulk densities to remain below or return to levels below those defined by Regional soil quality standards as detrimentally compacted, cumulative soil compaction would be expected to be minimal and within the acceptable limits set by Forest Plan Standard 1103.

**Nutrient Removal:** Timber harvest and/or fuel treatments are proposed to occur on soils with an effective rooting depth of less than 15 inches. These sites inherently have limited nutrient availability and water-holding capacity, which is generally visible in the growth of ponderosa pine at those locations and/or evident in site indices. Application of WCPH design criteria described above and in Chapter 2 would retain or return residual slash material in the stands with shallow soils (effective rooting depths of 15 inches or less), with the expectation that soil nutrient levels would generally be maintained or potentially improved. Ongoing and future projects such as the North Bearlodge stewardship project that could affect soil nutrients in the project area would also be expected to incorporate and fully implement design criteria targeted at retaining

on-site material with the expectation that soil nutrient levels would be retained.

**Soil Heating:** Prescribed burning is proposed to reduce fuels to contribute toward the goals of reducing extent of crown fire and difficulty of suppression. Burns are expected to be conducted in accordance with WCPH management measure 13/design criteria (c) to limit the fire residence time at the soil surface. This measure would be expected to generally prevent soil heating to the point that soil could become severely burned as defined in USFS 2006c. Prescribed burning in the area would generally be expected to have beneficial long-term effects by potentially limiting the extent or intensity of future crown fires that may occur within the project area, thereby limiting soil heating that can be associated with high-intensity wildfires. No cumulative effects would be expected under any alternative.

In conclusion, based on the above information presented from project soil health assessments and Forest Plan monitoring, and the fact that similar activities would be implemented under any of the action alternatives for the Snyder project with design criteria to prevent or limit effects, the assumption is that effects would generally be similar to those that have been documented. Therefore, the sum of any land unit within the Snyder project area expected to be left in a severely burned, detrimentally compacted, eroded and displaced condition would be less than 15 percent for the action alternatives if standards and design criteria are applied or implemented as written.

#### *Regeneration Hazards*

Soils within the project area are rated as having low potential for seedling mortality. Problems obtaining sufficient regeneration have not been encountered in the project area (refer to the Forest Vegetation section of this EA). Because this is generally an inherent characteristic of sites, the action alternatives would generally not be expected to influence soils characteristics to the point of altering regeneration of ponderosa pine, and cumulative effects would not be expected to occur.

#### *Mass Movement*

Potential for mass movement events would generally be expected to be limited to rates similar to those typical of the geology in the area. Ongoing and future projects such as the North Bearlodge stewardship project that could influence the likelihood of soil mass movement in the project area would also generally be expected to incorporate similar design criteria. Therefore, adverse cumulative effects are not expected.

## Minerals

### Affected Environment

There are no active locatable or leasable mineral claims in the project area. There is one inactive Forest Service gravel pit on the edge of the project area. Other salable materials include building or landscape rocks. Permits are occasionally granted to members of the public for non-commercial collection of rocks along roadsides in the project area.

### Direct and Indirect Effects

Since there are no locatable or leasable mineral claims within the project area, none of the alternatives would be expected to impact any activities associated with potential mineral exploration. Proposed activities would not prevent mining claims from being located in the future.

### Cumulative Effects

Because the proposed action and alternatives would have no direct or indirect effects on the mineral resource, there would be no cumulative effects.

## Water Resources

### Affected Environment

The project area lies within portions of five seventh-level watersheds and three sixth-level watersheds, listed in **Table 11** and displayed in Map 1, Appendix A. The total watershed area is greater than the project area because portions of the watersheds are located outside of the project area boundaries.

**Table 11. Sixth and Seventh Level Watersheds in the Project Area**

| Forest Plan Watershed # | 6th Level Watershed Hydrologic Unit Code and Name | 7th Level Watershed Hydrologic Unit Code | 7th Level Acres | Percent of 7th Level in Project Area |
|---|---|---|---|---|
| 8101 | 101202010906<br>(Beaver Creek-Lame Jones Creek) | 10120201090603<br>10120201090604 | 8,485<br>8,743 | 99.6<br>85.4 |
| 8102 | 101202010907<br>(Lame Jones Creek) | 10120201090702 | 7,524 | 16.8 |
| 8209 | 101202030406<br>(South Fork Hay Creek) | 10120203040101<br>10120203040102 | 6,776<br>5,013 | 24.5<br>3.2 |

Watershed classes were assigned to sixth-level watersheds during revision of the Forest Plan (USFS 1996). Watershed 8209 is rated as a Class 1 watershed, meaning there is no concern with this watershed, the stream network is in equilibrium, and risks of human-caused deterioration are low. Watershed 8102 is rated as a Class 2 watershed. These watersheds may have streams and soils in disequilibrium. A change in the rate or nature of management activity or minor structural projects should be able to return these watersheds to a Class 1 condition. Watershed 8101 is rated as a Class 3 watershed. Management activities must be done with great care. Management activities can still occur in these watersheds, but watershed improvement projects, or other activities which will improve the health of the watershed, must be a part of project planning.

The Forest Plan revision sixth-level watersheds that overlap the project area include larger acreages outside the project area. Approximately 90 percent of watersheds 8102 and 8209 and 51 percent of watershed 8101 are outside the project area.

#### *Existing Stream Conditions*

Named streams in the project area (all ownerships) are identified in **Table 12**.

**Table 12: Project Area Streams by Watershed**

| Forest Plan Watershed | 7th Level Watersheds | Named Streams | Stream Miles in Project Area |
|---|---|---|---|
| 8101 | 10120201090603<br>10120201090604 | Beaver Creek | 12.7 |
| | | Little Beaver Creek | 6.9 |
| | | Fawn Creek | 3.0 |
| | | Reservoir Gulch | 1.8 |
| | | Wood Canyon | 2.6 |
| | | Lucky Gulch | 2.8 |
| | | Cub Creek | 6.1 |
| 8102 | 10120201090702 | Deer Creek | 1.9 |
| 8209 | 10120203040101<br>10120203040102 | None | |

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

**Streamflow Regime:** Peak flows in the Black Hills result from both rainfall and snowmelt. An examination of annual peak flows by the USGS indicates that rainfall-only peaks account for 90 percent of the peak flows in the Black Hills. Thus, the most significant flood events in the Black Hills are generally associated with high-intensity/high-moisture volume spring and summer thunderstorms. Approximately 50 percent of annual precipitation occurs in April, May, and June.

There are approximately 11.3 miles of perennial streams and 37.2 miles of intermittent streams in the project area. Stream health reconnaissance was conducted during the summer of 2007 on Reservoir Gulch, Lucky Gulch, Little Beaver Creek, Beaver Creek, Fawn Creek, Cub Creek, Wood Canyon, and Deer Creek (USFS 2007b). The survey documented general characteristics of stream reaches on NFS lands as well as riparian composition, presence or absence of water, location of beaver dams and any major resource concerns. Only minor impacts from grazing and past road/culvert placement were documented.

**Water Quality:** Water quality refers to the physical, chemical, and biological composition of a given streamflow and how these components affect beneficial uses. Existing water quality in project area drainages is a result of the natural characteristics of the watersheds along with the past and ongoing management activities on NFS and private lands. Changes in water quality parameters can adversely affect the support of beneficial uses if watershed conservation practices are not implemented.

No streams in the Snyder project area are known to have water quality impairments based on Wyoming's 2006 305(b) State Water Quality Assessment Report and 2006 303(d) List of Waters Requiring TMDLs (WDEQ 2006). These documents are next scheduled for updates in 2008.

**Channel Morphology:** As determined through stream health surveys, channel morphology of perennial streams in the Snyder project area is generally Rosgen channel types E (slightly entrenched, very low width/depth ratio, high sinuosity) and B (moderately entrenched, moderate width/depth ratio, moderate sinuosity) in the headwater areas and channel types E and C (slightly entrenched, moderate to high width/depth ratio, moderate to high sinuosity) in the valley bottoms. Many of the headwater streams have active or relic beaver dams that have created extensive wetland/riparian complexes. Detailed results of stream health surveys are found in section F001 of the Analysis File.

**Floodplains:** Floodplains are defined as "the flat area adjoining a river channel constructed by the river in its present climate and overflowed at times of high discharge" (Dunne and Leopold 1978 *in* USFS 1996). Periodic flooding in this area encourages the growth of riparian vegetation, which in turn slows erosion and traps sediment. Floodplains along Fawn Creek and Cub Creek are somewhat constricted by roads.

**Riparian Ecosystems:** Riparian ecosystems in the project area are primarily associated with perennial drainages. Some intermittent and ephemeral drainage bottoms may also contain plants associated with riparian areas, although likely to a lesser extent. Roads that restrict or alter floodplains commonly reduce or alter riparian vegetation. Cattle have also altered some riparian systems in the project area via trampling and hoofshear.

**Wetlands:** The National Wetlands Inventory (NWI) was used initially to delineate wetlands in the Snyder project area. The NWI identifies 46 wetlands on NFS lands in the project area with a total area of 5.5 acres. These are mostly along Deer Creek, Cub Creek, Fawn Creek and its tributaries, Little Beaver Creek, Reservoir Gulch, and Lucky Gulch. Field reconnaissance confirmed most of these wetlands and identified additional small, isolated wetlands associated primarily with seeps in areas of historic mass movement.

#### *Constructed Watershed Features*

**Road Condition Inventory:** Connected Disturbed Areas (CDAs) are a measure of sediment sources and peak flow conditions (USFS 2006c). CDAs may include bare soil patterns, compacted soils, roads, severely burned areas, or mine spoils. When a disturbed area flows into a water body without sufficient delay from vegetated filter strips or sediment detention structures, it is considered connected to the water body. CDAs contribute sediment to streams or wetlands, causing degradation of physical function and water quality and increased peak flows, which may alter physical channel processes. Most roads that cross streams will create a CDA. Forest Service Handbook 2509.25, Chapter 10 directs the Forest Service to "progress toward zero connected disturbed area as much as feasible" (USFS 2006c).

Of the 16 stream crossing sites visited during surveys in 2006, 75 percent crossed intermittent portions of drainages (USFS 2006b). The remainder crossed perennial streams. Approximately 50 percent appeared to contribute sediment to the drainage network. These include crossings on 832.1B (two locations), 832.1V, 834.1, 859.1, 838.4A, U580047, U590062, U590064, U610025, and U610036. More information on the stream crossing inventory can be found in section F002 of the Analysis File.

**Grazing Improvements:** Water developments exist throughout the project area. Many springs have been developed for livestock watering. Fenced springs are generally protected from trampling and disturbance. Non-fenced springs or those with fences requiring repair remain vulnerable to overuse, particularly during dry years. Fences concentrate cattle into paths, and areas of bare, compacted earth may be found adjacent to fences, stock tanks, and ponds.

### Direct and Indirect Effects

#### *Streamflow Regime*

Under the no action alternative, existing groundcover would not be disturbed by new activities, and small pockets of hydrophobic soils would not occur during prescribed fire. Streamflow would be expected to continue to depend on precipitation variability in the short term. Vegetation growth over time may slightly diminish water yield until a stand-replacing event (fire, etc.) occurs. In the event of a stand-replacing fire, runoff rates may increase due to vegetation loss and development of hydrophobic soils.

Although any disturbance that reduces the density of live vegetation cover will increase runoff from forested watersheds, flow increases generally are not measurable until about 25 percent of the basal area of a forested watershed is cut. Basal area in seventh-level watersheds in the project area would be reduced by substantially less than 25 percent under any of the action alternatives. Reduction of evapotranspiration losses would be expected to occur within the first few years after harvest, but would likely decline over time with vegetation regrowth (USFS 1996) and would not be expected to produce measurable streamflow increases.

**Table 13** displays the percent of each seventh-level watershed proposed for commercial treatment by alternative.

**Table 13. Percent of Seventh-Level Watershed Acreage Proposed for Commercial Treatment**

| Watershed Code | Proposed Commercial Treatment – Percent of 7th-Level Watershed | | | |
|---|---|---|---|---|
| | Alternative 0 | Alternative 1 | Alternative 2 | Alternative 3 |
| 10120201090603 | 0 | 29 | 33 | 18 |
| 10120201090604 | 0 | 8 | 10 | 4 |
| 10120201090702 | 0 | 4 | 5 | 2 |
| 10120203040101 | 0 | 2 | 3 | 1 |

Percent basal area removed during each treatment type varies from about 25 to 40 percent for commercial thinning to 100 percent for patch cuts. Overstory removal cuts most of the remaining overstory trees, but the stand remains fully stocked with seedlings and saplings. Therefore, the actual reduction in basal area due to proposed treatments would be unlikely to approach 25 percent in any watershed.

All action alternatives include prescribed fire. The burn mosaic created by prescribed fire may produce pockets of bare or hydrophobic soil. Based on the low to moderate fire damage hazard ratings assigned to soil map units in areas where prescribed burns are planned, and the minimal amount of time that prescribed burns would be expected to reach 115 BTUs/second/feet, these pockets would be expected to be very limited and would be unlikely to substantially affect streamflow.

### *Water Quality*

Under the no action alternative, no new activities would occur and no new sources of sediment would be created as part of this project. Existing roads would be expected to continue to contribute sediment to the drainage network at CDAs. New roads that may contribute sediment to the drainage network would not be built. Sediment delivery rates from roads in need of decommissioning or reconstruction may persist. Current conditions of dissolved oxygen, sediment, temperature, and water purity would generally be expected to persist, but could change in the event of a stand-replacing wildfire.

Alternatives 1, 2, and 3 include decommissioning of roads. Decommissioning conducted in accordance with Forest Plan Standards and WCPH management measures would be expected to decrease the effects of road-related runoff transported to the drainage network. The degree to which these benefits are realized would depend on the location and initial condition of the road and the specific measures that are implemented. Roads in or along drainage bottoms that would be disconnected from the drainage network through decommissioning are the same for all action alternatives. These include upper 859.1, U580047, U590062, U590064, U610025, and U610036, all of which are located in Forest Plan sixth-level watershed 8101. An additional 10.7 miles of unauthorized roads would be decommissioned in watershed 8101 under all action alternatives. Road reconstruction also provides an opportunity to reduce sedimentation by improving water bars and other drainage structures and by relocating roads that are currently in or closely

paralleling channels (USFS 1996). Reconstruction of NFSRs 832.1B, 832.1V, 838.4A, and part of 859.1 would occur under all action alternatives (except 832.1V under Alternative 3) and would be expected to decrease their impact on the drainage network. These actions, as well as fence construction in Lucky Gulch, would be expected to disconnect disturbed areas, reduce sediment entering the drainage network, and improve watershed condition.

Under all action alternatives, U590039 would be reconstructed and converted to a system road (approximately 0.3 mile). This road is in an ephemeral drainage that is tributary to Cub Creek. Reconstruction of this road in accordance with WCPH management measures 9, 10, and 11, and associated design criteria, would be expected to minimize its impact on Cub Creek. Under all action alternatives, fewer road miles would be constructed than decommissioned.

Timber harvest, other mechanical treatments, and prescribed fire control lines causing soil disturbance or compaction in or near stream channels may affect water quality through sedimentation (USFS 1996). Harvesting within a streamside management zone or vegetation buffer strip could potentially lead to bank destabilization, reduction of large woody material necessary for channel stability, and increased stream temperature (USFS 1996).

None of the alternatives propose commercial timber harvest in water influence zones. Alternatives 2 and 3 propose cutting of non-commercial pine in aspen and oak stands in the Lucky Gulch and Fawn Creek water influence zones, respectively. These would be manual treatments and would not involve heavy equipment. No effects on the water influence zone or water quality would be expected.

Alternative 1 proposes prescribed fire in two large blocks. This area includes water influence zones associated with Deer Creek, Wood Canyon, Cub Creek, Reservoir Gulch, and Planting Spring. Burning this large area would require construction of control lines along the National Forest boundary and across water influence zones. Alternatives 2 and 3 propose prescribed fire on a much smaller area that includes a water influence zone along an intermittent tributary to Fawn Creek. Under Alternatives 2 and 3, control lines would consist primarily of existing roads and would not be placed in the draw bottom. Under all action alternatives, lighting would not occur in water influence zones. With adherence to WCPH management measure 3/design criteria (c) and management measure 6/design criteria (f), proposed burning would be expected to have little effect on water quality. The larger area of prescribed fire proposed by Alternative 1 may increase the chance of pockets of intense fire, which may increase the chance of negative effects. Effects of prescribed fire are discussed further on page 42. Burning would be unlikely to substantially affect sediment transport under any of the action alternatives.

**Best Management Practice Effectiveness:** A Memorandum of Understanding between the Forest Service and the state of Wyoming approves the use of Regional Watershed Conservation Practices to meet the requirements of state Best Management Practices (USFS/WDEQ 2005). The Black Hills National Forest completed a BMP evaluation in 2003 (USFS 2003a). Chapter 4 of the evaluation cites two studies done on the Black Hills National Forest in 2001 by the Black Hills Forest Resource Association and the Wyoming Timber Industry Association. The study concludes, “These results highlight the consistent application and effectiveness of BMPs in the Black Hills and other National Forests.” 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.” This evaluation demonstrates that BMPs are effective.

BMP field audits were conducted in 2004 and 2007 on the Wyoming portion of the Black Hills (including timber sales on state, private, and federal lands). The 2004 audit revealed that the BMP standards for application were met or exceeded on 97 percent of the total rated items (Wyoming Timber Industry Association et al. 2004). Ratings for BMP effectiveness confirmed adequate or improved protection of soil and water resources on 95 percent of the total rated items. This study

showed an increase in effectiveness and application of BMPs over the 2001 study. The 2007 audit showed that BMP standards for application were met or exceeded on 95 percent of the total rated items (Wyoming State Forestry Division 2007). Ratings for BMP effectiveness confirmed adequate or improved protection of soil and water resources on 92 percent of the total rated items. Additionally, Forest Plan monitoring demonstrates that BMPs and WCPs are being implemented and are effective in the timber sale and units that have been inspected. BMPs and WCPs are generally being implemented on road systems and are generally effective, though ruts, rills, and gullies were documented on some roads. More effective road drainage features or hardening (such as gravel application) needed to be incorporated on a number of the roads within the areas monitored (USFS 2007). WCP implementation monitoring is proposed as part of the Snyder project, and findings of areas of concern would trigger application of additional measures.

Forest Plan management requirements and Regional WCPs would be implemented under all action alternatives. This would protect water quality, meeting the requirements of the Clean Water Act.

#### *Channel Morphology*

Under the no action alternative, no activities are planned that would affect stream morphology. Existing roads and road/stream crossings that affect channel morphology would continue to do so until some equilibrium between flow, sediment, channel, form, and disturbance is achieved. In the event of a stand-replacing wildfire, changes in sediment and runoff delivered to stream channels could lead to adjustments in stream morphology.

Under all action alternatives, proposed activities may result in ground disturbance in close proximity to streams or draws as described in the section on water quality. This could result in increased sediment delivery to stream channels. Increased sediment in stream channels can alter channel width, depth, gradient, and the relative balance between pools and riffles, causing channel braiding and the accumulation of fines (USFS 1996). Implementation of WCPs previously described would be expected to minimize transport of sediment to drainages in the Snyder project area under all action alternatives.

Elevated peakflows increase stream energy, which may then be dissipated through bank cutting and bedload movement in areas that were previously stable. Effects of action alternative activities on streamflow within the Snyder project area are described in the section on water quantity. Implementation of WCPs previously described would be expected to minimize streamflow increases delivered to drainages in the Snyder project area.

#### *Riparian Areas, Water Influence Zones, and Wetlands*

The discussion that follows centers on floodplains, riparian areas, and wetlands. The geomorphic floodplain and riparian ecosystem are both components of the water influence zone. The Forest Plan provides direction relevant to the Snyder project for riparian areas, water influence zones, and wetlands (Standards/Guidelines 1301, 1302, 1304, and 1306). Additional information and design criteria are provided in the WCPH (USFS 2006c).

**Floodplains:** Under the no action alternative, no new impacts to floodplains would occur. Roads currently affecting floodplains would continue to do so. The action alternatives propose no commercial harvest or road construction in water influence zones or floodplains. Non-commercial, manual cutting of pine from oak stands is proposed under Alternatives 2 and 3 in part of the Fawn Creek floodplain. NFSR 832, which runs along Fawn Creek, is a county road and would not be changed by this project. Minor reconstruction of the lower part of NFSR 859.1 along Cub Creek as proposed under these alternatives would not alter the road's existing effects on the floodplain. Proposed decommissioning of the upper part of 859.1 along Cub Creek would not include template removal. Function or values of known floodplains would therefore not be

expected to change under any of the action alternatives.

**Riparian Ecosystems and Wetlands:** Riparian ecosystems provide shade, bank stability, fish cover, woody debris, wildlife habitat, migration corridors, sediment storage and release, and surface-ground water interactions. Wetlands control runoff and water quality, recharge ground water, and provide special habitats.

Under the no action alternative, no new impacts to riparian ecosystems, water influence zones, or wetlands would occur due to proposed activities. Existing impacts from roads, grazing, and past harvest may persist.

Proposed actions would be most likely to directly affect riparian and wetland ecosystems if these ecosystems are disturbed by timber harvest or road-related activities (such as stream crossings or placement of fill). Riparian and wetland ecosystems within the project area are associated primarily with perennial drainages, springs, and seeps. No commercial timber harvest, non-commercial vegetation management, road construction, or road improvement is proposed in riparian areas or wetlands under any of these alternatives. Decommissioning of roads adjacent to Cub Creek and associated ponds would be expected to reduce the potential for disturbance and sedimentation of the riparian area and wetlands.

Alternatives 2 and 3 propose prescribed burning in a block that includes a drainage with intermittent beaver ponds. Lighting would not occur in the water influence zone, and equipment associated with the burn would not enter wetlands. Control lines would consist primarily of existing roads and would not be placed in the draw bottom.

Alternative 1 proposes prescribed fire in two much larger blocks. These include riparian areas and wetlands associated with Deer Creek, Wood Canyon, Cub Creek, Reservoir Gulch, and Planting Spring. There are also scattered small wetlands associated with historic areas of mass movement. Burning this large area would require construction of control lines along the National Forest boundary. Lighting would not occur in water influence zones. Fire would not be prevented from entering riparian areas and wetlands, though these areas are less likely to burn due to damp soils and persistent green vegetation. Burn intensities in riparian areas and wetlands would be expected to be low, at most, and the resulting burn mosaic would be expected to improve riparian age class structure and integrity. With adherence to Forest Plan Standard 1301, WCPH management measure 3, and other relevant direction, proposed burning would therefore be expected to have little effect on riparian areas and wetlands. Effects of prescribed fire are discussed further on page 42.

## Cumulative Effects

The cumulative effects are for water resources is the seventh-level watersheds that overlap the project area (Map 1, Appendix A). The total area of these watersheds is 36,540 acres, including 13,038 acres of NFS lands. This area was selected because effects on water would not be expected to be discernable beyond the seventh-level watersheds due to the distance from proposed activities and lack of surface water in much of the project area. The time span for the cumulative effects analysis for water resources is 1997 through 2047 to account for effects of recent, ongoing, and foreseeable projects, including future uneven-age management entries, and revegetation of areas that may be disturbed as a result of this and foreseeable projects.

### *Streamflow*

Proposed activities could affect streamflow as described in the Direct/Indirect Effects section above. Flow increases are not usually measurable until about 25 percent of the basal area of a forested watershed is cut. Cumulatively, the ongoing (Cub, North Bearlodge, and Chicago timber sales), foreseeable (post-sale, future uneven-age management entries), and proposed activities

would not be expected to decrease basal area by this amount in any seventh-level watershed. In addition, past, present, and foreseeable activities would take place over a period of up to 40 years; vegetation regrowth during this time would be expected to further decrease the potential for measurable increases in streamflow.

#### *Water Quality*

No streams in the project area are known to have water quality impairments based on Wyoming's 2006 305(b) State Water Quality Assessment Report and 303(d) List (WDEQ 2006). With application of design criteria described earlier in this section, none of the alternatives would be expected to reduce water quality conditions in the cumulative effects analysis area. Current projects and foreseeable activities that could affect water quality would also be expected to implement appropriate design criteria. Therefore, adverse cumulative effects are not expected.

#### *Channel Morphology*

With application of design criteria included in this EA, sediment and runoff would not be expected to enter stream channels in amounts likely to affect channel morphology. Current projects and foreseeable activities that could affect channel morphology would also be expected to implement appropriate design criteria. Therefore, adverse cumulative effects are not expected.

#### *Floodplains*

No direct/indirect effects on floodplains are expected to occur under any of the action alternatives. Therefore, no cumulative effects are anticipated.

#### *Wetlands, Riparian Areas, and Water Influence Zones*

Activities in the water influence zone would be conducted in accordance with Forest Plan Standard 1301 and WCPH management measure 3. Current projects and foreseeable activities that could affect wetlands, riparian areas, and water influence zones would also be expected to implement appropriate design criteria. Therefore, adverse cumulative effects are not expected.

## Biological Environment

### Botany

The Snyder project area contains a variety of habitats. Most of the area, particularly the ridges and upper slopes, is dominated by ponderosa pine. Mixed conifer-deciduous communities are common. Mixed stands of paper birch (*Betula papyrifera*), quaking aspen (*Populus tremuloides*), and beaked hazelnut (*Corylus cornuta*) are common on north facing slopes. Dry ponderosa pine (*Pinus ponderosa*) stands mixed with bur oak (*Quercus macrocarpa*) occur on the upper slopes and south facing aspects. Ponderosa pine mixed with hardwoods occupies much of the project area. Bur oak stands dominate the project area's western edge. Grass and sedge meadows are occasionally found in draw bottoms, along creeks, and on the western edge of the project area.

Botanical resources in the Snyder project area were surveyed in 2006. The project area contains habitat considered suitable to support several Region 2 sensitive plant species. Some is considered high-quality habitat for sensitive plant species and consists of stands of birch, mixed birch/aspen, and some riparian habitats. These sites often have a dense canopy cover and/or more moisture than average. They usually support a diversity of understory species, including mosses and lichens.

Based on current information and professional judgment, species with habitat preferences differing from habitat types present in the Snyder project area are not analyzed in this document. Details are available in the Snyder Project Botany Biological Evaluation (Analysis File section E001).

#### Endangered, Threatened, or Sensitive Species

##### *Federally Listed Plant Species*

A list of Federally endangered, threatened, proposed, and candidate species has been provided by Brian T. Kelly of the U.S. Fish and Wildlife Service (USFWS), Wyoming State Office, and last updated on August 8, 2007. No federally endangered, threatened, or proposed plant species occur on the Black Hills National Forest.

##### *Region 2 Sensitive Plant Species*

All Region 2 sensitive plant species and other target plant species occurring on the Black Hills National Forest were considered in this evaluation. Suitable habitat, defined as habitat that meets the requirements of a species, exists in the Snyder project area for several Region 2 sensitive plant species known to occur in the Black Hills. Different species may have different requirements and not all requirements are fully understood. Habitat may exhibit varying degrees of quality and can be suitable but unoccupied.

Based on current information and professional judgment, species with habitat preferences differing from habitat types present in the Snyder project area were not analyzed in this document. **Table 14** summarizes Region 2 sensitive plant species known to occur in the project area and those having suitable or possibly suitable habitat but no known occurrences in the project area. The Snyder Project Botany Biological Evaluation includes information on species not analyzed because their habitat preferences differ from habitats present in the project area.

**Table 14: Region 2 Sensitive Plant Species Known to Occur or with Potential to Occur in the Project Area**

| Species | Black Hills Distribution and Habitat | Known To Occur in Project Area? | Analyzed in This Document? |
|---|---|---|---|
| Prairie moonwort, aka Iowa moonwort *(Botrychium campestre)* | Prairie moonwort is extremely inconspicuous. Rangewide, it is considered a grassland species associated with sandy habitats in prairies, dunes, railroad sidings, and fields over limestone. In the Black Hills, there are currently 5 confirmed sites on NFS lands. Additional sites exist on private lands and at Wind Cave National Park. Black Hills sites are found on limestone in open grassland habitats usually with high forb diversity and often with a high percentage of bare and rocky soils. Little bluestem (*Schizachyrium scoparium*) and western snowberry (*Symphoricarpos occidentalis*) occur at the majority of sites. | No | Yes |
| Narrowleaf grapefern, aka slender moonwort *(Botrychium lineare)* | Four occurrences are confirmed on BHNF lands and are located on the Bearlodge and the Hell Canyon Ranger Districts. All sites occur in open conditions on limestone substrate. Two sites are located on old (estimated 15-25 years) native-surface roadbeds. A third site is located adjacent to a gravel roadbed in open grassland. The fourth site, located on a large north-facing hillside, is not associated with any road development. Elsewhere in its range, this species has often been documented in areas of road disturbances and other human and natural disturbances. | No | Yes |
| Leathery grapefern *(Botrychium multifidum)* | Currently, on the Black Hills, the majority of known occurrences are in mesic sites next to riparian areas dominated by spruce (*Picea glauca*) or mixed spruce-pine (*Pinus ponderosa*) along small, perennial streams in more or less open areas, and in or near old stream channels without permanent water but where occasional flooding events may cause scouring. Currently known populations are located a few meters from stream channels along Iron Creek, Nelson Creek, and Lost Cabin Creek, all in the Norbeck Wildlife Preserve or the Black Elk Wilderness. One exception is a single site in the Bear Lodge Mountains in a steep narrow drainage with birch/hazelnut community on sandstone. Plants are found on moss-covered sandstone boulders and streambank berms near occasional pools of water. In general, plants in the Black Hills are associated with mossy mats, frequently with the moss *Climacium.* Individuals of leathery grapefern have been found in duff under spruce, in grassy margins along streams, on sand/gravel bars along streams, and in mesic soils near hiking trails. Currently known to occur at elevations ranging from 4,620 to 6,400 feet. | Yes | Yes |
| Foxtail sedge *(Carex alopecoidea)* | In the Black Hills, foxtail sedge is currently known from two general areas: The Cement Ridge area along the South Dakota–Wyoming border, and in the Bear Lodge Mountains in Wyoming. Foxtail sedge has been found along open, perennial streams, often with old beaver dams or ponds. Documented occurrences are primarily in the transitional areas between saturated soils and the more mesic upland areas. Currently known elevation range is 3,840-5,900 feet. | Yes | Yes |
| Yellow lady's slipper *(Cypripedium parviflorum)* | Habitat in the Black Hills includes stream banks under both spruce and deciduous overstories, moist cliffs (usually north-facing), and moist areas/seeps under spruce or mixed conifer forest. Occasionally found higher on mesic forest slopes. Currently known to occur from 3,500 to 6,500 feet. | No | Yes |
| Large round-leaf orchid *(Platanthera orbiculata)* | Found on shady, north-facing slopes in paper birch/hardwood stands, and occasionally in conifer forests on damp, rich humus soil. Currently known elevation range is 4,350-6,150 feet. | Yes | Yes |
| Highbush cranberry *(Viburnum opulus* var. *americanum)* | Occasional at mid-elevations in wet, shaded habitats along streams, springs and canyon bottoms. The large majority of documented occurrences are in drainage bottoms or lower parts of slopes with dry-mesic to moist soil conditions with partial shading. Known sites are primarily associated with paper birch /ironwood (*Ostrya virginiana*) and birch/hazelnut (*Corylus cornuta*), with or without spruce or aspen (*Populus tremuloides*). A few sites are in pine/bur oak (*Quercus macrocarpa*). Paper birch is present at almost all known sites. Elevation range is 3,800-5,700 feet. | No | Yes |

Species are grouped into appropriate habitat categories for analysis. Table 15 displays habitat category for each of the analyzed species.

**Table 15: R2 Sensitive Plant Species and Habitat Category**

| Species | Habitat Category for Analysis |
|---|---|
| Leathery grapefern *(Botrychium multifidum)* | Moist forest/riparian meadow |
| Fox-tail sedge *(Carex alopecoidea)* | Riparian meadow |
| Large round-leaved orchid *(Platanthera orbiculata)* | Moist forest |
| Yellow lady's slipper *(Cypripedium parviflorum)* | Moist forest/riparian meadow |
| Highbush cranberry *(Viburnum opulus* var. *americanum)* | Moist forest/riparian meadow |
| Prairie moonwort *(Botrychium campestre)* | * |
| Narrowleaf grapefern *(Botrychium lineare)* | * |

*These species are analyzed separately.

*Region 2 Sensitive Plant Species Known to Occur in Project Area*

### Leathery Grapefern *(Botrychium multifidum)*

Leathery grapefern is currently assigned a rank of S2 (imperiled) in Wyoming and S1 (critically imperiled) in South Dakota. Global ranking is G5, indicating that the species is considered to be secure across its range (NatureServe 2007).

**Species Distribution:** Leathery grapefern is nearly circumboreal in distribution, being found across North America, Europe, and northwest Asia. This species has been documented at one site in the Snyder project area.

**Habitat:** In the Black Hills, leathery grapefern generally occurs in mesic sites next to riparian areas dominated by white spruce or mixed spruce-pine along small, perennial streams in more or less open areas, and in or near dry stream channels that may receive scouring disturbance by occasional flooding events. The site in the Snyder project area is the only known site in the Bear Lodge Mountains. Black Hills sites are in the Norbeck Wildlife Preserve and Black Elk Wilderness. The Snyder site is located in a steep, narrow drainage with a birch/hazelnut plant community. Plants are found on moss-covered sandstone boulders and streambank berms near occasional pools of water. In the Black Hills, this species is associated with mossy mats, frequently with the moss *Climacium*. Individuals of leathery grapefern have been found in duff under spruce, in grassy margins along streams, on sand/gravel bars along streams, and in mesic soils near hiking trails. The known elevation range in the Black Hills is 4,620-6,400 feet (USFS 2005a, 2007c).

### Foxtail Sedge *(Carex alopecoidea)*

Foxtail sedge is currently assigned a rank of S2 (imperiled) in Wyoming and South Dakota. Global ranking is G5, indicating that the species is considered to be secure across its range (NatureServe 2007).

**Species Distribution:** Foxtail sedge is widely distributed from eastern to central Canada, the northeastern United States, the Great Lakes region south to Tennessee, and west to North Dakota and the Black Hills (USFS 2005a). There are 29 documented sites on the Black Hills National Forest (USFS 2005a). This species has been documented at one site in the Snyder project area.

**Habitat:** The majority of Black Hills occurrences are along the upper headwaters of low-gradient perennial streams, often associated with old beaver dams and ponds where flooding and disturbance have created wet to moist meadow conditions. Black Hills foxtail sedge sites are usually open, with little to no canopy cover, and are located at elevations between 3,840 and

6,400 feet. Occasionally a few individuals extend into areas scattered with willows, hawthorn, hazelnut, or spruce. In the Black Hills, foxtail sedge occurs primarily in the transitional areas between saturated soils and adjacent mesic uplands, and individuals are often found on the downstream side of old beaver dams. Individuals at the lowest known elevation site in the Black Hills grow within the saturated riparian zone (USFS 2005a, 2007c).

### Large Round-leaved Orchid *(Platanthera orbiculata)*

Large round-leaved orchid is currently assigned a rank of S1 (critically imperiled because of extreme rarity) in Wyoming. Global ranking is G5, indicating that the species is considered to be secure across its range (NatureServe 2007).

**Species Distribution:** Large round-leaved orchid is endemic to the boreal regions of northern North America from Newfoundland to southern Alaska, with a more southern distribution in the eastern United States into the Appalachians and Great Lakes. Large round-leaved orchid exists as sparse, intermittent occurrences throughout its range. In the Black Hills, occurrences are disjunct and found in remnant boreal/hardwood forest in the Bear Lodge Mountains, the northwestern limestone plateau, and Black Elk Wilderness. Although most occurrences are small and sparsely distributed, the species is more abundant and widely distributed on the Forest than was previously believed (USFS 2005a). This species has been documented at two sites in the Snyder project area.

**Habitat:** In the Black Hills, scattered occurrences of large round-leaved orchid are located on sheltered, north-facing, forested slopes in damp, humus-rich soil at elevations from 4,300 to 6,000 feet (Hornbeck et al. 2003a). This is a facultative species (NRCS 2007a) often associated with dense understory vegetation in mid-to-late successional paper birch/beaked hazelnut forest, often with an overstory component of white spruce. Habitat for large round-leaved orchid in the Black Hills is characterized by a dense to partially open canopy with filtered light, dense understory vegetation, and damp, humic soil with a thick litter layer. A few scattered individuals occupy ridgetops in more open and substantially drier conditions, but these appear to be extensions of large concentrations in adjacent, more mesic site.

## Direct and Indirect Effects on R2 Sensitive Plant Species Known to Occur in the Project Area

The no action alternative would have no direct effects on known occurrences of leathery grapefern, foxtail sedge, or large round-leaved orchid. These occurrences could be affected by natural succession and ongoing motorized vehicle use. Natural succession could lead, over time, to denser stands with a more closed canopy. Pine canopy may increase in meadows and aspen stands. These effects could be reversed by wildfire.

As pine stands become denser, resources (water, nutrients, and light) available to each individual decreases. Individuals subjected to such environmental stress become more susceptible to a variety of pathogens. Additional fuels that could result may increase fire residence time and the damaging effects on soils and understory vegetation. The level of indirect effects from fire would be expected to vary depending on fire timing and intensity, and the sensitivity of the individual species to fire. While fire is detrimental to some species (particularly those that inhabit interior forest habitats with a closed canopy), fire suppression is detrimental to plants that inhabit forest openings. No single successional path, fire regime, or disturbance regime is advantageous to all species.

Under Alternative 1, variable density thinning would take place about 120 feet from the leathery grapefern occurrence. The proposed treatment would remain outside the moist habitat associated with the occurrence. No plants were found within the proposed treatment area. Leathery grapefern does not occur near any proposed road construction or reconstruction. Therefore, no

direct effects to leathery grapefern are expected as a result of implementation of Alternative 1.

Also under Alternative 1, prescribed burning is proposed in the stand containing the foxtail sedge occurrence. The habitat at this occurrence is riparian (USFS 2006) with a paper birch/bur oak component. Little information is available to determine the degree of threat posed by natural or prescribed fire to foxtail sedge (Moore et al. 2006). Since this occurrence is located in a wetland area with minimal tree and shrub cover, there appears to be only a slight chance that a natural or prescribed fire would directly impact the occurrence or its habitat. Wetland habitat itself provides some degree of fire protection for the roots and rhizomes of wetland plants. Wetland habitats may, however, burn during drought when water levels are low. Rhizomatous species (such as foxtail sedge) that do not depend solely on reproduction from seed often recover more quickly from fire. Design criteria prohibit construction of fire control lines and direct lighting in sensitive plant habitat. The proposed treatment calls for low to moderate intensity fire, and the nature of the riparian habitat would likely minimize risk of loss of individuals to fire.

Under all action alternatives, road decommissioning is proposed about 100 feet from the occurrence, and commercial timber harvest would take place in the stand across the road from the occurrence. These actions would not be expected to affect the foxtail sedge site. Decommissioning of this road would not include removal of the template, and would not be expected to negatively affect the sedge site. The stand across the road would be harvested using cable yarding to haul the logs to the top of the slope, away from the drainage bottom. All activities associated with the proposed treatment would remain on the same side of the road as the treated stand. Therefore, no direct effects to foxtail sedge are expected as a result of these activities.

Stands proposed for commercial timber harvest are about 160 feet from each of the two large round-leaved orchid occurrences. At one site, treatment is proposed on a plateau above the steep drainage in which the orchid and its habitat are found, and access to the stand is from the plateau, so there would be no reason for activities associated with the harvest to enter the sensitive plant habitat. At the other site, cable yarding would be used to remove logs from the stand similar to the area discussed above. Proposed treatments would remain outside the moist habitat associated with the occurrences. Therefore, no effects on the large round-leaved orchid occurrences would be expected.

Disturbance adjacent to sensitive plant habitat could result in colonization by invasive species. Invasive species negatively affect sensitive plant habitats, though different habitats may be invaded by different invasive plant species or noxious weeds. Once established, these species indirectly affect sensitive plants through allelopathy[6], changing the fire regime, or direct competition for nutrients, light, and water. Subsequent weed control efforts could also negatively impact sensitive plants. Adherence to Forest Plan Standards and Guidelines regarding noxious weeds would be expected to minimize the potential of colonization by invasive species and lessen the risk of impacts to known sensitive plant occurrences.

Fuel treatments proposed under all action alternatives may benefit known sensitive plan occurrences. Reducing fuels through timber harvest, prescribed burning, and non-commercial treatments may decrease risk of large, high-intensity wildfires. Prescribed burning in upland conifer stands may also decrease the likelihood of crown fires reaching sensitive plant locations (USFS 2005a).

Construction of a fence to protect riparian habitat in Lucky Gulch, proposed under all action alternatives, would be expected to reduce effects of livestock grazing on potential sensitive plant habitat.

[6] Production and release of compounds that inhibit the growth of other plants.

Known sensitive plant occurrences are in locations that appear to have little off-road motorized vehicle use. Proposed area closures would therefore be unlikely to affect these occurrences.

**Cumulative Effects on R2 Sensitive Plant Species Known to Occur in the Project Area**

The cumulative effects area for the three sensitive plant species known to occur in the Snyder project area is suitable habitat as described starting on page 49, and includes moist forested and riparian meadow habitats. Moist forested communities are dominated by paper birch and have moist soil conditions and relatively closed canopies. Most of these communities include an understory component of beaked hazelnut and are often found at riparian zones, springs, and seeps. Past, present, and foreseeable actions contributing to cumulative effects are described starting on page 26.

Soil disturbance, introduction of invasive species, and changes in microsite moisture and hydrologic regimes can negatively affect sensitive plant species and their habitats. Moist forested and riparian areas in the Black Hills have been changed by historical management practices such as livestock grazing, road construction, fire suppression, recreation, mining, water diversion, and near-extirpation of beaver. These activities decreased suitability of many of these habitats for sensitive plant species.

Continued fire suppression without vegetation treatment would be expected to add to the effects of past fire suppression (higher fuel loading and increased fire hazard). This may increase the wildfire susceptibility of stands adjacent to sensitive plant habitat. These conditions could increase effects of wildfire on sensitive plant occurrences and their habitat, which would otherwise be expected to act as a fuel break. Alternative 0 would add to the effects of fire suppression by allowing pine stand density to continue to increase. Fire suppression would continue under all action alternatives, but proposed treatments would act against the effects of this practice by reducing fuel loading and decreasing fire hazard. This would be expected to decrease the wildfire susceptibility of stands adjacent to sensitive plant habitat, reducing effects of wildfire on plant habitat and allowing it to act as a fuel break.

Livestock grazing may have affected riparian meadow habitats through trampling or removal of riparian vegetation, soil compaction, and reduced streambank stability. No activities are proposed in riparian meadows except prescribed burning under Alternative 1. Construction of control lines and lighting would not take place in this habitat; therefore, none of the alternatives would be expected add to these effects.

Mechanized treatments, prescribed fire, and road construction and improvement proposed under the action alternatives may add to effects of past, present, and foreseeable activities on moist forest communities by increasing the potential for noxious weed infestation. Risk of this and other cumulative effects would be expected to be reduced by exclusion of most activities from suitable habitat. Risk would be expected to be highest under Alternative 1 due to the larger area of overlap between suitable habitat and prescribed burning, and the use of mechanical treatment in one area of suitable habitat.

**Determination – R2 Sensitive Plant Species Known to Occur in the Project Area**

For Alternative 0, the determination of “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” for leathery grapefern, foxtail sedge, and large round-leaved orchid is based on the following rationale:

- No new management activities would take place.
- Continuing succession might result in less suitable habitat for leathery grapefern and foxtail sedge.
- The risk of severe wildfire effects may be greater as a result of increased fuel loading.

For Alternatives 1, 2, and 3, the determination of "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" for leathery grapefern, foxtail sedge, and large round-leaved orchid is based on the following rationale:

- Although site-specific botanical surveys were conducted in the project area, it is possible that individuals or populations of these sensitive species went undetected.
- These alternatives may indirectly affect individuals outside areas where management activities are proposed.

#### *Region 2 Sensitive Plant Species with Suitable Habitat but No Known Occurrences in Project Area*

This section discusses the four R2 sensitive plant species with suitable habitat but no known occurrences according to their preferred habitat. Yellow lady's slipper and highbush cranberry are discussed together due to their similar habitat preferences.

**Yellow Lady's Slipper and Highbush Cranberry**

Yellow lady's slipper *(Cypripedium parviflorum)* and highbush cranberry *(Viburnum opulus* var. *americanum)* are associated with moist forested areas and riparian meadow communities, similar to the three species discussed above.

**Direct and Indirect Effects on Habitat Suitable for Yellow Lady's Slipper and Highbush Cranberry**

Under the no action alternative, effects on habitat for these species would be similar to those discussed above for sensitive plant species known to occur in the project area. In addition, motorized recreation could damage sensitive plant habitat or introduce noxious weeds.

Alternative 1 proposes approximately 288 acres of prescribed burning in suitable sensitive plant habitat. Prescribed fire may result in direct impacts, including crushing or burning, on habitat or individual sensitive plants (if any occur). Light ground disturbance is likely to occur in burn units due to fire and workers entering the area. Construction of fire control lines, which would take place mainly on the National Forest boundary, would occur adjacent to one area of suitable habitat. Prescribed fire operations could also affect moist forest/riparian meadow communities by facilitating increased noxious weed invasion and changes in vegetation structure. These potential effects result from removal of vegetation and opening the area to additional light. The level of indirect effects from fire would be expected to vary depending on the timing and intensity of burning. Alternative 1 has the greatest potential to affect moist forest/riparian meadow habitats due to 1) the larger area of overlap between prescribed fire and these habitats and 2) the overall larger area to be burned. Burning larger blocks as proposed under this alternative would be expected to increase efficiency and reduce costs, but may result in more pockets of high-intensity fire as compared to burns proposed under Alternatives 2 and 3. As a result, there is potential for burning of moist forest/riparian meadow communities at higher intensity. This may be more likely to impact individual plants and the seedbank.

Conversely, proposed burning may reduce the risk of high-intensity wildfire and thus positively affect suitable habitat for these species by reducing the potential for stand-replacing events. Uncharacteristically intense fires could negatively affect suitable habitat and sensitive plant species by reducing canopy cover, burning duff and organic soil layers, and allowing noxious weed infestations to expand. Large and small-scale disturbances such as fire are important in the development of a shifting mosaic of successional stages and vegetation structures (Lesher and Henderson 1998). Fire therefore may have the beneficial effect of increasing the extent of some suitable habitats by reducing competition from woody shrubs or encroaching pine in riparian

meadow habitat.

Alternative 1 also proposes 18 acres of goshawk nesting habitat management in suitable sensitive plant habitat. Due to steep slopes in part of the stand, treatment would consist of a mix of mechanical and manual operation. Manual treatment would be expected to cause minimal ground disturbance but could result in trampling of plants and reduction of shade. Mechanical treatment could also cause include trampling or flattening of habitat and individual plants. Furthermore, if mechanical treatment takes place when ground is not frozen, ground disturbance may occur; this could facilitate infestation by noxious weeds.

Alternatives 2 and 3 propose 22 acres of non-commercial oak enhancement in moist forest/riparian meadow communities. Effects would be expected to be the same as those described above for manual non-commercial treatment. Alternative 2 also proposes four acres of prescribed burning in this habitat. Design criteria prohibit construction of fire control lines and direct lighting in sensitive plant habitat. Due to the location of the habitat (adjacent to a road on the edge of the proposed burn area), burn intensity would be expected to be low. Effects would be expected to be similar in type but less intense than those of burning proposed under Alternative 1.

A beneficial indirect effect of proposed activities would be a reduction in the fire hazard through mechanical treatments and prescribed fire. Ecotones between suitable plant habitat and pine stands (as well as the adjacent pine stands themselves) may have a strong influence on the health of suitable plant habitat, particularly relative to fuel loads and crown fire hazard. Heavy fuel loading may contribute to widespread, high-severity wildfires that could negatively affect moist forested communities and riparian communities which, under other conditions, would be expected to act as fuel breaks. Reducing fuels in the project area via mechanical treatments and prescribed burns could, in the case of a wildfire, cause crown fires to drop to the ground before reaching suitable sensitive plant habitat. This would reduce the likelihood of severe impacts on moist forest communities. Prescribed burning and selective thinning of adjacent conifer stands could maintain a mosaic of seral stages, increase available moisture, and decrease the potential for widespread crown fires (Hornbeck et al. 2003). Resulting patches of paper birch and other moist communities may act as natural fuel breaks. As a forest type, paper birch stands are one of the least flammable. These stands typically have a canopy with high moisture content and a lush understory. Crown fires in coniferous stands often stop at the boundary of large paper birch stands or become slow-moving ground fires (Uchytil 1991).

Under all action alternatives, a possible negative indirect effect would be the spread and/or creation of new weed infestations resulting from ground disturbance associated with mechanical and fire treatments. Noxious weeds may out-compete desired plant species, and herbicides used to help control weeds can have negative effects on desirable plants. Adherence to Forest Plan standards and guidelines and the Black Hills National Forest Noxious Weed Management Plan would be expected to help reduce indirect effects on habitat due to the spread of weeds.

Proposed road construction would not occur in or adjacent to suitable habitat under any alternative. Alternative 1 includes reconstruction of NFSRs 832.1V and 859.1, parts of which overlap suitable habitat. Alternative 2 includes reconstruction of these roads plus NFSR 834.1, while Alternative 3 would reconstruct 834.1 and 859.1. Roads act as corridors for the dispersal for invasive weeds, which are one of the greatest risks to sensitive plant species. This is true particularly for sensitive plants found in riparian areas and wetlands due to the concentration of a variety of management activities and uses that occur in these habitats (USFS 1999). Proposed road reconstruction in suitable habitat could facilitate weed infestation. Adherence to Forest Plan Standards and Guidelines and the Black Hills National Forest Noxious Weed Management Plan would help reduce indirect effects on habitat due to the spread of weeds.

A beneficial indirect effect of Alternatives 1, 2, and 3 would be expected to result from area closures and decommissioning of roads. Reducing disturbance caused by motorized travel in these areas has the potential to improve plant habitat by allowing vegetation to reestablish and by increasing shade and moisture levels as a result of increased canopy cover. Decommissioning roads would have a beneficial effect on all plant communities and "eventually, obliterated roads would be expected to function like undisturbed areas" (USFS 1996). Alternative 1 proposes the largest area closure and would be expected to reduce effects on suitable habitat to the greatest degree, followed by Alternatives 3 and 2.

**Cumulative Effects on Habitat Suitable for Yellow Lady's Slipper and Highbush Cranberry**

Habitat suitable for these species (moist forest and riparian meadow communities) is the same as habitat suitable for R2 sensitive plant species known to occur in the project area. Cumulative effects on this habitat are discussed starting on page 52.

**Determination – Yellow Lady's Slipper and Highbush Cranberry**

For Alternative 0, the determination of "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" for *Cypripedium parviflorum* and *Viburnum opulus* var. *americanum* is based on the following:

- No new management activities would take place.
- Moist forest and riparian meadow habitat may be impacted by unrestricted motorized off-road vehicle travel.
- The risk of severe wildfire effects may be greater as a result of increased fuel loading.

For Alternatives 1, 2, and 3, the determination of "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" for *Cypripedium parviflorum* and *Viburnum opulus* var. *americanum* is based on the following:

- Although suitable habitat was identified and surveyed within the project area, and moist forest and riparian meadow communities would be avoided during most proposed activities, negative effects are possible. Negative impacts would be expected to be balanced or outweighted by beneficial effects such as a reduction in the risk of intense wildfire and mountain pine beetle infestation.

**Prairie Moonwort and Narrowleaf Grapefern**

**Prairie Moonwort:** Prairie moonwort *(Botrychium campestre)* and narrowleaf grapefern *(Botrychium lineare)* are associated with a variety of habitats. Members of the genus *Botrychium* (moonworts) can be difficult to identify to species level. Morphology is variable within species, and differences between species can be subtle. Research by Dr. Donald Farrar of Iowa State University is revealing genetic similarity between *B. campestre* and *B. lineare*. Dr. Farrar plans to continue analysis to resolve whether the taxa warrant taxonomic separation.

In the Black Hills, there are currently five confirmed prairie moonwort sites on NFS lands. Additional sites exist on private lands and at Wind Cave National Park. No known occurrences are present in the Snyder project area. Prairie moonwort is considered a grassland species associated with sandy grassland habitats in prairies, dunes, railroad sidings, and fields over limestone (USFS 2005a). Black Hills sites are found on limestone in open grassland habitats, usually with high forb diversity and often with a high percentage of bare and rocky soils. Little bluestem (*Schizachyrium scoparium*) and western snowberry (*Symphoricarpos occidentalis*) occur at the majority of sites.

**Narrowleaf Grapefern:** Typical habitat descriptions for narrowleaf grapefern are problematic because sites are so different across its range (Beatty et al. 2003). This species may be a habitat

generalist, since habitat across the range is quite variable and its range stretches from sea level in Quebec to approximately 10,000 feet in Colorado. Narrowleaf grapefern has been observed growing in primarily open habitats and often in areas with documented disturbances, both human-caused and natural (USFS 2005a).

Baseline inventory documentation of the narrowleaf grapefern occurrences in the Black Hills shows habitat similarities to as well as differences from occurrences elsewhere. In the Black Hills, confirmed occurrences on NFS lands are located on the Bearlodge and Hell Canyon Ranger Districts. All sites are in open conditions on limestone geologic material. Two sites have been confirmed on native-surface roadbeds last disturbed approximately 15-25 years ago. A third site is located adjacent to a gravel roadbed in open grassland. The fourth site, located on a north-facing hillside, is not associated with a road. Elsewhere in its range, this species has often been documented in areas of roads and other human and natural disturbances.

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

**Determination – Prairie Moonwort and Narrowleaf Grapefern**

The following determination is assigned to *Botrychium campestre* and *Botrychium lineare*. The rational that follows the determination applies to both species.

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

1. Verified occurrences of prairie moonwort and narrowleaf grapefern are located more than 15 miles from the Snyder project area. The occurrences of both species south of Beulah, Wyoming are located approximately 15 miles from the project area. None of these occurrences would be disturbed by the activities proposed under the Snyder project. While the full extent of the distribution of these species in the Black Hills is unknown, the appearance of above-ground sporophytes at the known sites is indicative of viable populations with extensive supporting underground biomass (including mycorrhizae). Therefore, while loss of individuals may occur in unknown sites (if any) in the Snyder project area, the viable populations at the known occurrence sites outside the project area would not be affected by the project.
2. Baseline monitoring data for prairie moonwort and narrowleaf grapefern occurrences in the Black Hills document that the species are able to colonize areas of past disturbance and are persisting at the monitored sites with limited ongoing disturbances (USFS 2005a).
3. Under Alternatives 1, 2, and 3, forest canopy cover would decrease in some portions of the project area. The conditions could benefit prairie moonwort and narrowleaf grapefern. Although specific data are lacking on the Black Hills National Forest, the earlier successional conditions that occur with opening the overstory canopy could benefit site colonization by these wind-dispersed, spore-producing species, if the associated mycorrhizal species and other microsite conditions are present (USFS 2005a).

4. If there are unknown occurrences of these species in the project area, implementation of Alternative 1, 2, or 3 could facilitate expansion. Proposed actions could alter site conditions to those that may be favorable for expansion and/or colonization by *Botrychium* spores (i.e., earlier successional conditions, including shrub shade reduction, disturbed site conditions, and changes in plant competition patterns), as long as associated mycorrhizae and other microsite conditions are present.
5. Under Alternatives 1, 2, and 3,, log skidding that results in ground disturbance could impact unknown *Botrychium* individuals, if any exist in the project area. Conversely, skidding may create conditions suitable for colonization by prairie moonwort and narrowleaf grapefern (USFS 2005a).
6. Although uncertainty exists, weed competition and herbicide application are considered to be potential risks to *Botrychium* spp. If herbicide spraying occurred at a prairie moonwort or narrowleaf grapefern site when aboveground plant portions are present, the individual plants could react to the herbicide and a negative effect to those individuals would likely be realized. There would, however, likely be enough belowground spores, gametes, juveniles, etc., so that not all of any one occurrence would be affected by herbicide treatment (Farrar pers. comm.). In addition, if a prairie moonwort and/or narrowleaf grapefern occurrence does exist at a herbicide application site, the individuals would be expected to benefit from reduced weed competition (USFS 2005a).
7. Despite the fact that aboveground stems may be negatively affected, beneficial short- and long-term effects may be realized by prescribed burning proposed under Alternatives 1, 2, and 3. A fast-moving fire may remove aboveground stem portions but would not be expected to affect belowground individuals or parts. Burning may release more nutrients to the soil that may immediately benefit the mycorrhizae and *Botrychium* species, and prescribed fire may provide the disturbance needed for site colonization. An intense fire (wild or prescribed) with high-severity effects such as deep soil heating could negatively affect both the belowground and aboveground portions of prairie moonwort and narrowleaf grapefern individuals. Fuel reduction in adjacent upland conifer stands would be expected to decreases the likelihood of crown fires reaching occurrences of R2 sensitive plant species such as prairie moonwort and narrowleaf grapefern (USFS 2005a).
8. Complete distribution, abundance, microhabitat needs, and disturbance regime optimal for persistence of prairie moonwort and narrowleaf grapefern are unknown. This lack of information makes it difficult to predict the cumulative effects to these species under any of the Snyder project alternatives. Past, present, and foreseeable actions (as well as natural disturbances) likely have had and could be expected to continue to have both beneficial or negative effects on some of these individuals or entire occurrences, while at the same time contributing to site conditions suitable for colonization by these species or helping to conserve or maintain existing habitat (USFS 2005a).

Refer to Appendix C of the FEIS for the Phase 2 Amendment to the Forest Plan (USFS 2005a) and to the Supplemental Information report on *Botrychium campestre* for the Biological Evaluation for the Phase 2 Amendment to the Forest Plan (USFS 2005b) for more information on prairie moonwort and narrowleaf grapefern and for a more in-depth rationale for the above determination.

### Plant Species of Local Concern

No plant species of local concern (SOLC) are known to occur in the Snyder project area. Habitat may be present in the project area for four plant SOLC: arrowleaf sweet coltsfoot (*Petasites sagittatus*), northern hollyfern (*Polystichum lonchitis*), pleated gentian (*Gentiana affinis*), and greenleaf or shining willow (*Salix lucida* spp. *caudata*), as shown in **Table 16**. A checklist of plant SOLC and rational for analysis or exclusion from analysis can be found in the Snyder Project Botany Specialist's Report (Analysis File, section E002).

**Table 16: Plant SOLC with Potential Habitat but No Known Occurrences in the Project Area**

| Species | Habitat Category |
|---|---|
| Greenleaf willow *(Salix lucida* spp. *caudata)* | Riparian meadow |
| Arrowleaf sweet coltsfoot *(Petasites sagittatus)* | Riparian meadow |
| Northern hollyfern *(Polystichum lonchitis)* | Moist forest |
| Pleated gentian *(Gentiana affinis)* | Riparian meadow |

### Species of Local Concern (SOLC) – Direct, Indirect, and Cumulative Effects

The direct/indirect and cumulative effects area for plant SOLC is suitable plant habitat within the project area as described in the Field Reconnaissance and Survey Information section of the Snyder Project Botany Biological Evaluation (Analysis File section E001), and includes moist forested and riparian meadow communities.

The cumulative effects analysis is bounded temporally by management activities of the last 10 years. This provides the baseline on which this project is considered to add cumulatively to all other past, present, and reasonably foreseeable actions.

#### *All Alternatives*

These species are associated with habitat similar to that of sensitive plant species known to occur and with suitable habitat in the project area. It is likely that the high-quality sensitive plant habitat identified in the project area includes habitat necessary for SOLC. These habitats are protected by a variety of integrated design criteria, and SOLC will benefit from such protection. Any beneficial effects identified for sensitive plant species above also apply to SOLC. These potential benefits include a reduction in motorized off-road vehicle travel due to area closures and reduction of fuel loading and the risk of high-intensity wildfire. Habitat conditions for these species would therefore be expected to persist in the project area. Additional information can be found in the Snyder Project Botany Specialist Report (Analysis File section E002).

## Forest Vegetation

### Introduction

Approximately 9,885 NFS acres in the project area are forested with ponderosa pine. Vegetation treatments over the last 15 to 20 years have resulted in four general stand structures of pine in the project area. Single-storied stands comprised of mature, dominant pine reflect the intermediate thinnings and preparation cuts of the last 15 to 20 years. Two-storied stands of mature forest overstory with abundant sapling/pole regeneration are the product of past shelterwood seedcut treatments. Regeneration in these stands often does not form a continuous second story but occurs in dense patches and stringers, creating an intra-stand mosaic of both single and two-storied conditions. A third general stand condition is one in which three distinct canopy layers can be found: seedlings/saplings, poles, and mature trees. These stands are very heterogeneous, with all

the layers occurring together or singularly in patches or clumps. A fourth distinctive stand condition is one dominated by stems 5 to 9 inches DBH. Small sawtimber[7] and/or large pine are sometimes present but usually only in minor, incidental amounts.

Development of a bur oak understory following pine regeneration cuts is common. Stands dominated by oak are found on 2,130 acres, concentrated in the western half of the project area. Aspen and birch are found on north-facing slopes, in riparian drainages, and in the understory of many pine stands.

## Affected Environment

### *Pine Structural Diversity*

Existing habitat structural stage (SS) distribution for ponderosa pine on NFS lands in the project area is shown in **Table 17.** Structural stages are defined as follows.

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

**Table 17. Existing Ponderosa Pine Structural Stage Distribution in the Project Area**

| Structural Stage | Acres | Percent of NFS Pine Acres |
|---|---|---|
| 1 | 17 | 0.2 |
| 2 | 16 | 0.2 |
| 3A | 54 | 0.5 |
| 3B | 311 | 3.1 |
| 3C | 232 | 2.3 |
| 4A | 1,827 | 18.5 |
| 4B | 3,792 | 38.4 |
| 4C | 2,995 | 30.3 |
| 5 | 641 | 6.5 |

The project area is dominated by SS 4B and 4C. While young pine is present in the understory in some stands, there are few stands composed primarily of these structural stages.

The mature structural stages that dominate the area provide opportunities for development of younger forest. Regenerating mature stands using the shelterwood method results in SS 2 or 4A, depending on understory conditions. Commercial thinning also would reduce stocking and produce structure densities A and B.

### *Age Class Distribution*

Approximately 53 percent (5,268 acres) of the dominant pine cover inventoried in the Snyder project area is between 100 and 120 years of age. The remainder of the forest falls primarily in the 80-100 and 120-140 age classes, with very little acreage represented in the 0-80 age classes and in those over 140. These ages reflect the predominance of 4A, 4B, and 4C structural stage classes present in the project area.

[7] Generally, trees at least 9 inches DBH.

### *Stocking Level*

Approximately 5,233 pine-forested acres have stocking levels outside desired Timber Management Zone levels using the methodology in Appendix H-3 of the Forest Plan. Of that total, 3,598 acres (36 percent of the pine acres) are stocked above desired levels (greater than 60 percent average maximum density, or AMD). Approximately 651 acres (seven percent) are below desired stocking levels (less than 20 percent AMD). Stands below desired stocking levels can generally either be left to grow and increase site occupancy or can be regenerated. Stands above desired stocking levels can be thinned.

Basal area is usually a good measure of stocking and site occupancy in most sawtimber and pole stands. About 6,437 acres (65 percent) of the pine acres have greater than 100 square feet of basal area per acre (an average of 22 feet between trees 14 inches DBH) and are at or approaching a silviculturally overstocked condition. Another 2,130 acres (22 percent) have BAs between 60 and 100 square feet per acre. This is usually considered fully stocked and equates, at least roughly, to an AMD of between 40 and 60 in sawtimber stands. Approximately 1,318 acres (13 percent) have stocking of less than 60 feet of BA, and are generally considered understocked using BA standards.

### *Snags*

Stand data show that there are an average of 4.3 hard snags at least 10 inches DBH and 25 feet tall per acre in pine stands on NFS lands in the project area, with 1.9 per acre of those snags at least 14 inches DBH. Snags are well distributed across the project area except in the northwest corner between Reservoir Gulch and Planting Spring. Overall, Forest Plan Objective 211 is currently met in the project area.

### *Regeneration*

As noted above, pine regeneration has occurred and is occurring in the project area where the crown canopy has been opened and where competition from grasses, forbs, and brush (often bur oak) is relatively low.

### *Insects and Disease*

Mountain pine beetle activity in the Snyder project area is at endemic levels. Only single tree and small group mortality has resulted from pine beetle damage thus far. Insect-risk ratings for the project area were evaluated based on structural stage class using the method described by Stevens et al. (1980). Existing pine acres by risk class (Low, Moderate, High) are shown in **Table 18**.

**Table 18: Mountain Pine Beetle Infestation Risk in the Project Area**

| Risk Class | Acres | Percent of Pine Acres |
|---|---|---|
| High | 2,339 | 24 |
| Moderate | 4,359 | 44 |
| Low | 3,187 | 32 |

Currently, the combined area at moderate or high risk is 6,698 acres, or 68 percent of the pine cover type.

Analysis of mountain pine beetle risk does not reflect short-term climatic trends, specific weather events, or the effect of other insects/disease agents that could increase the risk in individual stands. For example, storm damage in the form of windthrow or crown breakage in the midst of an extended dry period could increase the incidence of the *Ips* engraver beetle, further weakening trees already under moisture stress. The resulting incidence and severity of mountain pine beetle

in this scenario may not be solely a product of the stand parameters discussed above. Environmental factors such as these make absolute "bug-proofing" of stands nearly impossible.

Other insects and diseases are having minimal impact on the area. No factors are foreseen at this time that would increase this impact in the next 5 to 10 years.

## Direct and Indirect Effects

### *Pine Structural Diversity*

Resulting structural diversity of pine in the project area is shown in **Table 19**.

**Table 19: Pine Structural Diversity in the Project Area by Alternative**

| Structural Stage | Alternative 0 | | Alternative 1 | | Alternative 2 | | Alternative 3 | |
|---|---|---|---|---|---|---|---|---|
| | Acres | % | Acres | % | Acres | % | Acres | % |
| 1 | 17 | 0.2 | 226 | 2.3 | 105 | 1.1 | 398 | 4.0 |
| 2 | 16 | 0.2 | 1,271 | 12.9 | 1,370 | 13.9 | 203 | 2.1 |
| 3A | 54 | 0.5 | 244 | 2.5 | 362 | 3.7 | 167 | 1.7 |
| 3B | 311 | 3.1 | 92 | 0.9 | 92 | 0.9 | 311 | 3.1 |
| 3C | 242 | 2.3 | 187 | 1.9 | 187 | 1.9 | 203 | 2.1 |
| 4A | 1,827 | 18.5 | 2,412 | 24.4 | 2,673 | 27.0 | 2,093 | 21.2 |
| 4B | 3,791 | 38.4 | 3,128 | 31.7 | 2,350 | 23.8 | 3,354 | 34.0 |
| 4C | 2,995 | 30.3 | 1,684 | 17.0 | 2,150 | 21.3 | 2,514 | 25.4 |
| 5 | 641 | 6.5 | 641 | 6.5 | 641 | 6.5 | 641 | 6.5 |

All action alternatives would increase the percent of SS 1, 2, 3A, and 4A pine stands while decreasing 4B and 4C.

SS classification based on basal area (BA) may under-report the actual acreage in SS 2 and 3. The analysis assumed that shelterwood seedcuts and shelterwood seedcut/overstory removal treatments would result in SS 4A. In both treatments, inclusions and patches of SS 2 or 3 may result but are overridden by the BA in SS 4 structural stages. Areas of SS 2 or 3 are estimated to comprise from five to 15 percent of the stands treated with these prescriptions. The analysis also assumed that patch cuts would result in SS 1, and that group selections would, on average, result in 50 percent SS 1 and 25 percent each of SS 2 and 3A.

### *Age Class Distribution*

Under Alternative 0, age class distribution and disparity would not be expected to change in the next 5 to 10 years in the absence of disturbance events such as beetle infestation or wildfire. Beyond 10 years, effects would be likely to include an increase in mortality due to competition among trees and an increase in merchantable defect due to disease. In addition, sustainability of the timber resource over the next several decades may be compromised since few stands are currently young and available to grow into the next generation of mature forest.

Age class distribution would become more balanced under Alternative 1 through overstory removals and patch cuts (total of about 1,422 acres), which would move stands into younger age classes. In addition, shelterwood seedcuts on about 955 acres would be expected to result in establishment of regeneration under the reserve trees, providing future young stands. Currently, young stands are noticeably few across the landscape, so an increase in acreage would be beneficial.

Alternative 2 would have similar effects through overstory removal cuts, patch cuts, and group selections on approximately 1,307 acres and shelterwood seedcuts on approximately 1,137 acres.

The effects of Alternative 3 on age class distribution would be considerably less (overstory removal, patch cuts, and group selections on 463 acres, and shelterwood seedcut on 67 acres).

### *Stocking Level*

The effects of Alternative 0 would be an increase in standing timber volume as the size of the existing trees increases with growth, a reduction of diameter growth due to age and overstocking (trees would continue to grow, but at a slower rate due to competition), an increasing risk of mountain pine beetle infestation, and an increased risk of stand-replacing wildfire. Growth would be expected to decrease in pine stands that are above timber management zone levels due to overcrowding and competition for nutrients, water, and light.

Under Alternatives 1, 2, and 3, pine stocking levels in stands proposed for thinning and prescribed burning would decrease. Commercial thins would reduce stems per acre to improve individual tree productivity and to bring stands into the desired timber management zone described in the Forest Plan. Other proposed treatments, with the exception of shelterwood seedcut, patch cut, and fuel break, would be designed to retain adequate stocking for future management. Seedcut, patch cut, and fuel break treatments are not intended to control stocking for future management, but to encourage pine seedling regeneration or alter fire behavior.

The effect of reduce stocking levels on the timber resource would be an increase in the quality of the timber through the removal of damaged, diseased, and poorly formed trees, and an increase in individual tree growth by releasing the remaining trees from competition for light, water, and nutrients. Reduction of competition and resulting concentration of stand growth in fewer stems would be expected to lead to development of larger tree diameters.

### *Snags*

Alternative 0 would not affect existing snags. Individual tree mortality would be likely to continue in dense stands at rates higher than in stands treated under the action alternatives. Snag density would be likely to be highest under this alternative. Cutting of snags for fuelwood would continue to be prohibited under all alternatives, though illegal cutting may occur adjacent to open roads.

Under Alternatives 1, 2, and 3, design criteria specify that all existing snags would be left standing except those cut for safety reasons. Prescribed burning would be expected to create more snags than are lost, but most of these snags would probably be in small size classes. Sanitation harvest, if necessary, would cut green, beetle-infested trees. This harvest, like other proposed treatments, is intended to reduce susceptibility to beetle infestation and fire, and would be expected to reduce the potential for creation of large concentrations of snags. There is currently a good distribution of snags within the project area, contributing toward Objective 211. As demonstrated by structural stage distribution, mature trees that could become snags in the future dominate the project area (see page 61).

### *Regeneration*

Alternative 0 would not affect pine regeneration potential or success. Shelterwood seedcuts, patch cuts, group selections, and other low-density cuts proposed under Alternatives 1, 2, and 3 would be expected to result in prolific natural regeneration of pine and other native tree species. Prescribed burning would be expected to adversely affect existing pine regeneration in burned areas, but this is considered acceptable where the stand of management interest is the mature overstory, and the burning reduces competition from pine regeneration. Burning would have a beneficial effect on seedling establishment for natural regeneration by exposing some areas of mineral soil. Stimulation of oak sprouting may also result from treatments, which may not be desirable in timber management areas. Spring burning may help reduce the vigor of oak sprouts.

Past prescribed burning in the area has resulted in lower initial stocking levels, but has not prevented successful regeneration within 5 to 10 years. Alternative 1 proposes the most prescribed burning, followed by Alternatives 3 and 2.

### *Insects and Disease*

**Table 20** compares current mountain pine beetle risk for ponderosa pine stands to the estimated risk after implementation of each alternative.

**Table 20: Mountain Pine Beetle Infestation Risk by Alternative**

| Risk Class | Alternative 0 | | Alternative 1 | | Alternative 2 | | Alternative 3 | |
|---|---|---|---|---|---|---|---|---|
| | Acres | % | Acres | % | Acres | % | Acres | % |
| High | 2,339 | 24 | 1,687 | 17 | 1,676 | 17 | 1,899 | 19 |
| Moderate | 4,359 | 44 | 3,780 | 38 | 3,615 | 37 | 4,234 | 43 |
| Low | 3,187 | 32 | 4,418 | 45 | 4,594 | 46 | 3,752 | 38 |

Currently, 68 percent of the project area pine acres are at high or moderate risk of infestation. Under Alternative 0, overstocked stands of pine would continue to be at high risk of loss by mountain pine beetle. This risk would be likely to increase over time due to increasing stocking levels.

The action alternatives would reduce acres at high and moderate risk and increase acres at low risk. Alternatives 1 and 2 would reduce high- and moderate-risk acres by about the same amount (19 percent). Alternative 3 would decrease high- and moderate-risk acres by nine percent.

Slash resulting from proposed activities, if not treated properly, could facilitate tree mortality due to *Ips* spp. (pine engraver beetles) infestation. Past practices of lopping, scattering, and burning of slash piles within a year of treatment have generally reduced *Ips* infestation to less than a few trees per acre. Proposed post-sale treatments for fire risk reduction would also reduce the probability of insect infestations. Scattering slash facilitates the rapid drying of fuels, which reduces conditions favorable for *Ips* buildup.

## Contribution to Allowable Sale Quantity

All action alternatives would contribute to the Allowable Sale Quantity as described in Forest Plan Objective 303 (**Table 21**).

**Table 21: Contribution to ASQ by Alternative**

| Alternative | Sawtimber Output | |
|---|---|---|
| | Board Feet | Cubic Feet |
| **1** | 12,313,400 | 2,462,280 |
| **2** | 15,200,400 | 3,040,080 |
| **3** | 7,540,300 | 1,508,060 |

## Cumulative Effects

The cumulative effects boundary for age class distribution, stocking level, snags, insect and disease risk, and regeneration is the project area boundary, where the direct and indirect effects of the project would occur. The cumulative effects boundary for insect and disease risk is the project area plus a one-mile buffer (43,830 acres; Map 17, Appendix A). This boundary was selected because mountain pine beetle infestation levels in the project area could be affected by levels in adjacent forested areas, and vice versa. The time span for the cumulative effects analysis on these areas is from 1990 to 2047 to account for past activities that are still affecting forest resources and completion of all activities included in the Snyder project proposals, including future uneven-age

management entries.

### *Pine Structural Diversity*

The cumulative effects boundary for structural stage is the boundary of the relevant management area across the National Forest. This boundary is prescribed by Forest Plan Objectives 4.1-203, 5.1-204, and 5.4-206. The time span for the cumulative effects analysis of structural stage is from 2007, when Forest-wide structural stage data were updated and frozen, to 2017, when activities directly associated with the Snyder project are expected to end.

The Phase 2 Amendment includes objectives for distribution of pine stand structure and tree size. These objectives are applied on a management area basis. The objectives are identical for MAs 4.1, 5.1, and 5.4:

*Objectives 4.1-203, 5.1-204, and 5.4-206. Manage for the following percentages of structural stages in ponderosa pine across the management area in a variety of sizes and shapes.*

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

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

Regarding the "very large" tree size provision of these objectives, forest vegetation databases define stands of "very large" trees as those with an average DBH of at least nine inches and, of the trees over nine inches, the average DBH is at least 16 inches.

To demonstrate how the Snyder project would contribute toward achievement of Objective 4.1-203, **Table 22** displays existing structural stage distribution in MA 4.1 across the Forest and how the Snyder alternatives would affect this distribution.

**Table 22. Ponderosa Pine Structural Stage Distribution in MA 4.1 (Forest-wide)**

| Structural Stage | Objec-tive (%) | Alternative 0 | | Alternative 1 | | Alternative 2 | | Alternative 3 | |
|---|---|---|---|---|---|---|---|---|---|
| | | Acres | % | Acres | % | Acres | % | Acres | % |
| 1 | 5% | 487 | 1 | 487 | 1 | 487 | 1 | 585 | 2 |
| 2 | 5% | 745 | 2 | 1,346 | 4 | 1,298 | 4 | 794 | 2 |
| 3A | 10% | 1,012 | 3 | 1,022 | 3 | 1,096 | 3 | 1,082 | 3 |
| 3B | 15% | 1,021 | 3 | 985 | 3 | 958 | 3 | 1,021 | 3 |
| 3C | 5% | 844 | 2 | 823 | 2 | 823 | 2 | 823 | 2 |
| 4A | 25% | 10,214 | 28 | 10,307 | 29 | 10,365 | 29 | 10,249 | 28 |
| 4B | 25% | 13,974 | 39 | 14,119 | 39 | 13,652 | 38 | 13,886 | 38 |
| 4C | 5% | 6,875 | 19 | 6,084 | 17 | 6,493 | 18 | 6,733 | 19 |
| 5 | 5% | 984 | 3 | 984 | 3 | 984 | 3 | 984 | 3 |

The table above shows that the Snyder proposed action and alternatives would generally have little effect on distribution of pine structural stages in MA 4.1 across the Forest. All alternatives would contribute toward meeting the objective by increasing stages 2 and 3A and decreasing stage 4C. All alternatives would, however, increase stage 4A, which is already above the objective. This change is relatively small (an increase of about 1.5 percent across the management area) and is a result of actions proposed to decrease fire hazard (in response to Forest Plan Objective 10-01) and mountain pine beetle infestation risk (in response to Objective 10-07). Alternative 1 would also increase stage 4B, which is above the objective. Alternatives 2 and 3 would decrease 4B. Alternatives 1 and 2 would decrease stage 3B further below the objective, while Alternative 3 would increase stage 1 toward the objective. None of the alternatives would affect stage 5.

**Table 23** displays Forest-wide acres and percentages of very large trees in structural stage 4 in MA 4.1, and how these figures would change as a result of the Snyder project. MA 4.1 is currently above the objective for acres of stands dominated by very large trees. Alternatives 1 and 2 would decrease the percentage as a result of overstory removal treatments, while Alternative 3 would have no effect.

**Table 23. "Very Large" Tree Distribution in MA 4.1 (Forest-wide)**

| Object-tive | Alternative 0 | | Alternative 1 | | Alternative 2 | | Alternative 3 | |
|---|---|---|---|---|---|---|---|---|
| % of SS4 | Acres | % of SS4 | Acres | % of SS4 | Acres | % of SS4 | Acres | % of SS4 |
| 10% | 5,676 | 18 | 5,349 | 18 | 5,349 | 18 | 5,676 | 18 |

To demonstrate how the Snyder project contributes to Objective 5.1-204, **Table 24** displays existing structural stage distribution in MA 5.1 across the Forest and how the Snyder alternatives would affect this distribution.

**Table 24. Ponderosa Pine Structural Stage Distribution in MA 5.1 (Forest-wide)**

| Structural Stage | Objec-tive (%) | Alternative 0 | | Alternative 1 | | Alternative 2 | | Alternative 3 | |
|---|---|---|---|---|---|---|---|---|---|
| | | Acres | % | Acres | % | Acres | % | Acres | % |
| 1 | 5% | 38,460 | 8 | 38,460 | 8 | 38,460 | 8 | 38,517 | 8 |
| 2 | 5% | 15,796 | 3 | 16,336 | 3 | 16,152 | 3 | 15,920 | 3 |
| 3A | 10% | 19,555 | 4 | 19,736 | 4 | 19,736 | 4 | 19,584 | 4 |
| 3B | 15% | 22,916 | 5 | 22,760 | 5 | 22,760 | 5 | 22,916 | 5 |
| 3C | 5% | 11,667 | 2 | 11,642 | 2 | 11,642 | 2 | 11,659 | 2 |
| 4A | 25% | 180,334 | 38 | 180,611 | 38 | 180,743 | 38 | 180,424 | 38 |
| 4B | 25% | 140,844 | 30 | 140,286 | 29 | 140,327 | 29 | 140,691 | 30 |
| 4C | 5% | 46,320 | 10 | 46,061 | 10 | 46,073 | 10 | 46,181 | 10 |
| 5 | 5% | 493 | <1 | 493 | <1 | 493 | <1 | 493 | <1 |

The table above shows that the Snyder proposed action and alternatives would have little effect on distribution of pine structural stages in MA 5.1 across the Forest. All action alternatives would contribute toward meeting the objective by increasing stages 2 and 3A and decreasing stages 4B and 4C. All action alternatives would, however, increase stage 4A, which is already well above the objective. This change is a result of actions proposed to decrease fire hazard (in response to Forest Plan Objective 10-01) and mountain pine beetle infestation risk (in response to Objective 10-07). Stage 3C is currently below the objective, and all action alternatives would decrease it further due to thinning or group selection in two stands. Alternatives 1 and 2 would move stage

3B slightly further from the objective, while Alternative 3 would increase stage 1 toward the objective. Under Alternatives 2 and 3, future uneven-age management entries (at approximately 15-20 and 30-40 years) would reduce the amount of 4A and further increase stages 2 and 3. None of the alternatives would affect stage 5.

**Table 25** displays Forest-wide acres and percentages of very large trees in structural stage 4 in MA 5.1, and how these figures would change as a result of the Snyder project. MA 5.1 is currently slightly above the objective for acres of stands dominated by very large trees. All action alternatives would decrease the percentage as a result of overstory removals. Alternative 1 would cause the largest decrease (241 acres) and Alternative 3 the smallest (95 acres).

**Table 25. "Very Large" Tree Distribution in MA 5.1 (Forest-wide)**

| Object-tive | Alternative 0 | | Alternative 1 | | Alternative 2 | | Alternative 3 | |
|---|---|---|---|---|---|---|---|---|
| % of SS4 | Acres | % of SS4 | Acres | % of SS4 | Acres | % of SS4 | Acres | % of SS4 |
| 10% | 40,635 | 11 | 40,394 | 11 | 40,554 | 11 | 40,540 | 11 |

To demonstrate how the Snyder project contributes to Objective 5.4-206, **Table 26** displays existing structural stage distribution in MA 5.4 across the Forest and how the Snyder alternatives would affect this distribution.

**Table 26. Ponderosa Pine Structural Stage Distribution in MA 5.4 (Forest-wide)**

| Structural Stage | Objec-tive (%) | Alternative 0 | | Alternative 1 | | Alternative 2 | | Alternative 3 | |
|---|---|---|---|---|---|---|---|---|---|
| | | Acres | % | Acres | % | Acres | % | Acres | % |
| 1 | 5% | 51,883 | 15 | 52,092 | 15 | 51,971 | 15 | 52,109 | 15 |
| 2 | 5% | 9,347 | 3 | 9,434 | 3 | 9,791 | 3 | 9,361 | 3 |
| 3A | 10% | 18,045 | 5 | 18,045 | 5 | 18,089 | 5 | 18,059 | 5 |
| 3B | 15% | 28,964 | 8 | 28,964 | 8 | 28,964 | 8 | 28,964 | 8 |
| 3C | 5% | 19,904 | 6 | 19,904 | 6 | 19,904 | 6 | 19,904 | 6 |
| 4A | 25% | 79,263 | 23 | 79,478 | 23 | 79,549 | 23 | 79,403 | 23 |
| 4B | 25% | 92,561 | 27 | 92,313 | 27 | 91,959 | 27 | 92,369 | 27 |
| 4C | 5% | 42,991 | 12 | 42,729 | 12 | 42,732 | 12 | 42,790 | 12 |
| 5 | 5% | 1,137 | <1 | 1,137 | <1 | 1,137 | <1 | 1,137 | <1 |

The table above shows that the Snyder proposed action and alternatives would have little effect on distribution of pine structural stages in MA 5.4 across the Forest. All action alternatives would contribute toward meeting the objective by increasing stages 2 and 4A and decreasing stages 4B and 4C. Alternatives 2 and 3 would increase stage 3A toward the objective. All action alternatives would increase stage 1 further away from the objective as a result of patch cut and group selection treatments, which are proposed for wildlife habitat and structural diversity reasons. Pine structural stage 1 in MA 5.4 is concentrated in the southern part of the Black Hills and makes up only two-tenths of one percent of pine acres in the Snyder area. Under Alternatives 2 and 3, future uneven-age management entries (at approximately 15-20 and 30-40 years) would reduce the amount of 4A and further increase stages 2 and 3. None of the alternatives would affect stage 3B, 3C, or 5.

**Table 27** displays Forest-wide acres and percentages of very large trees in structural stage 4 in MA 5.4, and how these figures would change as a result of the Snyder project. MA 5.4 is currently slightly below the objective for acres of stands dominated by very large trees. Alternatives 1 and 2 would further decrease the percentage as a result of overstory removal.

Alternative 1 would decrease the total by 88 acres (0.5 percent) and Alternative 2 by 285 acres (1.6 percent).

**Table 27. "Very Large" Tree Distribution in MA 5.4 (Forest-wide)**

| Object-tive | Alternative 0 | | Alternative 1 | | Alternative 2 | | Alternative 3 | |
|---|---|---|---|---|---|---|---|---|
| % of SS4 | Acres | % of SS4 | Acres | % of SS4 | Acres | % of SS4 | Acres | % of SS4 |
| 10% | 17348 | 8 | 17260 | 8 | 17063 | 8 | 17348 | 8 |

### *Other Cumulative Effects*

The Puma, Cub, Truck Trail, Chicago, and North Bearlodge timber sales, which occurred or will occur on 1,865 acres in the project area since 1997, increased merchantable volume growth rates and quality of timber. Commercial thinning conducted under these sales reduced stocking levels in overstocked stands on ground suitable for timber production. Not all stands in the project area were treated, and growth has occurred, so there are currently many overstocked stands. An additional effect has been an increase in the quality of the timber through the removal of damaged, diseased, and poorly formed trees, but this has also resulted in those trees not being currently available for harvest. There has been an increase in individual tree growth by releasing the remaining trees from competition for light, water, and nutrients. Trees have developed larger diameters due to a reduction of competition. The number of mature trees available for future snags has decreased, and stand density reduction has decreased the probability of individual tree mortality. Some stands were regenerated, resulting in seedlings. A reduction of the risk of mountain pine beetle infestation due to reduction of stand density occurred, but risk is increasing due to tree growth and regeneration.

Alternative 0 would not add to these effects on age class distribution, stocking level, or pine regeneration. In the absence of disturbance events, the area would continue to be dominated by stands 80 to 120 years old and stocking levels would increase.

Alternatives 1, 2, and 3 would add incrementally to effects on age class distribution by moving stands treated with overstory removal, patch cut, and group selection to younger age classes and promoting regeneration in shelterwood seedcut and group selection areas. All proposed treatments would add to cumulative effects on stocking levels by decreasing stand density. Under Alternatives 1 and 2, stocking in fuel breaks would be expected to remain low into the future as maintenance treatments remove pine and oak regeneration.

Removal of mature trees would add to cumulative effects on snags, as fewer mature trees would be available for development into large-diameter snags. Continued domination of the project area by mature structural stages, however, indicates that none of the alternatives would make presence of mature trees a limiting factor in future availability of snags.

Alternatives 1, 2, and 3 may negatively affect some areas of pine regeneration through prescribed fire, but the additive effect of this and other projects would be a net increase in pine regeneration. These effects are consistent with Forest Plan Standards and Guidelines and would not exceed or approach any threshold.

The cumulative effects boundary for mountain pine beetle includes parts of the Hemler and Planting timber sales, scheduled to run from 2006 through 2011 and 2012, respectively. Hemler timber sale is located southeast of the project area and Planting timber sale is located to the north. There are currently no known heavily infested stands in the cumulative effects area. Under Alternative 0, dense pine stands in much of the Snyder project area would continue to provide conditions capable of hosting epidemic beetle populations. Alternatives 1, 2, and 3 would

decrease risk of infestation in the project area, adding to effects of past and ongoing sales and the Hemler and Planting sales. This effect is consistent with Forest Plan Standards and Guidelines.

## Rangeland

### Affected Environment

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

The Snyder project area includes parts of the Beaver Creek, Farrall, and North Bearlodge grazing allotments (**Table 28**).

**Table 28. Grazing Allotments in the Project Area**

| Allotment | Unit | Grazing System | Numbers | Dates | Unit Acres in Project Area (Total Unit Acres) |
|---|---|---|---|---|---|
| Beaver Creek | Cub Creek | Three-pasture deferred | 100 cow/calf | 6/11-10/15 | 3,402 (3,402) |
| | Fawn Creek | Three-pasture deferred | 104 cow/calf<br>12 cow/calf | 6/11-10/15<br>6/11-7/10 | 3,900 (4,260) |
| | Taylor Divide | Two-pasture deferred plus one occasionally used small pasture | 165 cow/calf | 6/11-10/15 | 640 (4,820) |
| Farrall | Farrall | Two-pasture | 188 cow/calf | 6/11-10/15 | 2,649 (7,649) |
| | Table Mountain | Season-long | 75 cow/calf | 6/11-10/15 | 1,272 (1,272) |
| North Bearlodge | North Unit | Season-long | 138 cow/calf | 6/11-10/15 | 2,050 (8,023) |
| | South Unit | Season-long | 80 cow/calf | 6/11-10/15 | 260 (260) |
| | | | | **Total Acres** | **14,173 (29,686)** |

Range improvements in the project analysis area include 18 water developments (spring tanks, stock dams), three miles of water pipeline, seven miles of interior fence, and 25 miles of boundary fence. Improvements would be protected during proposed activities. The interior fences include 0.4 miles of drift fence in the North Bearlodge Allotment and three miles of permanent electric fence in the Cub Creek Unit of Beaver Creek.

### Direct and Indirect Effects

Impacts to the rangeland resources in the Snyder analysis area revolve mainly around forage production, which may increase or decrease depending on alternative. Road construction, closure, and decommissioning may impact the use of available forage by livestock as well as maintenance of range improvements necessary for proper livestock management. None of the alternative proposes additional structural range improvements.

Livestock grazing is expected to continue across the project area under all alternatives. A Record of Decision signed in September 2006 (North Zone Range 2005 project) changed the grazing strategy in the Farrall Allotment from a two-pasture system to three-pasture. This change was implemented during the 2007 grazing season. Beaver Creek Allotment is included in an ongoing analysis covering a larger area (North Zone Range 2008 project). Effects of grazing in North Bearlodge Allotment were last analyzed in 1998.

Large, contiguous, mature stands of timber, which are common in the project area, are vulnerable to wildfire and beetle infestation. Both events would affect herbaceous plant communities and available forage for livestock and wildlife. If the canopy opened up due to tree mortality, the grass/forb component would receive more sunlight and moisture, increasing the vigor and health of these communities. At the same time, noxious weed infestations could increase. Downed trees could limit access to forage. An increase in downed timber from beetle kill would increase the risk of stand-replacing wildfires that could create tens to hundreds of acres of bare ground on which weeds could establish and compete with more desirable species (see Noxious Weeds section below).

The no action alternative would allow continued encroachment of ponderosa pine on primary range in areas outside of the Chicago timber sale and North Bearlodge fuel project. Encroachment of ponderosa pine into grassland communities, meadows, and riparian areas increases the grazing pressure on these areas as they shrink in size. This could ultimately reduce their capability under the current permitted livestock numbers. Utilization guidelines described in Forest Plan Standard 2505 may eventually be exceeded, making it difficult to maintain satisfactory condition in some areas.

The action alternative include removal of timber through commercial and non-commercial treatment, which would provide transitory range (an area that temporarily produces an increase in rangeland vegetation). This condition occurs when the tree and shrub overstory are removed, allowing the grass/forb component more sunlight and moisture. This would be expected to improve the quality and quantity of the forage available to livestock. Distribution of livestock in the project area would improve as treatment areas are opened up and roads are improved or new ones are built, as long as water is available. The impacts of livestock on primary range, mostly located in meadows, upland grasslands, and riparian areas, would be expected to lessen as cattle distribute throughout the transitory range. These actions would aid in maintaining or moving these communities towards desired condition, and would be expected contribute to the health of riparian areas where concerns have resulted in grazing management changes in the Cub Creek Unit of the Beaver Creek Allotment and the main portion of the Farrall Allotment. Proposed treatments located around and in primary grazing areas in both allotments would be expected to increase available forage and improve livestock distribution in these areas. Construction of an exclosure fence in Lucky Gulch (North Bearlodge Allotment) would be expected to improve the condition of the riparian area.

Prescribed fire and mechanical fuel reduction proposed under all action alternatives would aid in maintaining or moving primary range towards satisfactory condition. These treatments would help maintain or restore upland grasslands and meadows by decreasing pine encroachment and increasing available forage. Prescribed fire would have a direct short-term impact on permittees and livestock grazing, since pasture rotations, season of use, or livestock numbers may need to be adjusted in order to allow sufficient recovery time in burned areas. New vegetation in burned areas often becomes very desirable to livestock and wildlife because of palatability and access. Forest Plan Guideline 4107 states that prescribed burn areas will be deferred from livestock grazing for a portion or all of the following growing season to ensure regrowth of forage. An interdisciplinary approach is taken to analyze the readiness of burned areas for grazing. With close coordination between district fuels/fire and range staffs, adequate time would be provided for vegetation to recover before grazing occurs while minimally impacting livestock permittee operations. Alternative 1 has the greatest potential to affect rangelands through prescribed burning of 4,808 acres. Alternatives 2 and 3 would burn a much smaller area and would therefore be expected to result in fewer effects on rangeland.

Road work would be coordinated with grazing permittee access needs. Permittees need access to maintain improvements such as fences and water developments and to manage livestock grazing,

which normally occurs between June 11 and October 15. Improvements are often accessed via unclassified roads that could be closed for all or part of the year with administrative access given to the permittees. All roads help to facilitate livestock movement and aid in distribution across the rangeland.

Road construction and reconstruction directly affect vegetation by removing it, and can indirectly increase noxious weeds that reduce the function and value of rangelands. Noxious weeds often outcompete desirable rangeland vegetation. Alternatives 1 and 2 have the greatest potential for soil disturbance. Alternative 1 has the most miles of construction, but Alternative 2 has more miles of reconstruction.

Actual acres disturbed are likely to be greatest under Alternative 1, which would therefore be expected to have the greatest potential to impact rangeland through potential introduction or spread of noxious weeds. Alternative 1 also has the greatest potential for temporary interference with grazing systems, especially in the Cub Creek and North Bearlodge units.

### Cumulative Effects

The cumulative effects area for rangeland is the total area of the Beaver Creek, Farrall, and North Bearlodge allotments. The time span for the cumulative effects analysis of rangeland is five to 10 years. These spatial and temporal boundaries were chosen for the rangeland cumulative effects analysis because grazing is an ongoing activity in the three allotments that overlap the Snyder project area.

Past, present, and reasonably foreseeable activities include livestock grazing, timber harvest, prescribed fire, and wildfires. Recent and ongoing timber sales and post-sale activities have created and continue to create transitory range, increasing livestock distribution and available forage. This is expected to reduce the time livestock spend on primary range, contributing toward achievement of Forest Plan Objectives 301 and 302 as well as Guideline 2505. Transitory range lasts only as long as it takes for regeneration of trees and increased canopy cover, usually five to 10 years. Broadcast burning proposed under all action alternatives would work against the cumulative effect of fire suppression by killing small trees and setting back succession, though it is expected to have limited effects on overstory canopy.

All proposed activities are limited in intensity and duration; any negative impacts would be minimal and are directly related to livestock management in the short term. Long-term negative impacts resulting from increased weed infestations are discussed in the Noxious Weeds section (page 123).

## Wildlife

This section documents what is currently known regarding wildlife and habitat resources in the Snyder project area and analyzes the potential effects of the proposed action and alternatives. Data in this section were compiled from field surveys, Bearlodge District wildlife observation data, Rocky Mountain Bird Observatory (RMBO) surveys, Wyoming Natural Diversity Database records, the Atlas of Birds, Mammals, Reptiles and Amphibians in Wyoming (Cerovski et al. 2004), literature reviews, communication with district personnel, and the Biological Assessments/Biological Evaluations completed for the Forest Plan Revision and the Phase 2 Forest Plan Amendment (USFS 1996, 2005).

### Wildlife Surveys

Surveys were conducted in the Snyder project area at various times during 2001 through 2006. Surveys involved ground reconnaissance and included avian surveys by the Rocky Mountain Bird Observatory (RMBO). Additional surveying was conducted in areas of high-potential habitat for

the northern goshawk. High-potential habitat was identified using aerial photographs, the forest vegetation database, pertinent literature, local knowledge, and field reconnaissance. Goshawk surveys followed the Southwestern Region Goshawk Inventory Protocol (Lloyd 1992). Frest and Johannes (1993, 2000, and 2002) conducted surveys for sensitive snail species in this area. Surveys for other sensitive wildlife species and/or species of concern were conducted in conjunction with goshawk and rangeland surveys.

## Wildlife Habitat Components – Affected Environment

### *Grassland Communities*

Approximately four percent of the project area (555 acres) is in natural openings, meadows, and riparian grasslands. Grasslands and meadows provide unique habitats not found elsewhere within the forested ecosystem. Pine and oak are encroaching on upland meadows where pine removal has not recently taken place.

### *Hardwood Communities*

Approximately 20 percent (2,625 acres) of the project area is forested with hardwoods. According to the forest vegetation database, there are 2,130 acres of bur oak, 379 acres of quaking aspen, 98 acres of paper birch, and 18 acres of other hardwoods. In addition, numerous mixed pine/hardwood stands typed as ponderosa pine support a substantial amount of oak and, to a lesser extent, aspen and birch. Some hardwood stands have undergone pine removal. Other stands are being encroached by pine. One objective of the Forest Plan is to maintain or enhance hardwood habitats to promote diversity in forest composition.

### *Snags*

Existing snag conditions are discussed in the Forest Vegetation section (page 60).

### *Late-Succession Forest*

There are 641 acres of structural stage 5 (late-succession forest) in the project area. These pine stands exhibit late-succession characteristics such as a large trees (average diameter of the trees over nine inches DBH is at least 16 inches DBH) and overstory age of at least 160 years. Structural stage 5 makes up six percent of the pine stands in the project area.

### *Riparian/Aquatic Communities*

Riparian and/or aquatic communities are found in the project area in the Deer, Cub, Wood, Fawn, Beaver, Little Beaver, Reservoir, and Lucky drainages. Riparian communities can also be found at various seeps and springs. Road placement, decrease of beaver, livestock use, and water diversion have contributed to degradation of some of the riparian habitats in the project area. Pine encroachment may have decreased the quality and quantity of riparian grassland and shrubland habitat.

## Wildlife Habitat Components – Direct and Indirect Effects

### *Grassland Communities*

Under Alternative 0, meadow habitat that has become overgrown with pine would remain forested. Grassland communities would continue to decline in the absence of disturbance events. Prescribed burning proposed under all action alternatives would be expected to decrease pine cover in formerly open areas. Alternative 1 would be expected to have the greatest effect since it proposes by far the greatest acreage of burning.

### *Hardwood Communities*

Alternative 0 would allow pine to continue to encroach on hardwood stands. Hardwood communities may decline in the absence of disturbance events. Alternative 1 proposes removal of pine from aspen on 20 acres and patch cuts with aspen enhancement on 270 acres. These treatments, in conjunction with prescribed burning, would be expected to expand aspen coverage and diversify aspen age structure in treated areas. Alternatives 2 and 3 propose 60 and 40 acres, respectively, of pine removal from aspen, which would help perpetuate treated stands. The lesser area of burning proposed under these alternatives could also rejuvenate aspen inclusions in pine stands.

### *Snags*

Direct and indirect effects on snags are discussed in the Forest Vegetation section (page 62).

### *Late-Succession Forest*

Alternatives 0, 2, and 3 would have no effect on the 641 acres of late-succession forest (structural stage 5). Alternative 1 proposes understory burning in four late-succession pine stands (126 acres) as a result of the large-block approach to burning. Three of these stands are in Wood Canyon. Because these stands are relatively dense and on steep slopes, it may be difficult to prevent a higher level of overstory mortality than would otherwise be desired. Pockets of fire-caused mortality could increase the stands' value to cavity-nesting birds and insectivores; widespread mortality would be expected to decrease late-succession values.

### *Riparian/Aquatic Communities*

Alternative 0 would not affect riparian communities. Existing impacts from roads, grazing, and past timber harvesting may persist. Alternatives 1, 2, and 3 would be expected to positively affect riparian habitat in Lucky Gulch through construction of an exclosure fence. Other than prescribed burning (Alternative 1) and road decommissioning (all action alternatives), no activities are proposed in riparian areas or wetlands. Activities that do occur in water influence zones would be conducted in accordance with WCPH management measures 3, 9, 10, and 11 to ensure that riparian areas and wetlands are not adversely affected and that long-term stream health is maintained.

## Wildlife Habitat Components – Cumulative Effects

The cumulative effects boundary for grassland communities, hardwood communities, snags, and late-succession forest is NFS lands within the project area boundary, because direct and indirect effects of the project would not be discernable beyond this area. The cumulative effects boundary for riparian/aquatic habitat is the seventh-level watersheds overlapping the project area, including all ownerships (approximately 36,540 acres). This area was selected for analysis because activities in the project area may affect aquatic habitats downstream, and activities upstream may affect habitats in the project area.

The time span for the cumulative effects analysis of wildlife habitat components is from 1990 to 2018 to account for past activities that are still affecting these components and completion of all activities included in the Snyder proposals.

### *Grassland Communities*

Succession has resulted in expansion of pine forest into meadows. Meadow restoration/pine encroachment cutting conducted under the Cub timber sale (about 98 acres) set back pine succession in meadows, and prescribed fire planned under the North Bearlodge project would be expected to do the same in the northern part of the project area.

Alternative 0 would add to cumulative effects of forest succession by allowing pine to continue to expand. The action alternatives would be expected to act against the trend of pine encroachment as a result of prescribed burning. The additive effect would be greatest under Alternative 1. Alternatives 1, 2, and 3 would contribute toward achievement of Forest Plan Objective 205.

### *Hardwood Communities*

Succession has resulted in expansion of pine forest into stands of hardwoods. Conversely, the North Bearlodge project removed pine from 40 acres of aspen, and Cub timber sale conducted hardwood restoration on 62 acres.

Alternative 0 would add to cumulative effects of forest succession by allowing pine to continue to expand into hardwood stands. Aspen enhancement treatments and prescribed burning proposed under Alternatives 1, 2, and 3 would act against the cumulative effect of pine expansion. Alternative 1 would be expected to have the greatest effect due to larger area of these treatments. Alternatives 1, 2, and 3 would contribute toward achievement of Forest Plan Objective 201.

### *Snags*

Recent and ongoing timber sales (see page 26) have increased tree growth rates. Trees have developed larger diameters due to a reduction of competition. The number of mature trees available for future snags has decreased, and stand density reduction has decreased the probability of individual tree mortality.

Alternative 0 would not add to these effects. Removal of mature trees proposed under Alternatives 1, 2, and 3 would add to cumulative effects on snags, as fewer mature trees would be available for development into large-diameter snags and reduction of stand density would further decrease probability of individual tree mortality. The cumulative effect of Alternative 3 would probably be less than Alternative 1 or 2 due to reduced acreage of overstory removal. Continued domination of the project area by mature structural stages, however, indicates that none of the alternatives would make presence of mature trees a limiting factor in future availability of snags. Given existing snag densities and large numbers of mature trees that would remain, none of the alternatives would be expected to affect achievement of Forest Plan Objective 211.

### *Late-Succession Forest*

Recent, ongoing, and planned activities have not affected late-succession forest. Alternative 0 would not add to effects on late-succession forest or opportunities for development of additional late-succession forest. Alternative 1 may affect up to 124 acres of existing late-succession pine through prescribed burning. Alternatives 2 and 3 would not affect existing late-succession stands. These outcomes would contribute toward achievement of Forest Plan Objectives 4.1-203, 5.1-204, and 5.4-206.

All action alternatives would decrease density of treated stands. Treatments such as overstory removal would move stands into early-succession conditions. Regenerated stands would not be available for development into late-succession forest for many decades. Alternatives 1 and 2 would move approximately 1,500 acres of pine into early-succession conditions, adding the most to effects of past and ongoing activities. Under each alternative, however, more than 7,000 acres (71 percent of the pine acres) would remain in mature age classes, indicating ample opportunity for development of additional late-succession forest in the future..

*Riparian/Aquatic Communities*

Under Alternative 0, existing roads with disturbed areas connected to drainages would be expected to continue to contribute sediment to the drainage network. Sediment delivery rates from damaged or poorly designed roads may persist. Prescribed burning planned under the North Bearlodge project will take place adjacent to the water influence zones along Reservoir Gulch and Lucky Gulch. Application of WCPH design criteria to these activities is expected to maintain long-term stream health and riparian ecosystem condition. Modification of grazing systems and fencing of springs in the Farrall Allotment, approved under the North Zone Range 2005 project (USFS 2007d), is reducing livestock effects on riparian communities. Revision of the grazing management plan for the Beaver Creek Allotment is scheduled for 2008 and may modify use to achieve desired range conditions and Forest Plan Objectives.

Under Alternatives 1, 2, and 3, activities proposed in water influence zones, conducted in accordance with WCPH management measures 3, 9, 10, and 11, would not be expected to degrade long-term stream health or riparian ecosystem condition. Therefore, these alternatives would not be expected to add to cumulative effects on riparian or aquatic communities.

## Federally Listed Species

A list of Federally endangered, threatened, proposed, and candidate species has been provided by Brian T. Kelly of the U.S. Fish and Wildlife Service (USFWS), Wyoming State Office, and last updated on August 8, 2007. Bald eagles were removed from the endangered species list in 2007 (50 CFR 217, FR Vol. 72, No. 130, July 9, 2007). This species is now discussed in the sensitive species section below. There are no federally listed species or critical habitat known to occur or with potential to occur on Bearlodge Ranger District.

## Sensitive Species

The Regional Forester updated the sensitive species list for Forest Service Region 2 effective May 17, 2005. The following table includes Region 2 sensitive species likely to occur on the Black Hills National Forest. Species not known to occur in the project area and without suitable habitat in the project area were not analyzed further. Risk assessments were completed for sensitive species known to occur or potentially occurring in the project area (**Table 29**).

**Table 29. Sensitive Wildlife Species**

| Species | Documented in Project Area | Habitat in Project Area | Habitat Description |
|---|---|---|---|
| Bald eagle (*Haliaeetus leucocephalus*) | Yes | Yes | Winter resident in the Black Hills and spring/fall migrant; recent nesting attempts by large lakes. Usually found near water or carrion in winter (Tallman et al. 2002). |
| American peregrine falcon (*Falco peregrinus anatum*) | No | No | Open habitat with cliffs (Terres 1991). |
| American three-toed woodpecker (*Picoides dorsalis*) | Yes | Yes | Mature spruce forests, burned areas (Panjabi 2003). |
| Black-backed woodpecker (*Picoides arcticus*) | Yes | Yes | Burned areas with a high density of pre-burn snags; dense and/or mature forests with a high snag density (Anderson 2002, Panjabi 2003). Rare outside burned areas (Beason et al. 2006). |
| Burrowing owl (*Athene cunicularia*) | No | No | Dry grasslands and pastures, usually associated with prairie dogs or ground squirrels (Tallman et al. 2002). |
| Flammulated owl (*Otus flammeolus*) | No | Yes | Open ponderosa pine forests (Hayward and Verner 1994). |
| Grasshopper sparrow (*Ammodramus savannarum*) | No | Yes | Native mixed-grass prairies (Panjabi 2004, Beason et al. 2006); prefers grassland patches at least 20 acres in size (Slater 2004). |

| Species | Documented in Project Area | Habitat in Project Area | Habitat Description |
|---|---|---|---|
| Lewis' woodpecker (*Melanerpes lewis*) | No | Yes | Open burned areas with large snags; oak and cottonwood forests (Anderson 2002, Panjabi 2003). |
| Loggerhead shrike (*Lanius ludovicianus*) | No | No | Open country with scattered, low, deciduous thickets (Tallman et al. 2002). |
| Northern goshawk (*Accipiter gentilis)* | Yes | Yes | Forages in a variety of forested areas and small openings; nests primarily in dense mature conifer forests (Erickson 1987). |
| Long-billed curlew *(Numenius americanus)* | No | No | Native-grass prairies, rolling to flat. Nests primarily in shortgrass or mixed-grass prairies (Sedgwick 2006). |
| Northern harrier (*Circus cyaneus*) | No | No | Open country in medium/tall grass prairies and associated wetlands, marshes, and meadows (USFS 2003). |
| Yellow-billed cuckoo (*Coccyzus americanus*) | No | Yes | Low-elevation riparian areas and woodlands characterized by cottonwood-willow or bur oak (Panjabi 2003). |
| American marten (*Martes americana*) | Yes | Yes | Spruce forests with complex near-ground structure, extending into adjacent ponderosa pine stands (Buskirk 2002). |
| Black-tailed prairie dog (*Cynomys ludovicianus*) | No | No | Short-grass and mixed-grass prairies (Higgins et al. 2000). |
| Rocky Mountain bighorn sheep *(Ovis canadensis)* | No | No | Limited to areas around Sheridan Lake, Dark Canyon, Spring Creek, and Custer State Park (USFS 2005c). |
| Fringed myotis (*Myotis thysanodes*) | No | Yes | Forages on insects in a variety of habitats including grasslands and forested areas. Roosts in a variety of structures including caves, mines, and buildings (Schmidt 2003d). |
| Townsend's big-eared bat (*Corynorhinus townsendii)* | No | Yes | Forages on insects in a variety of habitats including forested and wet areas. Roosts in a variety of structures including caves, mines, and buildings (Schmidt 2003e). |
| Black Hills redbelly snake (*Storeria occipitomaculata pahasapae*) | Yes | Yes | Wet meadows, woodlands, and forest-meadow edge habitat in the Black Hills (Smith and Stephens 2003). |
| Northern leopard frog (*Rana pipiens)* | Yes | Yes | Riparian and wetland areas for tadpoles, subadults, and breeding adults; upland habitats for foraging adults (Smith 2003). |
| Finescale dace (*Phoxinus neogaeus*) | No | No | Small lakes and cool, boggy environments associated with springs or beaver dams (Isaak et al. 2003). |
| Lake chub (*Couesius plumbeus*) | No | No | Streams or lakes with clear, cool water and clean cobble/gravel substrate; only population on the Forest is in Deerfield Reservoir (Isaak et al. 2003). |
| Mountain sucker (*Catostomus platyrhynchus*) | Yes | Yes | 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). |
| Cooper's Mountain snail (*Oreohelix strigosa cooperi*) | No | Yes | Lowland wooded or riparian areas on limestone soils (Frest and Johannes 2002). |
| Regal fritillary (*Speyeria idalia*) | No | No | Tallgrass prairie and extensive grasslands with violets (Marrone 2002). |

### *Bald Eagle (Haliaeetus leucocephalus)*

In the Black Hills, this species is a winter resident (Tallman et al. 2002). Bald eagles have been observed in the project area in winter. There were no records of nesting in the Black Hills until early 2004, when a pair was observed displaying nesting behavior near a lake in the southern Black Hills. The eagles left the area in spring without nesting successfully. Reasons for the nest failure are not known. A second nesting attempt occurred in 2007 in the central Black Hills. Bald eagles have also been documented nesting in Meade County, South Dakota, to the east of the Black Hills. No roost trees or nests have been documented in the project area. The project area is

probably unsuitable for bald eagle nesting due to lack of large water features.

There is one confirmed communal winter roost site in the Black Hills (Staab 2006, pers. comm.). The roost site is approximately 45 miles from the project area near a large lake. The ponderosa pine landscape in the project area provides abundant suitable roost structures that are used on a transitory basis. Transitory roost sites do not appear to be a limiting factor.

Bald eagles occur sporadically in winter and spring across the Forest, and their presence appears to be determined more by the availability of carrion than any other factor. Winter eagle populations in the Black Hills appear to be stable to increasing (USFS 2007).

Direct and Indirect Effects: Alternative 0 would have no direct or indirect effect on bald eagles because no new activities would occur. Bald eagle use of the project area would not be affected. Under Alternatives 1, 2, and 3, proposed activities would have no effect on bald eagles because there are no known or expected eagle nests or traditional winter roost sites in the project area. Transitory roost sites are not a limiting factor in the project area, so removal of any when not in use by bald eagles would not be expected to affect eagle reproduction or survival. If any traditional or transitory roost sites are found in the project area during project layout or implementation, they would be protected from disturbance in accordance with Forest Plan Standard 3101. Habitat for bald eagles would be conserved under all alternatives in accordance with Forest Plan Objective 220. Under all alternatives, bald eagles would continue to be protected in accordance with the Bald and Golden Eagle Protection Act.

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

Determination: Implementation of Alternative 0 would have no impact on the bald eagle. This determination is based on the lack of new activities. Alternative 1, 2, or 3 also would have no impact on the bald eagle because there are no known or expected eagle nests or traditional winter roost sites in the project area. Transitory roost sites are not a limiting factor in the project area or on the Forest, so inadvertent removal of any when not in use by bald eagles would not be expected to affect eagle reproduction or survival. Any traditional or transitory roost sites identified in the Snyder project area during project layout or implementation would be protected from disturbance in accordance with Forest Plan direction. This determination demonstrates compliance with the Bald and Golden Eagle Protection Act.

#### *American Three-toed Woodpecker (Picoides dorsalis)*

The three-toed woodpecker is a montane forest species. Foraging occurs in areas with abundant dead and decaying trees that are infested with wood-boring insects, especially newly burned areas (Hutto and Young 1999; Murphy and Lehnhausen 1998; DeGraaf et al. 1991). Closed-canopy, mature spruce stands are preferred for nesting (Weydemeyer and Weydemeyer 1928), but aspen stands are also used in the Black Hills.

Distribution of this woodpecker in the Black Hills seems to be tied exclusively to mature spruce stands (Panjabi 2005). There is no spruce in the project area. Due to lack of preferred habitat, observations of this species in the Bear Lodge Mountains may be accidental. One three-toed woodpecker has been documented in the Snyder project area (Panjabi 2001). Because preferred habitat is not present, this analysis will concentrate on effects on aspen habitat.

Preferred habitat across the National Forest is above levels specified in Objective 239-LVD (USFS 2006). This project would not prevent attainment of Objective 221.

Direct and Indirect Effects: Alternative 0 would have no immediate effects on three-toed woodpecker. Aspen habitat may decrease over time due to succession to pine. Alternatives 1, 2, and 3 would be expected to benefit aspen habitat through pine removal and prescribed burning. Individual woodpeckers could be affected if occupied nest trees are cut. Alternative 1 proposes the largest area of prescribed fire and aspen-related treatments, and would be expected to produce more areas of suitable habitat.

Alternatives 1, 2, and 3 would contribute toward achievement of Forest Plan Objective 221 by conserving and enhancing potential three-toed woodpecker habitat (aspen forest). None of the alternatives would affect spruce habitat.

Cumulative Effects: The cumulative effects analysis area for three-toed woodpecker is aspen habitat in the project area (approximately 379 acres plus small inclusions in numerous stands). This area is selected because other habitats in the project area are not thought to be used substantially by this species.

Recent and ongoing projects have removed pine from aspen stands on approximately 100 acres. Planned burning may also benefit aspen habitat. Alternative 0 would not add to these effects. Alternatives 1, 2, and 3 would add to cumulative effects by maintaining, expanding, or rejuvenating aspen areas. Alternative 1 would be expected to have the greatest additive effect due to the larger area of burning and aspen enhancement proposed.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS, which determined that three-toed woodpecker is likely to persist on the Forest over the next 50 years if Standards and Guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction.

Determination: Implementation of Alternative 0 would have no impact on the three-toed woodpecker. This determination is based on the lack of new activities in the project area. Implementation of Alternative 1, 2, or 3 may adversely impact individuals but is not likely to result in a loss of viability in the Planning Area nor cause a trend toward federal listing. This determination is based on the lack of preferred habitat in the project area and potential benefits to aspen habitat.

### *Black-backed Woodpecker (Picoides arcticus)*

The black-backed woodpecker is associated with montane coniferous forests, primarily spruce and fir (Anderson 2002, Bent 1939). They also inhabit ponderosa pine (Dykstra et al. 1999) and lodgepole pine (Clark et al. 1989) forests. In northwestern Montana, Weydemeyer and Weydemeyer (1928) found this species to be more abundant in woods that have been logged or burned. In the Black Hills, Dykstra et al. (1999) also observed more black-backed woodpeckers in harvested stands compared to unharvested stands. The authors suggest an increased abundance of woody debris provided foraging sites for this species. A recent study in the Black Hills (Mohren and Anderson 2001) suggests black-backed woodpeckers are found in both immature and mature ponderosa pine stands with high (at least 60%) canopy cover. They are primary cavity nesters, tied to stand-replacing events such as insect outbreaks or large wildfires.

In the Black Hills, black-backed woodpeckers are highly associated with ponderosa pine forests that have been burned within the last five years or have high bark beetle populations. Another important habitat for this woodpecker is healthy ponderosa pine forests that have dense, mature or late-successional structure (SS 4C and 5). This third habitat type is especially important when recently burned areas and high beetle populations are not available (USFS 2006).

At least 24,877 acres of unsalvaged pine burned recently by stand-replacing fires exist across the National Forest, and are available habitat for black-backed woodpeckers (USFS 2006). This is approximately 2.5 times greater than the 10,000 acres called for under Forest Plan Objective 11-03. Bark beetle infestations continue in many locations across the Forest, including sites in the Bear Lodge Mountains. There are 2,995 acres of SS 4C and 641 acres of SS 5 in the project area. Snag density exceeds the minimum levels specified by Objective 211.

This species has been documented in the Snyder project area.

Direct and Indirect Effects: Alternative 0 would have no immediate effects on black-backed woodpecker, but would be expected to increase potential habitat over time as stand density and risk of mountain pine beetle infestation increase. Fire hazard would be highest under this alternative; any wildfires would further improve habitat. This alternative would be expected to maintain or enhance habitat in accordance with Objective 221.

Alternatives 1, 2, and 3 would not affect existing burned areas or SS 5 stands. Individual woodpeckers could be affected if occupied nest trees are cut. Potential for beetle infestation and stand-replacing wildfire would be expected to decrease. Structural stage 4C stands, currently 30 percent of the project area pine acres, would decrease to 17 percent. This would decrease habitat available for this species if burned or infested forest is not present. Incidental cutting of snags for safety reasons would not be expected to substantially reduce snag densities across the project area. Prescribed burning proposed under all alternatives would be expected to produce small areas of suitable habitat where overstory mortality occurs. Alternative 1 proposes by far the largest area of prescribed fire, and would be expected to produce more patches of suitable burned habitat.

Alternatives 1, 2, and 3 would contribute toward achievement of Forest Plan Objective 221 by conserving existing preferred habitat (burned areas). They would decrease the potential for formation of additional preferred habitat by reducing fire hazard and risk of beetle infestation.

Cumulative Effects: The cumulative effects analysis area for black-backed woodpecker is the project area plus a one-mile buffer (approximately 19,000 acres). This area is selected because fire and beetle infestation in pine stands are the main factors in this woodpecker's habitat, and fires or infestations adjacent to the project area could affect the project area and vice versa.

Following the Puma prescribed burn/wildfire, salvage of burned trees took place on about 30 acres in Puma timber sale units. Other recent projects have not included salvage and have had little effect on this aspect of potential black-backed woodpecker habitat, other than a reduction in the potential for stand-replacing wildfire. All of these projects have reduced or are reducing risk of beetle infestation.

Alternative 0 would not add to effects of wildfire, prescribed fire, or timber harvest. Alternatives 1, 2, and 3 would add to the effects of prescribed fire and timber harvest by continuing to reduce fire hazard and risk of beetle infestation. Objective 11-03 regarding burned areas is currently being met across the Forest. None of the alternatives would affect achievement of this objective. Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS, which determined that black-backed woodpecker is likely to persist on the Forest over the next 50 years if Standards and Guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction.

Determination: Implementation of Alternative 0 would have no impact on the black-backed woodpecker. This determination is based on the lack of new activities in the project area. Implementation of Alternative 1, 2, or 3 may adversely impact individuals but is not likely to result in a loss of viability in the Planning Area nor cause a trend toward federal listing. This determination is based on the small potential for loss of nest sites and the continued availability of

burned and infested forest in the project area and across the National Forest in accordance with Forest Plan Objective 11-03.

*Flammulated Owl (Otus flammeolus)*

This species primarily inhabits open ponderosa pine or aspen forests, often with a dense understory of saplings, oak, or other brush. This owl is primarily insectivorous but is known to prey on small mammals and birds as well. Flammulated owls hunt exclusively at night. Their nests are in natural cavities or old woodpecker holes and are reused year after year. Nests sites providing open, mature canopy conditions (open flight path to nest) appear to be preferred (McCallum 1994). Until 2002, this species had not been confirmed in the Black Hills, though an incidental observation was reported in the summer of 1994. At least one flammulated owl was detected by calls during June 2002 in the north-central Black Hills (Panjabi 2003). These observations are not considered proof that a flammulated owl population has established itself in the Black Hills.

This owl has not been documented in the Snyder project area. Potential habitat is abundant across the National Forest, particularly in the northern Black Hills and Bear Lodge Mountains. Habitat trend Forest-wide is stable. No owl surveys have been conducted in the project area, and there is no information suggesting that flammulated owls are established or breeding in the area.

Direct and Indirect Effects: Alternative 0 would have no direct effect on the flammulated owl because no new activities would occur. Mature stands would provide preferred owl habitats. Potential habitat may decrease over time as stands become denser. Snag densities would be expected to remain stable or increase. This alternative would be expected to maintain habitat in accordance with Objective 221.

It is unlikely but possible that Alternatives 1, 2, and 3 could result in loss of individuals or nests if undetected nests are present in treated areas. Under these alternatives, commercial thinning would create preferred nesting and foraging conditions for this species by promoting open, mature stands. Alternative 2 may increase potential flammulated owl habitat the most, as it would increase acreage of structural stage 4A by 42 percent, compared to 32 percent under Alternative 1 and 15 percent under Alternative 3. Alternative 1 proposes prescribed burning on the largest acreage, which may result both in loss of existing snags and creation of new snags as well as an increase in prey availability. Removal of snags would be allowed under all action alternatives for safety reasons. Existing snag densities in the project area exceed Objective 211 requirements; incidental loss of snags would not be expected to substantially reduce densities or limit nesting habitat.

Under Alternatives 1, 2, and 3, reduction of mature pine stand density and retention of most snags would be expected maintain or enhance habitat in accordance with Objective 221.

Cumulative Effects: The cumulative effects analysis area for flammulated owl is NFS lands in the project area. This area was selected for analysis because owls may use any of the habitat types in the project area and because effects on preferred habitat outside the project area are unlikely to overlap with effects in the project area due to the prevalence of this habitat.

Recent and ongoing timber management are increasing potential flammulated owl habitat by reducing density of mature stands on approximately 860 acres, while overstory removal treatments on about 50 acres are decreasing potential habitat (a net increase of 810 acres). Planned prescribed burning (1,450 acres) is expected to positively affect this habitat by decreasing understory density. It is likely that timber harvest and burning may also result in loss of some snags, though stand data show that snag densities in the project area exceed the requirements of Objective 211.

Alternative 0 would not add to these effects. Alternatives 1, 2, and 3 would continue to reduce stand density, increasing suitability of potential habitat. These alternatives would be expected to result in further loss of snags, though incidental cutting of snags for safety reasons would not be expected to substantially reduce snag densities across the project area.

Population viability was analyzed at the National Forest scale in the Phase 2 Forest Plan Amendment FEIS, which determined that possible colonization or establishment of flammulated owls on the National Forest would not be affected if Standards and Guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction.

Determination: All alternatives may adversely impact flammulated owl individuals but are not likely to result in a loss of viability in the Planning Area nor cause a trend toward federal listing. This determination is based on the potential for Alternatives 1, 2, and 3 to result in individual mortality and loss of certain snags.

*Grasshopper Sparrow (Ammodramus savannarum)*

The grasshopper sparrow breeds from southern Canada through the majority of the United States. It winters in the southern United States and Mexico. In Wyoming, this species breeds mainly in the eastern portion of the state, and occurs almost statewide (Cerovski et al. 2004). In South Dakota, there are breeding records throughout the state, including in the Black Hills. This species is considered a locally common migrant and summer resident (Tallman et al. 2002). There are no records of grasshopper sparrows in the project area, though one was observed by RMBO just south of the boundary (Beason et al. 2006).

Grasshopper sparrows have been monitored on the Black Hills since 2002 in cooperation with the Rocky Mountain Bird Observatory (USFS 2006). Data suggest an upward Forest-wide population trend between 2002 and 2004, but this may be a short-term phenomenon due to drought rather than a trend. According to Panjabi (2003), it is possible that Black Hills grasshopper sparrow numbers will decrease in future years as habitat becomes more suitable again on the Great Plains.

Direct and Indirect Effects: Alternative 0 would have no direct impacts because no new activities would occur. Indirect impacts of this alternative may include reduction of grassland areas over time due to pine encroachment. Large-scale beetle infestation or wildfire could create transitory open areas, but these would not be expected to provide high-quality grasshopper sparrow habitat due to the large amounts of coarse woody debris that may be present and probable rapid reforestation.

The action alternatives are unlikely to have discernable effects on grasshopper sparrows or their habitat. Most habitat in the project area is fairly marginal. Burning proposed under Alternative 1 is the only treatment that would take place in grasslands. Burning would not occur during the breeding season and would be expected to have minor positive effects on grasshopper sparrow habitat.

Cumulative Effects: The cumulative effects analysis area for grasshopper sparrow is grassland habitats in the project area, including private land (Map 6, Appendix A). This area was selected for analysis because grasshopper sparrows in the project area are most likely limited to this habitat. Most of the potential habitat is on private land used mainly for livestock pasture.

The North Bearlodge project includes prescribed burning of about 33 acres of grassland in the northern part of the project area. Prescribed fire would be expected to have positive effects on grasshopper sparrow habitat when conducted outside the breeding season. Alternative 0 would not add to this effect. Alternative 1 would add to this effect by burning in additional grassland areas. Other alternatives and proposed activities would not be expected to affect grasslands.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS, which determined that grasshopper sparrows are likely to persist on the Forest over the next 50 years if Standards and Guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction.

Determination: Implementation of Alternative 0 would have no impact on the grasshopper sparrow. This determination is based on the lack of new activities in the project area. Implementation of Alternative 1, 2, or 3 may adversely impact individuals, but is not likely to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing. This determination is based on limited potential for direct or indirect effects.

### *Lewis' Woodpecker (Melanerpes lewis)*

Lewis' woodpeckers inhabit open country with scattered trees. They select habitat based on stand density, snags, ground cover, and insect prey (Tobalske 1997). Open, park-like ponderosa pine forests are believed to be primary breeding habitat (Anderson 2002, DeGraaf et al. 1991). This species is known to nest in burned areas (Anderson 2002). In a ponderosa pine forest in southeastern Wyoming, Linder and Anderson (1998) found 98 percent of nests were surrounded by burned ponderosa pine. Lewis' woodpeckers also inhabit mature cottonwood riparian areas and oak woodlands. They forage by catching flying insects on the wing, and will consume mast and fruit as well (Anderson 2002).

Snags with a minimum diameter of 12 inches are recommended for this species (Thomas et al. 1979). This species has been observed on the Bearlodge District, though not in the Snyder project area. Current snag densities in the project area exceed the requirements of Objective 211.

Direct and Indirect Effects: Burned areas provide the most suitable Lewis' woodpecker habitat. Other than the Puma fire, which burned 55 acres in the project area in 2003, there have been no recent, sizable fires. Burned trees remaining in the Puma fire area may provide suitable habitat. The chance of large, stand-replacing wildfires would be expected to be highest under Alternative 0. None of the alternatives would decrease suitable Lewis' woodpecker habitat. Because Alternative 1 would burn large blocks, it may have the potential to create patches of burned habitat that would become suitable for Lewis' woodpecker within a few years. These alternatives would be expected to maintain or enhance habitat in accordance with Objective 221.

Cumulative Effects: The cumulative effects analysis area for Lewis' woodpecker is the project area plus a one-mile buffer (approximately 19,000 acres). This area is selected because fire is the main factors in this woodpecker's habitat, and fires adjacent to the project area could affect the project area and vice versa.

Recent and ongoing projects have not cut any burned stands and have had little effect on potential Lewis' woodpecker habitat other than a reduction in the potential for stand-replacing fire. The 480-acre Puma fire resulted in an increase in preferred habitat, though about 40 acres of burned timber were salvaged.

Alternative 0 would not add to effects of prescribed fire or timber harvest. Fire hazard would be highest under this alternative; additional wildfires would add to the effect of past burns, positively affecting this species. Alternatives 1, 2, and 3 would add to the effects of prescribed fire and timber harvest by continuing to reduce fire hazard.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS, which determined that Lewis' woodpecker is likely to persist on the Forest over the next 50 years if Standards and Guidelines are followed, and if conditions move towards management objectives. All alternatives would comply with Forest Plan direction.

Determination: Implementation of Alternative 1 would have no impact on Lewis' woodpecker. This determination is based on the lack of new activities in the project area. Implementation of Alternative 1, 2, or 3 may adversely impact individuals but is not likely to result in a loss of viability in the Planning Area nor cause a trend toward federal listing. This determination is based on the small potential for loss of nests and suitable nest sites during project implementation.

### *Northern Goshawk (Accipiter gentilis)*

Goshawks generally occur in mature or old-growth aspen, conifer, or mixed aspen/conifer forests. Nesting occurs primarily in mature and old-growth forest with large trees and dense canopy (structural stages 4B, 4C, and dense 5), indicating that these areas are particularly important to northern goshawks in the western United States (Kennedy 2003, Reynolds et al. 1992, Hayward and Escano 1989, Squires and Ruggiero 1996). Preferred nesting habitat for goshawk in the Black Hills (Bartelt 1977, Erickson 1987) is mature ponderosa pine stands with at least 50 percent canopy closure (i.e., structural stages 4B, 4C, and some 5). Although uncommon, the goshawk has consistently been the most frequently observed accipiter in the Black Hills (Panjabi 2005). Food items in the Black Hills include red squirrels, least chipmunks, rabbits, northern flying squirrels, deer mice, robins, flickers, juncos, and turkeys (Erickson 1987, Bartelt 1977).

The Forest Service conducted goshawk nest surveys in the project area during 2002, 2003, and 2005. There are three known territories and four existing nests. The eastern territory has three existing nests and one deteriorated nest. The middle territory has one deteriorated nest, and the western territory has one existing nest. There is an another nest less than one-half mile outside the project area boundary. Nest area stands have been designated for each territory in accordance with Forest Plan Standard 3108. In 2007, the eastern territory was active and produced one fledgling.

Direct and Indirect Effects: Alternative 0 would have no direct impacts on goshawk because no new activities would occur. Potential indirect impacts include loss of foraging and possibly nesting habitat as both become too dense provide suitable habitat. Additional nesting habitat would be expected to develop over time. There are approximately 7,428 acres of potential nesting habitat in the project area (pine SS 4B, 4C, and 5). Risk of intense wildfires would be expected to increase. Stand-replacing fire could destroy goshawk nests. This alternative would be expected to maintain habitat in accordance with Objective 221 except as foraging habitat becomes overgrown and less suitable, and possibly in the case of a stand-replacing fire.

Activities proposed under Alternatives 1, 2, and 3 could directly affect goshawks if unknown nest trees are cut. No commercial timber harvest would take place in known nest stands under any alternative.

Under Alternative 1, proposed timber harvest would reduce potential nesting habitat (pine SS 4B and 4C) by 1,974 acres (27 percent). Understory vegetation and small pine would be cut in 149 acres of nest stands to improve foraging conditions. Prescribed burning would take place in 227 acres of nest stands and would be expected to enhance nest stand conditions, provide habitat for goshawk prey, and create optimal hunting conditions (Reynolds et al. 1992). Activities proposed within one-half mile of active goshawk nests would not take place between April 1 and August 15. This alternative, as well as all others, would therefore comply with Forest Plan goshawk direction.

Alternative 2 would reduce potential nesting habitat by 2,332 acres (31 percent). Mulching of understory vegetation and prescribed burning in one 59-acre nest stand would be expected to positively affect nesting habitat as described for Alternative 1. Commercial treatment to enhance goshawk foraging habitat is proposed on 180 acres outside the nest stands. This treatment would be expected to improve prey habitat by opening the stands and creating patchy stand structure.

Alternative 3 would reduce potential nesting habitat by 915 acres (12 percent). Mulching of understory vegetation on 90 acres and prescribed burning on 136 acres would be expected to have effects similar to those described above for Alternative 1.

Most of the potential nesting habitat proposed for commercial treatment are currently SS 4B or 4C and would be moved to SS 4A, meaning the potential would exist for the stands to regain 4B characteristics over time. Proposed thinning of dense stands would be expected to decrease suitability as nesting habitat in near term (10-15 years) but may increase suitability over time as tree diameter increases rather than stagnating. Creation of young stands would work towards diversifying age structure so that a variety of habitat is available through time.

Foraging habitat would become more open and diverse under all action alternatives. Group selection cuts (Alternatives 2 and 3) would increase diversity in pine stands by creating one- to three-acre openings that may serve as habitat for prey (Kennedy 2003). Proposed removal of pine from aspen would be expected to maintain or improve foraging habitat. Burning is proposed on the largest area under Alternative 1 and would be expected to positively affect foraging conditions by reducing understory obstructions.

Under Alternatives 1, 2, and 3, lack of effects or positive effects on known nest stands and creation of foraging habitat would be expected to maintain or enhance habitat in accordance with Objective 221.

Cumulative Effects: The cumulative effects analysis area for northern goshawk is the project area plus the goshawk territory that overlaps the project area (approximately 26,000 acres). This area is selected because goshawks may be affected by conditions across their territories.

Recent and ongoing timber sales have decreased suitability of pine stands for goshawk nesting while improving habitats for prey species such as red squirrels and ruffed grouse. Alternative 0 would not add to this effect. Alternatives 1, 2, and 3 would have cumulative effects by decreasing suitability of many stands for goshawk nesting, though effects would comply with Standards and Guidelines and contribute toward Forest-wide objectives regarding structural diversity and natural disturbances. All action alternatives would open up forest understories, acting against the cumulative trend of loss of these foraging areas due to fire suppression and proliferation of oak brush. Future uneven-age management entries under Alternatives 2 and 3 would diversify within-stand structure, which may enhance prey habitat and foraging conditions.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS, which determined that goshawks are likely to persist on the Forest over the next 50 years if Standards and Guidelines are followed, and if conditions move towards management objectives. Alternatives 0, 1, 2, and 3 would comply with Forest Plan direction.

Determination: Implementation of Alternative 0 would have no impact on the northern goshawk. This determination is based on the lack of new activities in the project area. Implementation of Alternative 1, 2, or 3 may adversely impact individual goshawks but is not likely to result in a loss of viability in the Planning Area nor cause a trend toward federal listing. This determination is based on the potential to disrupt goshawk behavior and to modify preferred nesting and foraging habitats.

### *Western Yellow-billed Cuckoo (Coccyzus americanus)*

This species favors moderately dense thickets near watercourses, second-growth woodlands, deserted farmlands overgrown with shrubs and brush, and brushy orchards for habitat. It will also inhabit open woods, avoiding extremely dense woods and high elevations (Haldeman 1980). The nest is a flimsy saucer of twigs placed in a bush or small sapling (Degraaf et al. 1991). There are scattered records in southwest South Dakota but no records in the higher Black Hills (SDOU

1991).

In 2002, a Rocky Mountain Bird Observatory technician observed at least three yellow-billed cuckoos along Beaver Creek in the Snyder project area. It could not be determined whether the birds belonged to the western subspecies, *Coccyzus americanus occidentalis*, or the eastern subspecies. This species is rare but nevertheless apparently occurs in the Bear Lodge Mountains and possibly elsewhere in the Black Hills (Panjabi 2003). Habitat trend appears stable in the northern Black Hills and Bear Lodge Mountains.

Direct and Indirect Effects: Alternative 0 would have no direct effects because no new activities would occur. Potential indirect impacts include loss of nesting and foraging habitat due to increasing pine stand density. This alternative would be expected to maintain habitat in accordance with Objective 221 except possibly as foraging habitat becomes overgrown with pine, decreasing suitability.

Under all action alternatives, individual mortality could occur if occupied nests are affected by proposed activities, though the potential would be low due to lack of mechanized activities in suitable nesting habitat (riparian shrub communities). Proposed activities would open upland forest canopies and allow understory species such as oak and aspen to increase, which may provide marginally suitable habitat. No activities would take place in riparian habitat along Beaver Creek. Prescribed burning proposed under Alternative 1 could have negative effects on habitat for two to three years but would ultimately be expected to enhance hardwood shrubs, possibly improving cuckoo habitat. Alternatives 2 and 3 do not propose burning in riparian habitat but include 111 acres of oak enhancement, which may benefit cuckoo habitat by diversifying oak stand structure. Alternatives 1, 2, and 3 would otherwise have little to no effect on preferred brushy habitat in riparian areas. Habitat would be maintained or enhanced in accordance with Objective 221.

Cumulative Effects: The cumulative effects analysis area for western yellow-billed cuckoo is the project area. This area is selected because this species may use any of the habitat present in the project area, but effects are likely to be limited to the immediate area.

Recent and ongoing timber sales have probably increased bur oak brush in treated areas. Planned aspen restoration (42 acres) and hardwood release (170 acres) under the North Bearlodge and Cub projects, respectively, would be expected to result in moderate increases in habitat suitable for yellow-billed cuckoo. Planned burning near the Reservoir Gulch riparian area under the North Bearlodge project would be expected to add to these effects. Alternative 1 would be expected to have a greater cumulative effect due to proposed burning in potentially suitable habitat.

Population viability was analyzed at the National Forest scale in the Phase 2 Forest Plan Amendment FEIS, which determined that yellow-billed cuckoo is likely to persist on the National Forest over the next 50 years if Standards and Guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction.

Determination: Implementation of Alternative 0 would have no impact on the yellow-billed cuckoo. This determination is based on the lack of new activities in the project area. Implementation of Alternatives 1, 2, or 3 may adversely impact individual western yellow-billed cuckoos but is not likely to result in a loss of viability in the Planning Area nor cause a trend toward federal listing. This determination is based on the small potential for individual mortality or temporary habitat disruption. Overall, proposed treatments would be expected to benefit this species.

*American Marten (Martes americana)*

In the Black Hills, marten primarily use spruce stands as habitat. In other parts of North America, however, they can be found in coniferous stands with mixed hardwoods and canopy coverage of at least 30 percent (Bennett and Samson 1984). There is evidence that martens use pine habitat in the Black Hills (USFS 2005). The Bear Lodge Mountains have no spruce or resident marten population but provide habitat that may be valuable for dispersing marten (Buskirk 2002). Older, more dominant marten are known to stay in the best habitat, pushing younger marten into pine areas (Buskirk 2002). Tracks thought to be those of marten have been observed throughout the Bearlodge District and in the project area in the last five years.

Marten are active year-round (Buskirk 2002). The most critical time period for marten is winter and early spring, when there are high energy demands and reduced prey availability (Bennett and Samson 1984).

Direct and Indirect Effects: Alternative 0 would have no direct impacts on marten because no new activities would occur. Indirect impacts include continued forest succession, which would be expected to increase suitable decadent pine habitat.

Direct effects of Alternatives 1, 2, and 3 may include individual mortality or loss of resting or den sites. Indirect impacts may include habitat loss or disturbance due to logging, mechanical thinning, road construction, and prescribed burning. Proposed vegetation treatments could benefit summer foraging habitat by enhancing hardwood habitats and creating a hardwood understory below the ponderosa pine. Loss of canopy cover and forest floor debris, which are used as protection from predators, may negatively affect prey habitat.

Cumulative Effects: The cumulative effects analysis area for American marten is forested habitats in the project area (about 16,400 acres). This area is selected because marten would be expected to use any forested habitat while dispersing.

Recent and ongoing timber sales have probably decreased suitability of pine stands for use by marten through reduction of canopy cover and, in some areas, decrease of woody debris. Conversely, decreasing pine canopy cover in this area often leads to an increase in oak brush, which could be used by marten as cover in summer. Actions taken under the Cub and North Bearlodge projects to enhance hardwood habitat would be expected to enhance or expand potential marten habitat.

Alternative 0 would not add to these effects. Alternatives 1, 2, and 3 would add to cumulative effects by decreasing canopy cover in treated pine stands. All action alternatives would open up forest understories, which would decrease suitability for use by marten at least until oak brush grows back.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS, which determined that American marten is likely to persist on the Forest over the next 50 years if Standards and Guidelines are followed, and if conditions move towards management objectives. Alternatives 0, 1, 2, and 3 would comply with Forest Plan direction.

Determination: Implementation of Alternative 0 would have no impact on the marten. This determination is based on the lack of new activities in the project area. Implementation of Alternative 1, 2, or 3 may adversely impact marten but is not likely to result in a loss of viability in the Planning Area nor cause a trend toward federal listing. This determination is based on the potential to disrupt dispersal habitat and the lack of preferred spruce habitat.

### *Fringed Myotis (Myotis thysanodes)*

This subspecies of the fringed bat occurs only in certain montane areas of South Dakota and Wyoming (Higgins et al. 2000). In the Black Hills this species has been found to primarily use rock crevices for daytime roosting (SDBWG 2004, Tigner and Dowd Stukel 2003). They also use snags for maternity and day roosts and live pine trees for day roost sites.

In South Dakota, fringed myotis bats occur primarily in caves of the Black Hills and Badlands. These bats forage in open pine stands, riparian habitat, and near forest edge habitat (Keinath 2004), roosting near entrances to mines and caves that are used for hibernating. They are active from April through September (Barbour and Davis 1969). Current snag densities in the project area exceed the requirements of Objective 211.

Disturbance by humans (especially in hibernacula and maternity roosts) is the primary threat to the survival of these animals (Schmidt 2003d, Tigner and Stukel 2003, Barbour and Davis 1969). There are no known hibernacula or maternity roosts within the Snyder project area.

Fringed myotis have been reported on Bearlodge Ranger District, though not in the project area. They are year-round Black Hills residents (SDBWG 2004). In 2003, five hibernacula were monitored across the Forest, with this species found at one location. Because this species tends to hibernate individually, most often in cracks and crevices, and to change roost sites often in summer, it can be difficult to locate; consequently, few observations have occurred despite monitoring efforts. In 2003, the Forest installed or repaired gates at seven roost sites to protect the species from human disturbance, and in 2005 Bearlodge District re-opened a mine and installed a gate to protect the habitat for use by bats. This protection reflects an upward trend in known/potential bat habitat and demonstrates active management to successfully accomplish the intent of Objective 221 (USFS 2004).

Direct and Indirect Effects: Alternative 0 would have no direct effects because no new activities would occur. Potential indirect impacts include loss of foraging habitat due to increasing pine stand density and encroachment of pine into meadows and riparian areas. Risk of potential negative impacts from wildfire, both direct (mortality) and indirect (roost habitat loss), would be greatest under this alternative.

There are no caves or mines in the project area, so none of the action alternatives would affect potential hibernacula. Proposed harvest of mature trees could result in direct impacts (mortality) and indirect impacts (loss of day or maternity roost habitat). Except in the areas proposed for overstory removal and patch cuts, harvested areas would remain forested with mature trees that would continue to provide potential roosting habitat. Removal of snags for safety reasons may have similar direct and indirect effects. Existing snag densities in the project area exceed Objective 211 requirements; incidental loss of snags would not be expected to substantially reduce densities or limit roosting habitat. Under Alternatives 1, 2, and 3, lack of effects on caves or mines, creation of open pine habitat, and retention of most snags would be expected to maintain or enhance habitat in accordance with Objective 221.

Cumulative Effects: The cumulative effects analysis area for fringed myotis is NFS lands in the project area (13,084 acres). This area is selected because fringed myotis may use any of the forested or open habitats in the project area.

Impacts of past, present, and foreseeable activities on maternity, hibernating, and roosting habitat are likely to be minimal due to a lack of caves and mines in the analysis area. Individuals and roosting habitat could have been affected by cutting of live trees and snags. Enhancement of hardwood stands and meadows completed under the North Bearlodge and Cub projects have improved potential foraging habitat for this species.

None of the alternatives would affect availability of undisturbed caves and mines, this species' most critical and vulnerable habitat. Alternative 0 would not add to positive effects on foraging habitat or negative effects on roosting habitat. Alternatives 1, 2, and 3 would add to these effects by reducing pine stand density. Alternative 1 and to a lesser degree Alternatives 2 and 3 would further improve foraging habitat by removing pine from hardwood areas. Loss of potential roost snags would add to cumulative effects of other timber harvest and burning actions, though snag density would not be expected to decrease below Objective 211 levels across the analysis area.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS, which determined that this species is likely to persist on the Forest over the next 50 years if Standards and Guidelines are followed and if conditions move towards management objectives. All action alternatives would comply with Forest Plan Standards and Guidelines and would not prevent attainment of Objective 221.

Determination: Implementation of Alternative 0 would have no impact on fringed myotis. This determination is based on the lack of new activities in the project area. Implementation of Alternative 1, 2, or 3 may adversely impact individuals but is not likely to result in a loss of viability on the Planning Area nor cause a trend toward federal listing. This determination is based on the possibility that individual bats could be harmed, though this is considered unlikely due to lack of caves and mines that could serve as hibernacula.

#### *Townsend's Big-eared Bat (Corynorhinus townsendii)*

This bat inhabits shrub-steppe, forest edge, pinyon juniper, and dry coniferous forest types (Higgins et al. 2000). It usually roosts in caves, mine shafts, rock outcrops, lava tubes, and occasionally in buildings. This bat depends on underground roost structures year round (Schmidt 2003e, SDBWG 2004). Townsend's big-eared bat roosts near entrances to mines and caves that are used for hibernating, preferably those with high humidity and cool temperatures. Tree cavities may occasionally be used for daytime roosting, although this has not been documented in the Black Hills. Current snag densities in the project area exceed the requirements of Objective 211.

In the Black Hills, more individuals of this species have been found in hibernacula than any other species (USFS 2005c). This bat has been documented on Bearlodge Ranger District but not in the Snyder project area. Winter surveying at one Black Hills cave yielded 300 Townsend's bats in 2000, 218 in 2001, 235 in 2002, and 260 in 2003 (USFS 2004). Forest-wide populations appear to be relatively stable or slightly increasing (USFS 2004). The Forest has installed or repaired gates at a number of mines and caves in recent years. This protection represents improvement of known and potential bat habitat and demonstrates active management to successfully accomplish the intent of Forest Plan Objective 221 (USFS 2004).

Disturbance by humans, especially in hibernacula and maternity roosts, is the primary threat to the survival of these animals (Tigner and Dowd Stukel 2003, Schmidt 2003e, Barbour and Davis 1969).

Direct and Indirect Effects: Alternative 0 would have no direct effects because no new activities would occur. Potential indirect impacts include loss of foraging habitat due to increasing pine stand density and encroachment of pine into meadows and riparian areas. Risk of potential negative impacts from wildfire, both direct (mortality) and indirect (roost habitat loss), would be greatest under this alternative.

There are no caves or mines in the project area, so none of the action alternatives would affect potential hibernacula or maternity roosts. Proposed harvest of mature trees could result in direct impacts (mortality) and indirect impacts (loss of day roost habitat). Removal of snags for safety reasons may have similar direct and indirect effects. Except in the areas proposed for overstory removal and patch cuts, harvested areas would remain forested with mature trees that would

continue to provide potential roosting habitat. Proposed group selections (the most under Alternative 3, followed by Alternative 2) and patch cuts (Alternative 1/Alternative 3) would increase edge habitat, which is favored foraging habitat for big-eared bats. Prescribed burning, proposed on the largest area under Alternative 1, may enhance foraging habitat through creation of small openings and rejuvenation of hardwoods. Existing snag densities in the project area exceed Objective 211 requirements; incidental loss of snags would not be expected to substantially reduce densities or limit roosting habitat. Under Alternatives 1, 2, and 3, lack of effects on caves or mines, creation of open pine habitat, and retention of most snags would be expected to maintain or enhance habitat in accordance with Objective 221.

Cumulative Effects: The cumulative effects analysis area for Townsend's big-eared bat is NFS lands in the project area (13,084 acres). This area is selected because big-eared bats may use any of the forested or open habitats in the project area.

Impacts of past, present, and foreseeable activities on maternity, hibernating, and roosting habitat are likely to be minimal due to a lack of caves and mines in the analysis area. Individuals and roosting habitat could have been affected by cutting of live trees and snags. Enhancement of hardwood stands and meadows completed under the North Bearlodge and Cub projects have improved potential foraging habitat for this species.

None of the alternatives would affect availability of undisturbed caves and mines, this species' most critical and vulnerable habitat. Alternative 0 would not add to positive effects on foraging habitat or negative effects on roosting habitat. Alternatives 1, 2, and 3 would add to these effects by reducing pine stand density. Alternative 1 and to a lesser degree Alternatives 2 and 3 would further improve foraging habitat by removing pine from hardwood areas. Loss of potential roost snags would add to cumulative effects of other timber harvest and burning actions, though snag density would not be expected to decrease below Objective 211 levels across the analysis area.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS, which determined that this species is likely to persist on the Forest over the next 50 years if Standards and Guidelines are followed and if conditions move towards management objectives. All action alternatives would comply with Forest Plan Standards and Guidelines and would not prevent attainment of Objective 221.

Determination: Implementation of Alternative 0 would have no impact on Townsend's big-eared bat. This determination is based on the lack of new activities in the project area. Implementation of Alternative 1, 2, or 3 may adversely impact individuals but is not likely to result in a loss of viability on the Planning Area nor cause a trend toward federal listing. This determination is based on the possibility that individual bats could be harmed, though this is considered unlikely due to lack of caves and mines that could serve as hibernacula and roosts.

#### *Black Hills Redbelly Snake (Storeria occipitomaculata pahasapae)*

This species occurs in moist woodlands with adequate cover, such as rocks, logs, tree bark, or leaf litter. This snake feeds on slugs, earthworms, and soft-bodied insects (Smith and Stephens 2003). It is often found in or adjacent to riparian habitat and is inactive from November through March (Behler and King 1979). Black Hills redbelly snake is found in the Black Hills of South Dakota and Wyoming and in the Bear Lodge Mountains (Ashton and Dowd 1991). The species is usually found in riparian areas, mesic meadows, or meadow fringes near rocky outcrops and under various cover objects (Smith and Stephens 2003). Redbelly snakes are vulnerable to mortality from vehicles, especially where roads exist between riparian areas and adjacent rocky slopes. This species has been documented in the Snyder project area along Fawn Creek. Habitat trend Forest-wide appears to be stable to upward (USFS 2006).

Direct and Indirect Effects: Alternative 0 would have no direct effect on the Black Hills redbelly snake because no new activities would occur. Continued use of motorized vehicles on unclassified roads, especially those adjacent to riparian areas, and off roads may damage habitat and cause individual mortality. Except for this effect, Alternative 0 would be expected to maintain habitat in accordance with Objective 221.

All action alternatives would protect primary habitat in riparian areas and other water influence zones. Minimal treatment is proposed in these areas, and they would be protected through implementation of Regional Watershed Conservation Practices. Construction of an exclosure fence in Lucky Gulch would protect riparian habitat from livestock use. Road construction is not proposed in drainage bottoms or between moist areas and rock outcrops. Displacement of individuals may occur as down woody debris may be moved during skidding operations, but debris would not be removed from the site. Down woody debris would be maintained as required by Forest Plan Standard 2308. No barriers between moist areas and rock outcrops would be created (Standard 3116).

Prescribed burning may temporarily impact snake distribution by affecting ground vegetation characteristics and causing snake dispersal, increasing vulnerability to predation and vehicles. Alternative 1 proposes prescribed fire on 4,808 acres, substantially more than Alternative 2 or 3. Road decommissioning and area closure would be expected to reduce the potential for vehicle-caused snake mortality and disturbance of vegetation and woody debris. Decommissioning of roads U580047, U590062, U590064, U610025, U620036, and part of NFSR 859.1 may have additional benefits due to their location in drainage bottoms. No actions are proposed in the Fawn Creek water influence zone, but the main threat to redbelly snakes in that location is probably NFSR 832.1, a main gravel road that parallels the creek. Minor maintenance proposed for this road would not be expected to have any effects on redbelly snakes beyond those that may already be occurring.

Alternatives 1, 2, and 3 would maintain or enhance redbelly snake habitat in accordance with Objective 221 through road decommissioning and implementation of Watershed Conservation Practices (USFS 2006c). These alternatives may contribute additionally toward achievement of this objective by enhancing hardwood habitat.

Cumulative Effects: The cumulative effects analysis area for Black Hills redbelly snake is the project area. This area is selected because snakes may use any part of the project area, though they are most likely to be found in or near riparian areas or hardwood stands.

Recent and ongoing projects have had minimal effects on riparian areas but could affect snakes in pine and aspen stands where commercial timber harvest has taken or will take place. Planned prescribed burns would be expected to have little effect on riparian areas. Livestock grazing tends to decrease cover provided by grasses and forbs and decreases woody debris (hiding cover) in riparian areas through trampling. Grazing system changes and spring fencing in the Farrall Allotment (North Zone Range 2005 decision) would be expected to reduce these effects on potential redbelly snake habitat. Revision of the Beaver Creek Allotment grazing management plan is scheduled for 2008 and may modify use to achieve desired range conditions and Forest Plan objectives.

Alternative 0 would not add to these effects. Alternatives 1, 2, and 3 may add to effects on snakes, mainly in upland areas, but would be expected to decrease overall effects in drainages due to road decommissioning and construction of an exclosure in Lucky Gulch. Timber harvest and burning could increase forage production in transitory upland range, which may decrease grazing pressure in drainage-bottom meadows; this may result in fewer impacts on snakes and their habitat.

Determination: Implementation of Alternative 0, 1, 2, or 3 may adversely impact individual redbelly snakes but is not likely to result in a loss of viability in the Planning Area nor cause a trend toward federal listing. This determination is based on potential for direct effects from proposed activities or existing motorized vehicle use patterns, avoidance of riparian habitats, and application of conservation measures intended to avoid indirect effects on riparian habitats.

### *Northern Leopard Frog (Rana pipiens)*

The northern leopard frog is a widespread and formerly abundant frog that previously had one of the largest ranges of any amphibian in North America (Stebbins 1985, Conant and Collins 1991). This frog is found in a variety of habitats, from freshwater sites with profuse vegetation to brackish marshes and moist fields. This species is primarily nocturnal and is found throughout northern North America except on the West Coast (Behler and King 1979). The leopard frog is a pond-breeding amphibian that overwinters underwater beneath the ice of streams, lakes, and ponds (Smith 2003). It is common throughout Wyoming, except in the extreme northwest corner of the state (Baxter and Stone 1980).

Leopard frogs are common in the Black Hills (Smith 2003) and occur throughout Bearlodge District in permanent and semi-permanent water sources. During the spring they can be found in ephemeral pools and streams. They have been documented in the Snyder area in many drainages and moist areas. Standard 3104 reduces risk of adverse impacts by protecting habitat for sensitive species requiring moist soil conditions. Habitat trend forest-wide appears to be stable.

Direct and Indirect Effects: Alternative 0 would have no direct effects on the northern leopard frog because no new activities would occur. Potential for large, stand-replacing wildfires would be highest under this alternative. A fire with severe effects on soils would be expected to negatively affect leopard frogs and their habitat. Use of motorized vehicles off roads and on unauthorized roads would continue and may affect frogs where it occurs near springs and in the few perennial and intermittent stream channels.

Treatments proposed under the action alternatives would avoid suitable aquatic habitats through implementation of Regional Watershed Conservation Practices (USFS 2006c). With application of design criteria and mitigation, these activities would be expected to cause minimal sedimentation and subsequent effects on frog habitat. All water sources and their associated riparian areas are protected under the Clean Water Act and Regional WCPs. Construction of an exclosure fence in Lucky Gulch would protect this riparian habitat from livestock use. Roads U580047, U590062, U590064, U610025, U610036, and part of NFSR 859.1 are located in drainage bottoms and would be decommissioned, which would be expected to enhance this habitat by reducing soil disturbance and increasing vegetation cover. Construction of new roads is not proposed in drainage bottoms. Proposed timber harvest, road work, and prescribed fire could affect individual frogs using upland habitats. Alternative 3 proposes mechanical treatments on the fewest acres among the action alternatives, and may therefore have less potential to affect frogs using upland areas. The potential for prescribed fire to affect frogs would be expected to be limited; frogs are most likely to be found far from water in summer (Smith 2003), and prescribed fire is generally conducted only in early spring or late fall. Construction of fire control lines may happen at other times of year, however, and could affect individual frogs.

Alternatives 1, 2, and 3 would maintain or enhance habitat in accordance with Objective 221 through road decommissioning and implementation of WCPs.

Cumulative Effects: The cumulative effects analysis area for northern leopard frog is the project area. This area is selected because frogs may use any part of the project area, though most of the year they are likely to be found near surface water.

Recent and ongoing activities have had minimal effects on surface water but could have affected frogs in upland areas. Ongoing livestock grazing could have detrimental impacts where use is heavy (Backlund *in* USFS 2000). Many of the springs in the project area are fenced and/or diverted to water tanks; in these locations, livestock should have little direct effect on surface water. Springs, seeps, and other wet areas without fences often show signs of livestock trampling. Grazing system changes and spring fencing in the Farrall Allotment (North Zone Range 2005 decision) would be expected to reduce these effects on potential redbelly snake habitat. Revision of the Beaver Creek Allotment grazing management plan is scheduled for 2008 and may modify use to achieve desired range conditions and Forest Plan objectives.

Alternative 0 would not add to these effects. Alternatives 1, 2, and 3 may add to effects on frogs using upland habitats but would be expected to decrease overall effects in drainages due to road decommissioning and construction of the exclosure in Lucky Gulch. Timber harvest and burning would be expected to increase forage production in transitory upland range, which may decrease grazing pressure in drainage-bottom meadows; this may result in fewer impacts on frogs and their habitat. With application of Watershed Conservation Practices and other design criteria, proposed activities are not expected to add to other effects.

A total of 73 leopard frog index sites have been monitored on the Black Hills National Forest since 2001. There was no previous systematic sampling at most of these waters; therefore, the data are considered baseline. Current leopard frog distribution appears reasonably high. Sixty percent (43/73) of all index sites were occupied by the species in 2004, the most recent year of full-scale monitoring (USFS 2004).

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS, which determined that leopard frog is likely to persist on the Forest over the next 50 years if Standards and Guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction.

Determination: Implementation of Alternative 0, 1, 2, or 3 may adversely impact individual frogs but is not likely to result in a loss of viability in the Planning Area nor cause a trend toward federal listing. This determination is based on limited potential for direct effects due to proposed activities or existing motorized vehicle use patterns, avoidance of aquatic habitats, and application of conservation measures intended to avoid indirect effects on aquatic habitats.

### *Mountain Sucker (Catostomus platyrhynchus)*

Mountain suckers are native to the Black Hills and occur most often in cool, clear mountain streams with moderate water velocities. Stream substrate associated with mountain sucker habitat varies widely and ranges from mud/sand to gravel/boulders, although cobbles are most common. The mountain sucker has been documented in Beaver Creek upstream of the Snyder project area. Habitat loss and stream fragmentation has contributed to population declines (Belica and Nibbelink 2006).

Direct/Indirect Effects: None of the action alternatives propose treatments or activities that are of the intensity or magnitude to alter streamflow regimes, water quality or channel morphology (see the Water Resources section for additional details). The amount and location of road decommissioning is similar across the range of action alternatives and would be expected to reduce sediment input into streams. Proposed road maintenance and reconstruction would disturb road surface material, making it more susceptible to erosion for two to three years, but these activities would be expected to improve the surface water drainage of roads and ultimately reduce sediment input into streams. Forest Plan Standards and Guidelines and Regional Watershed Conservation Practices would be implemented to avoid and/or minimize adverse affects where ground-disturbing activities are proposed in close proximity to streamcourses. No new instream

barriers are proposed that would further fragment the stream network.

Cumulative Effects: The cumulative effects analysis area for mountain sucker is the seventh-level watersheds that overlap the project area (Map 1). This area was selected because it represents the stream habitat and connectivity issues most closely associated with this project area.

The direct and indirect effects resulting from implementation of the action alternatives would be expected to have a negligible incremental impact on fisheries resources, such that the cumulative effect when added to past, present, and reasonably foreseeable actions would not differ from the no action alternative. No dramatic changes in aquatic habitat conditions are likely to occur that would alter the current level of non-native gamefish management to the possible detriment of the mountain sucker. All alternatives would be expected to contribute toward achievement of Objectives 217, 219, and 221.

Determination: Alternatives 1, 2 and 3 would have no impact on mountain sucker due to the level of anticipated direct and indirect effects on water quality/quantity, stream fragmentation, and riparian habitat condition.

### *Cooper's Mountainsnail (Oreohelix strigosa cooperi)*

The Cooper's mountainsnail is found in moist environments in lowland wooded areas, riparian toe slopes, or talus slopes, generally with north to east exposure. This snail is loosely tied to calcareous soils and limestone outcrops. It forages on decayed deciduous tree leaves and degraded herbaceous vegetation. In suitable habitat, this snail can be found crawling on decaying woody debris (Frest and Johannes 1993, 2000, 2002).

Currently identified distribution is in the Black Hills of South Dakota and Wyoming, mainly in Spearfish Canyon, the upper reaches of the Rapid Creek drainage, Higgins Gulch, Prospect Gulch, and Grand Canyon (Frest and Johannes 2002). This species may also be found in other drainages in the northwest region of the Black Hills. Threats include habitat loss due to logging, grazing, forest fires, road construction, and other disturbance that reduce the moist microclimate necessary for this species. Herbicides and pesticides also negatively affect this species. Snails often depend on undisturbed forest and riparian habitat, making them especially vulnerable to the effects of habitat degradation and environmental change (Frest and Johannes 2002).

This snail has not been documented in the Snyder project area. Preferred habitat coincides with suitable sensitive plant habitat (see page 47).

Direct and Indirect Effects: Alternative 0 would have no direct effect on the Cooper's mountainsnail because no new activities would occur. Fire hazard would be highest under this alternative, and a stand-replacing fire could negatively affect snails and their habitat. This alternative would be expected to maintain habitat in accordance with Objective 221 except in the event of a stand-replacing fire.

Activities proposed under the action alternatives would be conducted in accordance with Standard 3103. Treatments prescribed under Alternatives 1, 2, and 3 may affect this species if unknown colonies occur in treatment areas. Unoccupied potential habitats that occur in the treatment units may be altered by soil compaction, increased insolation, and alterations to the detrital layer. Preferred snail habitat would be excluded from all treatments except prescribed burning under Alternative 1. Prescribed burning may affect snails, though probably to a lesser degree than high-intensity wildfire. Any colonies discovered during implementation would be protected with disturbance-free buffer zones.

Under Alternatives 1, 2, and 3, most suitable habitat would be excluded from treatment and newly discovered colonies would be protected. This would maintain or enhance habitat in accordance with Objective 221.

Cumulative Effects: The cumulative effects analysis area for Cooper's mountainsnail is the project area. This area is selected because snails may use any part of the project area.

Recent and ongoing projects could affect snails in treated areas and along roads. Planned prescribed fire could affect any snails that may occur where higher-intensity burning takes place. These burns are planned for early spring or late fall, as opposed to the height of summer when wildfires are more likely to occur. Soil conditions would be cooler and damper than in summer, and burn intensity should generally less than would be expected during a wildfire, so the effects on snails would be expected to be much less than those of a typical wildfire.

Livestock grazing may affect snail habitat through trampling. Grazing system changes in the Farrall Allotment (North Zone Range 2005 decision) may reduce this effect on potential snail habitat. Revision of the Beaver Creek Allotment grazing management plan is scheduled for 2008 and may modify use to achieve desired range conditions and Forest Plan objectives.

Alternative 0 would not immediately add to cumulative effects on this species. This alternative would retain greater potential for stand-replacing wildfire, which could add to cumulative effects by burning snail habitat at high intensity. Alternatives 1, 2, and 3 may result in cumulative effects if unknown snail colonies are disturbed by mechanical treatments or prescribed fire. Because any newly discovered colonies would be protected and the majority of suitable habitat would be excluded from treatment, these alternatives would be expected to have negligible additive effects.

Determination: Implementation of Alternative 0, 1, 2, or 3 may adversely impact individual Cooper's mountainsnails but is not likely to result in a loss of viability in the Planning Area nor cause a trend toward federal listing. This determination is based on potential for direct effects from proposed activities and avoidance of the known colony and most suitable habitats.

### Management Indicator Species

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

Table 30 lists MIS for the Forest, as provided in the Forest Plan and modified by the Phase 2 Amendment. Each species was evaluated for its potential to be affected by the proposed project. Species without suitable habitat present in the project area were not evaluated further.

**Table 30: Management Indicator Species**

| Species | Documented in Project Area | Habitat in Project Area | Habitat Represented |
|---|---|---|---|
| Black-backed woodpecker *(Picoides articus)* | Yes | Yes | Closed pine canopy, tree cavities |
| Brown creeper *(Certhia americana)* | Yes | Yes | Ponderosa pine late seral stages, tree cavities |
| White-tailed deer *(Odocoileus virginianus)* | Yes | Yes | Early-succession pine |
| Ruffed grouse *(Bonasa umbellus)* | Yes | Yes | Aspen forest |
| Mountain sucker *(Catostomus platyrhynchus)* | Yes | Yes | Cold water aquatic habitats |
| Beaver *(Castor canadensis)* | Yes | Yes | Riparian and hardwoods |
| Golden-crowned kinglet *(Regulus satrapa)* | Yes | Yes | White spruce forest (winters in hardwoods) |
| Song sparrow | Yes | Yes | Riparian |

| Species | Documented in Project Area | Habitat in Project Area | Habitat Represented |
|---|---|---|---|
| *(Melospiza melodia)* | | | |
| Grasshopper sparrow *(Ammodramus savannarum)* | No | Yes | Grasslands |

### *Black-backed Woodpecker (Picoides arcticus)*

See discussion of black-backed woodpecker on page 77.

The black-backed woodpecker was selected as an MIS to evaluate the effects of Forest Plan implementation and natural change on the ability of the Forest to support species that rely on disturbances such as wildfire and beetle infestation. Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS, which determined that the black-backed woodpecker is likely to persist on the Forest over the next 50 years if Standards and Guidelines are followed, and if conditions move towards management objectives. Alternatives 1, 2, and 3 would contribute toward achievement of Forest Plan Objective 221 by conserving existing preferred habitat (burned areas). They would decrease the potential for formation of additional preferred habitat by reducing fire hazard and risk of beetle infestation.

### *Brown Creeper (Certhia americana)*

The brown creeper was selected as an MIS to evaluate the effects of Forest Plan implementation and natural change on the ability of the Forest to support species that rely on mature and late-succession forest and snags. Forest characteristics preferred by creepers include large, unfragmented, mature, and old-growth stands with high canopy coverage and high densities of large trees and snags (Hejl et al. 2002).

Five years of RMBO data suggest the brown creeper is well distributed throughout the Black Hills (USFS 2006). Overall, the species occurs in low densities across the Forest, but is most abundant in late-succession pine forests and white spruce habitats. Populations across the Forest have varied over the last five years of monitoring with no obvious trend. Habitat trend appears to be stable, with a less than one percent decrease documented in the last 11 years (USFS 2006).

This species has been documented in the Snyder project area. Preferred habitat in the form of pine SS 4C and 5 occurs on 3,636 acres (37 percent of the pine acres in the project area). There is no spruce in the project area.

Direct and Indirect Effects: Alternative 0 would have no direct effects because no new activities would occur. Potential indirect effects include an increase in nesting and foraging habitat over time as forest matures and becomes denser. Snag habitat would not be affected. This alternative is likely to be the most beneficial for brown creepers. Risk of a stand-replacing wildfire would be highest under this alternative, and such an event would reduce habitat suitability for this species (Kotliar et al. 2002). The dense conditions of even-aged stands makes them susceptible to mountain pine beetle outbreaks, which are desirable for brown creeper in small patches due to the resulting increase in snag densities, but can quickly become widespread with the potential to eliminate large tracts of suitable habitat.

Alternatives 1, 2, and 3 would comply with Forest Plan direction and contribute toward achievement of Objective 238a. Further discussion of consistency with Forest Plan direction is included in the wildlife specialist's report.

Under Alternatives 1, 2, and 3, proposed treatments would reduce acreage of dense, mature pine stands (**Table 31**). Suitability of treated areas for brown creeper would decrease. Inadvertent loss of some individual birds or nests is possible under these alternatives if active nests are present in

treated areas. Removal of mature trees in treatment units may decrease the availability of nesting trees. This effect may be most likely to occur under Alternative 2, which proposes commercial timber harvest in the most SS 4C stands. Under all action alternatives, cutting of snags would generally be prohibited except to protect worker safety. For further discussion of effects on snags, see page 62.

**Table 31: Potential Impacts on Brown Creeper Habitat**

| Measure | Alternative 0 | | Alternative 1 | | Alternative 2 | | Alternative 3 | |
|---|---|---|---|---|---|---|---|---|
| | Acres | % | Acres | % | Acres | % | Acres | % |
| Preferred Habitat (% of pine ac) | 3,636 | 37 | 2,325 | 25 | 2,746 | 28 | 3,155 | 32 |
| Decrease in preferred habitat | 0 | 0 | 1,311 | 36 | 890 | 25 | 481 | 13 |
| Potential Impact greatest (1) - least (4) | 4 | | 1 | | 2 | | 3 | |

Cumulative Effects: The cumulative effects analysis area for brown creeper is ponderosa pine habitat in the project area (9,885 acres). This area is selected because brown creepers are associated with pine and spruce in the Black Hills, and there is no spruce in the project area. The time span for the cumulative effects analysis is from 1990 to 2018 to account for past activities that are still affecting pine habitat and completion of all activities included in the Snyder proposals.

Recent and ongoing timber sales have reduced pine stand density. No structural stage 5 has been treated. These actions did not affect existing brown creeper habitat, but reduced density or set back succession in moderately dense, mature stands that could have developed into SS 4C or 5. Planned prescribed burns will take place primarily in stands that already have low to moderate density, so effects on brown creeper habitat would be minimal.

Alternative 0 would not add to these cumulative effects. Forest succession and stand density would continue to increase in the absence of disturbance events. The action alternatives would add to cumulative effects by decreasing density of preferred brown creeper habitat. While acreage of SS 4C stands would decrease across the project area, Alternatives 1, 2, and 3 would contribute toward achievement of Forest-wide Objective 238a by generally moving structural stage distribution toward the desired distribution across the management areas.

Brown creeper was selected as an MIS to evaluate the effects of Forest Plan implementation and natural change on the ability of the National Forest to support species that rely on mature and late-successional forest and snags. Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS, which determined that brown creepers are likely to persist on the Forest over the next 50 years if Standards and Guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction and contribute toward achievement of Objective 238a.

### *White-tailed Deer (Odocoileus virginianus)*

White-tailed deer are common in the project area. In the Black Hills, white-tailed deer inhabit a variety of forest types and structural stages. The Forest Plan, as amended, designated the white-tailed deer as an MIS for early-succession ponderosa pine forests. The Black Hills white-tailed deer population increased between 2000 and 2004 (USFS 2007). Harvest statistics and Wyoming Game and Fish Department observations suggest that white-tailed deer populations dropped in 2004, but rebounded in 2005. Modeling indicated that the 2005 post-hunting season population was 36,917 animals, slightly below the state objective, but the model may not produce reliable estimates (Sandrini 2006). Forest-wide summer habitat trend is upward, and winter habitat trend is stable to slightly downward. The Forest is almost fully meeting Objective 217. The Forest is meeting Objective 238a with respect to summer habitat. Winter habitat may be declining slightly

(USFS 2007).

Forage production can be increased through prescribed burning, thinning, and pine litter reduction (DePerno 1998; Hippensteel 2000). Prescribed burning of browse species such as chokecherry, serviceberry, and aspen can be beneficial since these species are prolific root or crown sprouters. Thinning ponderosa pine stands allows more light to reach the forest floor than in unthinned stands and increases forage production (Uresk and Severson 1998). In mixed oak-pine stands, selective removal of pine trees may enhance reproduction of oak and associated shrubs (Sieg and Severson 1996).

Direct and Indirect Effects: Alternative 0 would have no direct effects because no new activities would occur. Potential indirect effects include forest succession that favors pine and contributes to loss of aspen. In the absence of disturbance events, preferred habitat would be expected to decrease under this alternative.

Proposed treatments and effects relevant to white-tailed deer are displayed in **Table 32**.

**Table 32: Effects on Components of White-tailed Deer Habitat**

| Measure | Alternative | | | |
|---|---|---|---|---|
| | 0 | 1 | 2 | 3 |
| Enhancement of aspen habitat (acres) | 0 | 290 | 60 | 40 |
| Prescribed burning (acres) | 0 | 4,808 | 825 | 894 |
| Percent of NFS pine acres in early successional stages (SS1, 2, 3) | 6% | 20% | 21% | 13% |
| Percent of NFS pine acres in open successional stages (SS1, 3A, 4A) | 19% | 29% | 32% | 27% |
| NFS acres in openings in pine in MA 5.4 (winter range) | 17 | 226 | 105 | 243 |
| Acres of uneven-age management in pine | 0 | 0 | 660 | 1,089 |
| NFS acres open to use of motorized vehicles off roads | 9,309 | 2,187 | 8,017 | 7,355 |
| Open road density (mi./NFS sq. mi.) | 1.8 | 1.1 | 1.1 | 1.1 |

Alternatives 1, 2, and 3 would increase preferred deer habitat by opening and regenerating pine stands and enhancing non-pine habitats through timber harvest and prescribed fire. Alternative 1 may have the greatest positive effect through the larger areas of prescribed fire and aspen enhancement. Alternatives 2 and 3 would conduct similar treatments on fewer acres but also include uneven-age management, which would be expected to benefit deer habitat. Proposed area closures may reduce the potential for disturbance of fawning, security, and foraging habitats.

Cumulative Effects: The cumulative effects analysis area for white-tailed deer is the project area, which serves primarily as summer range, plus adjacent lower-elevation grasslands that serve as winter range (a total of about 40,000 acres). Most of the winter range is outside the National Forest boundary. This area is selected because deer are affected by conditions across their range. The time span for the cumulative effects analysis is from 1990 to 2017 to account for past activities that are still affecting habitat and completion of all activities included in the Snyder proposals.

Recent and ongoing activities on NFS lands have reduced density of pine stands and removed pine from aspen and meadows (page 26). Planned actions include further mechanical reduction of stand density and prescribed fire. These actions positively affect deer habitat by improving forage and fawning habitat.

Past, present, and foreseeable actions in winter range on non-NFS lands are less well known. Most of this land is currently managed for livestock production. No substantial changes to this management are known to be planned. Effects of livestock management on deer winter range can be assumed to depend primarily on stocking levels and precipitation.

Alternative 0 would not add to these cumulative effects. Forest succession and stand density would continue to increase in the absence of disturbance events.

Alternatives 1, 2, and 3 would add to cumulative effects by decreasing density of pine stands and setting back succession. These alternatives would contribute toward achievement of Forest-wide Objectives 217and 238a by enhancing non-pine habitats and generally moving structural stage distribution toward the desired distribution across the management area.

White-tailed deer was selected as an MIS to evaluate the effects of Forest Plan implementation and natural change on the ability of the Forest to support species that rely on early-succession forest. Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS, which determined that deer are likely to persist on the Forest over the next 50 years if Standards and Guidelines are followed, and if conditions move towards management objectives. These alternatives would comply with Forest Plan direction.

#### *Ruffed Grouse (Bonasa umbellus)*

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

Young aspen stands (SS 2 and 3) make up approximately two percent of the project area and 72 percent of the aspen acres in the project area. Young aspen provides grouse broods with cover and display sites for breeding males. Although they do eat buds and fruits of other plants, research has shown that populations decline when aspen is removed, even if alternative food sources are plentiful. Some authors have indicated that conifers in close proximity to aspen stands are desirable for winter cover (DeGraaf et al. 1991).

Direct and Indirect Effects: Alternative 0 would have no direct effects because no new activities would occur. In the absence of disturbance events, forest succession that favors pine and contributes to loss of aspen would be expected to occur. Risk of stand-replacing wildfire and mountain pine beetle infestation would be highest under this alternative. Wildfire would be expected to have short-term (three- to five-year) negative effects, but long-term (five- to 50-year) beneficial effects by expanding and stimulating aspen stands. Mountain pine beetle infestations may benefit grouse habitat by removing pine.

Alternatives 1, 2, and 3 would benefit grouse habitat by thinning and regenerating pine, removing pine from aspen areas, and prescribed burning (**Table 33**). These activities may also have short-term (less than five-year) negative effects such as individual mortality, habitat loss, or disturbance. Alternative 1 would enhance conditions for aspen on the largest area and may have the greatest beneficial effect on grouse.

**Table 33: Effects on Components of Ruffed Grouse Habitat**

| Measure | Alternative | | | |
|---|---|---|---|---|
| | 0 | 1 | 2 | 3 |
| Enhancement of aspen habitat (acres) | 0 | 290 | 60 | 40 |
| Prescribed burning (acres) | 0 | 4,808 | 825 | 894 |
| Percent of NFS pine acres in open successional stages (SS1, 3A, 4A) | 19% | 29% | 32% | 27% |

Cumulative Effects: The cumulative effects analysis area for ruffed grouse is NFS lands in the project area (13,084 acres). This area is selected because, while ruffed grouse are primarily associated with aspen stands, many pine stands in the project area have an understory aspen component that may provide grouse habitat. The time span for the cumulative effects analysis is from 1990 to 2018 to account for past activities that are still affecting this habitat and completion of all activities included in the Snyder proposals.

Recent and ongoing activities on NFS lands in the project area removed pine from 102 acres of aspen. These actions, as well as 1,120 acres of prescribed burning (North Bearlodge project), would be expected to benefit ruffed grouse habitat by enhancing aspen stand condition.

Alternative 0 would not add to these cumulative effects. Forest succession to pine would continue in the absence of disturbance events. Alternatives 1, 2, and 3 would add to cumulative effects by reducing pine competition with aspen. These alternatives would also enhance conditions for understory hardwoods through pine stand density reduction and prescribed burning. Alternative 1 would be expected to have the greatest additive effect due to the largest acreage of aspen enhancement and prescribed fire. Alternatives 1, 2, and 3 would contribute toward achievement of Forest-wide Objectives 217 and 238a by enhancing hardwood conditions.

Ruffed grouse was selected as an MIS to evaluate the effects of Forest Plan implementation and natural change on the ability of the Forest to support species that rely on aspen habitat. Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS, which determined that ruffed grouse are likely to persist on the Forest over the next 50 years if Standards and Guidelines are followed, and if conditions move towards management objectives, including hardwood restoration (Objective 201). All action alternatives would comply with Forest Plan direction.

### *Mountain Sucker (Catostomus platyrhynchus)*

See the discussion of mountain sucker on page 91 for project-level effects on this species.

The mountain sucker was selected as an MIS to evaluate Forest Plan implementation on the quality and connectivity of stream habitat. Past surveys suggest mountain sucker occur in many of its historic drainages throughout the Black Hills (Isaak et al. 2003), but localized population reductions or absence at selected sites has occurred (USFS 2007). The Forest-wide trend of mountain sucker habitat is one of decline in the context of increased stream fragmentation, reduced stream flows and riparian habitat and increased competition/predation with non-native fish species.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS, which determined that the mountain sucker is likely to persist on the Forest for the next 50 years if Standards and Guidelines are followed. Alternatives 1, 2 and 3 would have a neutral effect on Forest-wide population and habitat trends for mountain sucker given the limited extent of direct or indirect effects that are predicted. Therefore, Objective 238d would be met.

*Beaver (Castor canadensis)*

Beaver use riparian habitats dominated by stands of willow, aspen, or cottonwood (Streubel 1989). Beaver require permanent water and an adequate supply of suitable woody vegetation. This species' strong association with hardwood riparian areas is the basis for its MIS status.

As early as the 1880s, beaver populations in the Black Hills had been substantially reduced due to heavy trapping and were restricted to remote areas (Parrish et al. 1996). Beaver have increased since then and are now widely distributed in both South Dakota (Higgins et al. 2000) and Wyoming (Cerovski et al. 2004). Beaver can be legally harvested in both states, but hunting regulations moderate the effect on populations. Observations across the Bearlodge District suggest that beaver colonies are expanding into suitable habitat. Beaver numbers are increasing and habitat trend appears stable (Stefanich 2005). There have been recent observations of beavers along Beaver Creek, Cub Creek, Fawn Creek, and Little Beaver Creek. Heavy rains in June 2007 resulted in flooding that breached many beaver dams in the project area, but active dams were present on Little Beaver Creek by August.

Direct and Indirect Effects: Alternative 0 would have no direct effects because no new activities would occur. In the absence of disturbance events, forest succession that favors pine and contributes to loss of hardwoods would be expected to occur. Risk of stand-replacing wildfire would be highest under this alternative. Wildfire would be expected to have short-term (three- to five-year) negative effects, but long-term (five- to 50-year) beneficial effects by expanding and stimulating hardwood vegetation.

Alternatives 1, 2, and 3 may affect beavers through habitat loss or disturbance. Activities proposed in riparian areas include road decommissioning and construction of an exclosure fence (all action alternatives), prescribed fire (Alternative 1), and oak enhancement (Alternatives 2 and 3). These activities would be expected to enhance riparian habitat through reduction of disturbance and removal of conifers and oak brush. Patch cut/aspen enhancement proposed under Alternative 1 would be expected to expand aspen near Little Beaver Creek. Alternative 2 would noncommercially remove pine from aspen adjacent to Lucky Gulch and a tributary of Little Beaver Creek, while Alternative 3 includes treatment of just the latter stand. These actions may provide additional suitable foraging habitat for beaver.

Cumulative Effects: The cumulative effects analysis area for beaver is the seventh-level watersheds associated with the project area. This area includes 13,084 acres of NFS lands and 23,456 acres under other ownership (Map 1, Appendix A). This area is selected because beaver are associated with streams that leave the project area and may be affected by conditions on other ownerships. The time span for the cumulative effects analysis is from 1990 to 2018 to account for past activities that are still affecting this habitat and completion of all activities included in the Snyder proposals.

Non-NFS lands in the analysis area are a dominated by grassland but include scattered areas of pine and hardwood forest. Most areas are used for livestock pasture, with some cultivation. Drainages are often impounded to form small stock ponds. These uses have changed little over the years and no major changes are foreseen at this time. The town of Alva (population about 200) is located at the lower end of the Lame Jones drainage.

Recent and ongoing activities on NFS lands in the project area removed pine from 102 acres of aspen. Much of this treatment occurred in upland areas, however, where beaver are unlikely to benefit. Prescribed fire planned under the North Bearlodge project (1,120 acres) may improve beaver habitat by enhancing aspen stand conditions in Reservoir Gulch and associated drainages. Grazing system changes and spring fencing in the Farrall Allotment (North Zone Range 2005 decision) would be expected to reduce livestock grazing effects on potential beaver habitat.

Revision of the Beaver Creek Allotment grazing management plan is scheduled for 2008 and may modify use to achieve desired range conditions and Forest Plan objectives.

Alternative 0 would not add to these cumulative effects. Forest succession to pine would continue in the absence of disturbance events. Alternatives 1, 2, and 3 would add to cumulative effects by reducing pine competition with aspen adjacent to streams. Alternative 1 would be expected to have the greatest additive effect due to the largest acreage of aspen enhancement and prescribed fire. Alternatives 1, 2, and 3 would contribute toward achievement of Forest-wide Objective 238a by enhancing hardwood conditions and improving watershed condition.

Beaver was selected as an MIS to evaluate the effects of Forest Plan implementation and natural change on the ability of the Forest to support species that rely on hardwood riparian habitats. Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS, which determined that beaver are likely to persist on the Forest over the next 50 years if Standards and Guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction.

### *Golden-crowned Kinglet (Regulus satrapa)*

The golden-crowned kinglet is found in white spruce stands during the breeding season (USFS 2006). In winter they reside in deciduous forests and thickets (Udvardy and Farrand 1994). Spruce is absent (apparently naturally) from the Bear Lodge Mountains, including the project area. Golden-crowned kinglets have been observed in the project area in winter.

Direct and Indirect Effects: There would be no direct impacts under Alternative 0 because no new activities would occur. Indirect impacts to the golden-crowned kinglet include forest succession that favors pine and contributes to loss of preferred winter habitat. Wildfire hazard would be highest under this alternative; fire would be expected to have short-term (less than 5 years) negative impacts but longer-term benefits by increasing hardwood habitat.

Direct effects of Alternatives 1, 2, and 3 could include destruction of nests or individual mortality during harvest activities. Golden-crowned kinglets are not known to breed in the project area, presumably due to lack of spruce habitat, so this risk would be expected to be low. Hardwood enhancement treatments and prescribed burning would be expected to benefit hardwood habitat used by kinglets in winter. Alternative 1 includes the largest area of hardwood treatments (290 acres) and burning (4,808 acres) and would be expected to have the greatest positive effect on potential kinglet habitat. Alternatives 2 and 3 propose smaller areas of these treatments.

Cumulative Effects: The cumulative effects analysis area for golden-crowned kinglet is NFS lands in the project area. This area is selected because golden-crowned kinglets are associated with hardwoods in winter, and hardwoods such as aspen, birch, and oak are found throughout the project area both in pure stands and in the understory of pine stands. The time span for the cumulative effects analysis is from 1990 to 2018 to account for past activities that are still affecting this habitat and completion of all activities included in the Snyder proposals.

Recent and ongoing activities on NFS lands in the project area have removed pine from 102 acres of aspen. These actions, as well as 1,120 acres of prescribed burning (North Bearlodge project), would be expected to benefit ruffed grouse habitat by enhancing aspen stand condition.

Alternative 0 would not add to these cumulative effects. Forest succession to pine would continue in the absence of disturbance events. Alternatives 1, 2, and 3 would add to cumulative effects by reducing pine competition with aspen. These alternatives would also enhance conditions for understory hardwoods through pine stand density reduction and prescribed burning. Alternative 1 would be expected to have the greatest additive effect due to the largest acreage of aspen enhancement and prescribed fire. Alternatives 1, 2, and 3 would contribute toward achievement

of Forest-wide Objectives 217 and 238a by enhancing hardwood conditions.

Golden-crowned kinglet was selected as an MIS to evaluate the effects of Forest Plan implementation and natural change on the ability of the Forest to support species that rely on spruce habitats. Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS, which determined that this species is likely to persist on the Forest over the next 50 years if Standards and Guidelines are followed, and if conditions move towards management objectives. The action alternatives would have no effect on spruce and would comply with Forest Plan direction.

#### *Song Sparrow (Melospiza melodia)*

In the Black Hills, the song sparrow is strongly associated with riparian habitats (Panjabi 2007), which is the basis for its MIS status. It depends on willows and streamside thickets (Panjabi 2007). This species has been documented in the Snyder project area. The song sparrow is well distributed throughout the northern Black Hills and Bear Lodge Mountains. Preliminary data suggest stable population trend and slightly upward habitat trend (USFS 2007).

Direct and Indirect Effects: Alternative 0 would have no direct effects on song sparrows because no new activities would occur. Potential indirect effects include forest succession that favors pine and contributes to loss of riparian shrub communities. In the absence of disturbance events, preferred habitat may decrease under this alternative.

Activities proposed in riparian areas include road decommissioning (all action alternatives), prescribed fire (Alternative 1), and oak enhancement (Alternatives 2 and 3). These activities would be expected to enhance riparian habitat through reduction of disturbance and removal of conifers and oak brush. These actions would be expected to maintain or enhance habitat for song sparrows.

Cumulative Effects: The cumulative effects analysis area for song sparrow is riparian habitat on NFS lands in the project area. This habitat is estimated to occupy approximately 200 acres. This area is selected because song sparrows are associated with riparian habitat and effects would not be expected to extend beyond this habitat. The time span for the cumulative effects analysis is from 1990 to 2018 to account for past activities that are still affecting this habitat and completion of all activities included in the Snyder proposals.

Recent and ongoing timber and fuel management projects in the analysis area have had little effect on riparian habitat. Prescribed fire planned under the North Bearlodge project may reduce pine in and adjacent to the Reservoir Gulch riparian area, which would be expected to improve song sparrow habitat. Roads restrict riparian areas along Fawn Creek and parts of Beaver Creek. Grazing system changes in the Farrall Allotment (North Zone Range 2005 decision) would be expected to reduce livestock-related effects on potential song sparrow habitat. Revision of the Beaver Creek Allotment grazing management plan is scheduled for 2008 and may modify use to achieve desired range conditions and Forest Plan objectives.

Alternative 0 would not add to these cumulative effects. Pine would continue to grow into riparian habitats in the absence of disturbance events. Alternatives 1, 2, and 3 would decrease cumulative effects of roads by decommissioning unauthorized roads in riparian areas. Burning proposed under Alternative 1 may add to cumulative effects of recent vegetation management projects by reducing pine competition in riparian areas. Because riparian areas would be excluded from other activities, Alternatives 2 and 3 would not be expected to add to cumulative effects. These alternatives would contribute toward achievement of Forest-wide Objective 238a by maintaining or enhancing riparian conditions.

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

## Species of Local Concern

Forest Service Region 2 (Rocky Mountain) defines species of local concern (SOLC) as species documented or suspected to be at risk at a local scale within Region 2, but not meeting the criteria for regional sensitive species designation. Project design and analysis need to address SOLC. For the Snyder project, risk analyses were completed only for those species that occur in the project area or whose habitat occurs in the project area. **Table 34** displays Black Hills National Forest SOLC.

**Table 34: Species of Local Concern**

| Species | Documented in Project Area | Habitat in Project Area | Habitat |
|---|---|---|---|
| **Invertebrates** | | | |
| Atlantis fritillary* (*Speyeria atlantis pahasapa)* | No | No | Wet meadows and boggy areas near springs and headwaters of small streams |
| Tawny crescent (*Phyciodes batesii*) | Yes | Yes | Open meadows and riparian woodlands |
| Callused vertigo (*Vertigo arthuri)* | Yes | Yes | Moist, relatively undisturbed forest with diverse understories, deep litter, and abundant woody material; calcareous or schist soils |
| Mystery vertigo (*Vertigo paradoxa)* | No | Yes | On limestone or schist soils, usually in spruce forests (but sometimes pine) with relatively closed canopy, abundant litter, and well-developed understory |
| Frigid ambersnail* (*Catinella gelida)* | No | No | Limestone soils, usually in open ponderosa pine forest, often with a secondary deciduous tree and shrub component |
| Striate disc* (*Discus shimekii)* | No | No | Found in litter of rich mesic forests with limestone soils, generally on shaded, north-facing slope bases; often bordering or ranging slightly onto stream floodplains |
| **Birds** | | | |
| Sharp-shinned hawk (*Accipiter striatus)* | Yes | Yes | A variety of forested areas; nesting habitat typically restricted to dense young conifer stands |
| Cooper's hawk (*Accipiter cooperii)* | Yes | Yes | Ponderosa pine, white spruce, riparian, shrubland, and burned areas |
| Broad-winged hawk (*Buteo platypterus)* | No | Yes | Forests with deciduous or late-succession component |
| Northern saw-whet owl *(Aegolius acadicus)* | No | Yes | Dense coniferous or mixed forest; prefers conifer stands and willow thickets for roosting; hunt along edges or openings in forest |
| Pygmy nuthatch (*Sitta pygmaea)* | No | Yes | Mature ponderosa pine stands with large trees and snags |
| American dipper* (*Cinclus mexicanus)* | No | No | Swift-flowing mountain streams |
| Black-and-white warbler (*Mniotitla varia)* | No | Yes | Bur oak woodlands and edges, mainly at lower elevations |
| **Mammals** | | | |
| Northern myotis | No | Yes | Dense ponderosa pine and mixed |

| Species | Documented in Project Area | Habitat in Project Area | Habitat |
|---|---|---|---|
| (*Myotis septentrionalis)* | | | coniferous/deciduous forest; roosts in caves, mines, tunnels, and under bark of snags |
| Small-footed myotis (*Myotis ciliolabrum)* | No | Yes | Usually associated with rocky areas like bluffs, cliffs, and major rock outcrops; roosts include mines, caves, rock features, and under bark |
| Long-eared myotis (*Myotis evotis)* | No | Yes | Mostly coniferous montane habitats; roosts in snags; no known hibernacula in Black Hills |
| Long-legged myotis (*Myotis volans)* | No | Yes | Primarily montane coniferous forests. Uses caves and mines as hibernacula; roosts in abandoned buildings, rock crevices, under bark |
| Northern flying squirrel (*Glaucomys sabrinus)* | Yes | Yes | Mature forest with abundant standing and down snags; typically dominated by conifers or mixed with deciduous species |
| Meadow jumping mouse (*Zapus hudsonius campestris)* | Yes | Yes | Riparian habitats along small streams in meadows |
| Rocky Mountain bighorn sheep* *(Ovis canadensis)* | No | No | Cliffs, rock outcrops, and nearby meadows |
| Mountain goat* (*Oreamnos americanus)* | No | No | Rugged terrain with cliffs, rock faces, ledges and talus slopes |

* Species not found in Bear Lodge Mountains

### *Tawny Crescent (Phyciodes batesii)*

The tawny crescent is a butterfly that occurs in all counties encompassing the Black Hills (Ferris 1971; Marrone 2002). It is found in open meadows, stream bottoms, roads, trails, and riparian woodlands (Stefanich 2001). It is also found in wet forest corridors across the ecotone between mixed-grass meadows or prairie grasslands and adjacent woodlands (Royer and Marrone 1992). Butterflies feed on a variety of forbs, including dogbane, leafy spurge, and various composite flowers. Tawny crescent larvae appear to depend on asters as a food source, although the specific host species and their relationship remain unclear (Stefanich 2001). Habitat trend appears to be slightly upward (USFS 2007).

Direct and Indirect Effects: Alternative 0 would have no direct effects because no new activities would occur. Potential indirect effects include forest succession that favors pine and contributes to loss of open meadows and hardwoods. In the absence of disturbance events, preferred habitat would be expected to decrease under this alternative.

Alternatives 1, 2, and 3 could cause individual butterfly mortality due to management activities. One- to two-year habitat reduction or disturbance may occur due to logging, fuel reduction, thinning, prescribed burning, and roadwork in or near meadow areas. Proposed treatments would have mostly beneficial impacts by decreasing pine stand density. Prescribed burning may have negative impacts for one season, but would ultimately expand butterfly habitat.

Cumulative Effects: The cumulative effects analysis area for tawny crescent is the project area. This area is selected because while tawny crescents are associated primarily with openings, they may be affected by actions that reduce forest density. The time span for the cumulative effects analysis is from 1990 to 2018 to account for past activities that are still affecting habitat and completion of all activities included in the Snyder proposals.

Recent and ongoing forest management projects have reduced density of pine stands in treated areas. These actions, as well as prescribed burning planned on 1,120 acres, are likely to have a positive effect on tawny crescent habitat by enhancing conditions for understory forbs. Riparian and upland meadow habitat has been negatively impacted in some areas due to livestock use of forage and trampling of streambanks. Where less intense livestock grazing has taken place,

butterfly habitat may have been improved by a decrease in grass cover and increase in forbs such as asters.

Alternative 0 would not add to cumulative effects. Forest succession and stand density would continue to increase in the absence of disturbance events. Alternatives 1, 2, and 3 would add to the cumulative effects of forest management by decreasing density of pine stands and setting back succession. Reduction in pine canopy may temporarily increase forage and draw livestock away from streams to some degree. These alternatives would contribute toward achievement of Forest-wide Objective 221 by enhancing non-pine habitats.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS, which determined that tawny crescent is likely to persist on the Forest over the next 50 years if Standards and Guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction.

#### *Callused Vertigo (Vertigo arthuri) and Mystery Vertigo (Vertigo paradoxa)*

Habitat characteristics for these two snails are very similar, which allows them to be discussed together. Callused vertigo and mystery vertigo are often found in the same colonies in wet, relatively undisturbed forest, primarily on northern aspects with deciduous litter (Frest and Johannes 2002). Essential habitat features include a limestone or schist substrate, shaded forest floor, organic surface litter, downed logs, and mesic site conditions. They are associated with spruce, pine, hardwood and riparian ecosystems. Callused vertigo has been documented at two sites in the Snyder project area (Frest sites 175 and 181).

Direct and Indirect Effects: There would be no direct impacts under Alternative 0 because no new activities would occur. Continued forest succession and pine encroachment could negatively affect snail habitat. None of the action alternatives propose vegetation management activities at the callused vertigo sites. Under all alternatives, minor maintenance would take place on main gravel roads (832 and 830) that are 40-60 feet from the sites. These roads were in place when the sites were first documented, and minor maintenance would not be expected to affect the snails.

If unknown colonies occur within proposed treatment areas, individuals of this species could be affected. Unoccupied suitable habitats that occur within the treatment units may be altered by soil compaction, increased insolation, and alterations to the detrital layer. Most damp sites and deciduous forest are excluded from the treatment proposals, reducing the area of potential direct effects. Any colonies discovered during implementation would be protected with disturbance-free buffer zones.

Cumulative Effects: The cumulative effects analysis area for callused vertigo and mystery vertigo is the project area. This area is selected because suitable habitat for these species occurs in various locations across the project area. The time span for the cumulative effects analysis is from 1990 to 2018 to account for past activities that are still affecting habitat and completion of all activities included in the Snyder proposals.

Recent and ongoing forest management projects have reduced density of pine stands. These actions, as well as 1,120 acres of planned burning, did not and will not affect known sites but could negatively affect unknown colonies.

Under Alternative 0, the remaining activities related to the Cub, Chicago, and North Bearlodge projects could add to cumulative effects. In untreated areas, forest succession and stand density would continue to increase in the absence of disturbance events. Lack of disturbance would maintain snail habitat; the potential for high-intensity wildfires that may have negative effects on snails and their habitat would be expected to increase.

Alternatives 1, 2, and 3 could add to cumulative effects by decreasing density of pine stands and setting back succession. Because the known snail sites would not be affected, these alternatives would contribute toward achievement of Objective 221.

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

### *Sharp-shinned Hawk (Accipiter striatus)*

The sharp-shinned hawk occurs throughout the Black Hills, but it is perhaps the rarest of the accipiters on the Forest (USFS 2007). Six sharp-shinned hawks were observed on transects in 2004, more than in any other year (Panjabi 2004). The sharp-shinned hawk breeds in dense forests throughout much of Canada and the United States (Udvardy and Farrand 1994). In the Black Hills, sharp-shinned hawks were suggested to be “probably fairly common” (Pettingill and Whitney 1965), although currently they seem to occur in very low densities (Panjabi 2004). Sharp-shinned hawks have been documented using spruce, pine, and aspen cover types (Panjabi 2003). An association between nesting and young seral stages with dense canopies has been noted (Stephens and Anderson 2003). Preferred prey includes small birds and mammals. Sharp-shinned hawks have been documented on the Bearlodge District. There are currently 543 acres of young, dense to moderately dense forest (SS 3B and 3C), though there are additional mature pine stands with pine seedling/sapling understory.

Direct and Indirect Effects: There would be no direct impacts under Alternative 0 because no new activities would occur. Potential nesting habitat (SS 3B and 3C) would gradually decrease as stands mature. Potential severity and rate of wildfire spread would gradually increase. Wildfire would have negative impacts for five to10 years, but ultimately beneficial impacts by resulting in young, dense stands.

Alternatives 1, 2, and 3 could result in individual mortality due to nest loss or abandonment if birds are disturbed by nearby management activities. Forest Plan Standard 3204 would reduce this risk by protecting raptor nests. Alternatives 1 and 2 would reduce SS 3C acres by 19 percent and Alternative 3 by 13 percent. SS 3B would decrease substantially under Alternatives 1 and 2 and would not change under Alternative 3. These changes are due mainly to precommercial thinning. Dense patches would remain in untreated stands, though the amount of habitat contained in these inclusions has not been quantified. At the same time, treatments that move stands toward younger structural stages (shelterwood seedcut, patch cut, and group selection) would set the stage for development of future potential nesting habitat. This effect would be nearly equal under Alternatives 1 and 2, and substantially less under Alternative 3.

Foraging habitat would be expected to increase, with timber harvest, thinning, prescribed fire, and hardwood enhancement treatments providing a variety of structural stages and cover types for a diversity of prey species. Uneven-age management would be expected to enhance stand diversity and patchiness, which may increase habitat suitability for sharp-shinned hawk. Changes are displayed in **Table 35**.

**Table 35: Effects on Components of Sharp-shinned Hawk Habitat**

| Activity | Alternative | | | |
|---|---|---|---|---|
| | 0 | 1 | 2 | 3 |
| Pine SS 3B and 3C (acres) | 543 | 279 | 279 | 514 |
| Pine SS 1 and 2 (acres) | 33 | 1,497 | 1,475 | 601 |
| Uneven-age management (acres) | 0 | 0 | 325 | 359 |

Cumulative Effects: The cumulative effects analysis area for sharp-shinned hawk is NFS lands in the project area. This area is selected because suitable habitat for this species occurs in various locations across the project area and is not generally affected by events on non-NFS lands. The time span for the cumulative effects analysis is from 1990 to 2018 to account for past activities that are still affecting habitat and completion of all activities included in the Snyder proposals.

Precommercial thinning completed in 2006-2007 (312 acres) is reducing density of potential sharp-shinned hawk habitat. Planned prescribed burning on 1,120 may reduce suitability of pockets of potential habitat.

Under Alternative 0, forest succession and stand density would continue to increase in the absence of disturbance events. Lack of disturbance would generally maintain potential nesting habitat and allow diversity of foraging habitat to decrease. Concurrently, the potential for intense wildfires that may have negative effects on nesting habitat would be expected to increase.

Alternatives 1 and 2 would be expected to add to cumulative effects for five to 10 years by decreasing density of young pine stands. Alternative 3 would have a smaller additive effect due to retention of most of the potential nesting habitat. Under all action alternatives, proposed regeneration harvest would ultimately increase this habitat. These alternatives would contribute toward achievement of Objective 221.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS, which determined that sharp-shinned hawk is likely to persist on the Forest over the next 50 years if Standards and Guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction.

#### *Cooper's Hawk (Accipiter cooperii)*

The Cooper's hawk appears to be distributed through most of the Black Hills and Bearlodge Mountains, though it is fairly uncommon (USFS 2007). It typically nests in riparian, coniferous, and aspen forests, and will nest in ponderosa pine with moderate to high canopy closure (SS 4B, 4C, and 5) adjacent to openings. The project area contains 7,428 acres of ponderosa pine in SS 4B, 4C, or 5, and 379 acres dominated by aspen.

The Cooper's hawk forages across diverse habitats and preys on a variety of birds and mammals (Stephens and Anderson 2003). It appears to use available forests opportunistically if the available types are not too dense for flight below or within the canopy (Reynolds 1989).

There are 31 records of Cooper's hawks in the RMBO database and 22 in the NRIS fauna wildlife database. The RMBO program has recorded the species in all of the major habitat types, with no obvious affinity for any one. Cooper's hawks have been documented in the Snyder project area.

Direct and Indirect Effects: Alternative 0 would have no direct impacts because no new activities would occur. Habitat for this species would be expected to remain stable over the next five to 10 years unless disturbed by fire or mountain pine beetle infestation. Continued forest succession may reduce habitat suitability beyond that time as aspen decreases and understory density increases.

The action alternatives could result in individual mortality due to nest loss or abandonment if birds are disturbed by nearby management activities. Application of Forest Plan Standard 3204 would reduce this risk by protecting raptor nests. Alternatives 1, 2, and 3 would be expected to enhance aspen habitat through removal of pine. These alternatives would affect potential nesting habitat in pine through various silvicultural treatments that reduce stand density or regenerate pine. Thinning may increase suitability for Cooper's hawk if the existing canopy has become denser than this species prefers. Other treatments such as shelterwood seedcut would be expected to decrease suitability due to the open canopy of the resulting stand. Patch cuts and group

selections may enhance habitat by providing openings adjacent to stands that remain dense. The most acres of SS 4B and 4C would be treated under Alternative 2 and the fewest under Alternative 3 (**Table 36**), but effects would also depend on spatial arrangement of treatments. Foraging habitat for Cooper's hawk would remain stable or increase with logging, thinning, and prescribed burning. These treatments would provide a variety of prey in diverse habitats.

**Table 36: Proposed Treatments that may Affect Preferred Cooper's Hawk Nesting Habitat**

| Treatment | Alternative | | | |
|---|---|---|---|---|
| | 0 | 1 | 2 | 3 |
| Commercial thinning | 0 | 832 | 832 | 279 |
| Patch cuts/group selections | 0 | 294 | 165 | 515 |
| Pine removal from aspen | 0 | 290 | 60 | 40 |
| Shelterwood seedcut or seedcut/overstory removal | 0 | 636 | 809 | 100 |

Cumulative Effects: The cumulative effects analysis area for Cooper's hawk is NFS lands in the project area. This area is selected because Cooper's hawk is associated with a variety of habitat types. The time span for the cumulative effects analysis is from 1990 to 2018 to account for past activities that are still affecting pine habitat and completion of all activities included in the Snyder proposals.

Recent and ongoing forest management projects have reduced pine stand density. These projects also removed pine from aspen, which would be expected to have a beneficial effect on potential Cooper's hawk habitat by maintaining this cover type. Planned burns (1,120 acres) would be expected to reduce understory pine and create small openings, which should increase habitat suitability for Cooper's hawk.

Alternative 0 may add to cumulative effects as forest succession and stand density continue to increase. Foraging habitat could decrease in diversity over time, and suitability of stands for nesting may decrease as density increases.

Alternatives 1, 2, and 3 would be expected to add to cumulative effects by decreasing density of potential Cooper's hawk nesting habitat in pine and burning understory vegetation. These alternatives would contribute toward achievement of Forest-wide Objective 221 by creating openings, enhancing aspen, and reducing understory density.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS, which determined that Cooper's hawk is likely to persist on the Forest over the next 50 years if Standards and Guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction.

### *Broad-winged Hawk (Buteo platypterus)*

The broad-winged hawk breeds in deciduous and coniferous forests from southern Canada south throughout the eastern United States (Bull and Farrand 1977). These hawks winter in tropical South America (Bull and Farrand 1977) and forage primarily in mature to old-growth forests, along forest streams, roads and openings (Stephens and Anderson 2003a). They feed on a variety of prey, including amphibians, reptiles, insects, birds, and small mammals (Stephens and Anderson 2003a).

In the Black Hills, the broad-winged hawk is found primarily in the northern Hills and the Bear Lodge Mountains. It has been reported 52 times through the RMBO program (USFS 2007), and there are three additional records in the NRIS Fauna wildlife database. Most (43 out of 52) of the RMBO detections occurred in 2004 or 2005. The RMBO observations have occurred most frequently in aspen (14), riparian (13), and late-succession pine habitats (13), indicating that a

deciduous tree component may be important. Panjabi (2003) suggested late-succession pine stands (SS 5) might also be important nesting habitat.

Broad-winged hawks were observed just northeast of the project area in 2005 and 2006, and two miles to the south (near Cook Lake) in 2007. The project area contains 641 acres of late-succession pine (SS 5) and 379 acres dominated by aspen.

Direct and Indirect Effects: Alternative 0 would have no direct impacts because no new activities would occur. Habitat for this species would be expected to remain stable over the next five to 10 years unless disturbed by fire or mountain pine beetle infestation. Forest succession would favor development of additional late-succession pine but may decrease the aspen component.

Alternatives 1, 2, and 3 could result in individual mortality due to nest loss or abandonment if birds are disturbed by nearby management activities. Application of Forest Plan Standard 3204 would be expected to reduce this risk by protecting raptor nests.

None of these alternatives would affect existing late-succession pine (641 acres). Thinning of SS 4B and 4C stands would move stands toward some late-succession characteristics by retaining many of the largest, oldest trees and promoting diameter growth in these trees, though stand density would decrease. Other treatments in 4B and 4C stands such as shelterwood seedcut would substantially reduce density and suitability as nesting habitat. Treatments removing pine from aspen would be expected to enhance potential broad-winged hawk habitat. **Table 37** summarizes effects on potential broad-winged hawk habitat.

**Table 37: Preferred Habitat for Broad-winged Hawk Nesting in the Project Area**

| Measure | Alternative | | | |
|---|---|---|---|---|
| | 0 | 1 | 2 | 3 |
| Late-successional pine (acres) | 641 | 641 | 641 | 641 |
| Structural stage 4B/4C pine (acres) | 6,787 | 4,813 | 4,455 | 5,872 |
| Aspen enhancement treatments (acres) | 0 | 290 | 60 | 40 |

Cumulative Effects: The cumulative effects analysis area for broad-winged hawk is NFS lands in the project area. This area is selected because this species is associated with a variety of habitat types. The time span for the cumulative effects analysis is from 1990 to 2018 to account for past activities that are still affecting pine habitat and completion of all activities included in the Snyder proposals.

Recent and ongoing forest management projects have reduced pine stand density, though no SS 5 stands were treated. Effects were similar to those described above under direct/indirect effects. These projects also removed pine from 102 acres of aspen, maintaining this habitat. Planned prescribed burns (1,120 acres) will take place primarily in stands that already have low to moderate density, so effects on broad-winged hawk habitat should be minimal.

Under Alternative 0, forest succession and density would continue to increase in the absence of disturbance events. This alternative would not add to effects on broad-winged hawk. Alternatives 1, 2, and 3 would add to cumulative effects by decreasing density of pine stands that could develop into SS 5. The action alternatives would enhance potential habitat in aspen through pine removal. These alternatives would contribute toward achievement of Forest-wide Objective 221 by enhancing aspen and maintaining existing late-succession forest.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS, which determined that the broad-winged hawk is likely to persist on the Forest over the next 50 years if Standards and Guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction.

### *Northern Saw-whet Owl (Aegolius acadicus)*

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 (Johnson and Anderson 2003). In the Black Hills, seasonal migration between high and low elevation habitat is likely (Johnson and Anderson 2003). The saw-whet owl can be found in more dense coniferous forests and dense riparian woodlands. This owl nests in cavities of snags excavated by flickers or other large woodpeckers (Johnson and Anderson 2003). Nests tend to be in mature forests (SS 4C and 5), while dense sapling-pole sized stands are preferred for roosting (Johnson and Anderson 2003). This species preys on small mammals, particularly deer mice, and birds.

There are few documented observations of the saw-whet owl on the National Forest, mainly because of the bird's nocturnal habits. Saw-whet owls have been encountered four times by RMBO program surveyors. This species may be fairly common throughout most of the Black Hills forest types (Panjabi 2005). It has been documented in Crook County.

The Snyder project area currently contains 3,636 acres of dense, mature coniferous forest (SS 4C and 5) and 232 acres of dense sapling/pole size stands (SS 3C). There are additional patches of dense pine seedling/sapling understory in mature stands, but this habitat has not been quantified. Snag density meets Objective 211 (see page 62).

Direct and Indirect Effects: There would be no direct effects because no new activities would occur. Potential indirect effects include an increase in nesting and foraging habitat over time as forest matures and becomes denser. Snag habitat would not be impacted. This alternative is likely to be the most beneficial for saw-whet owls. Risk of a stand-replacing wildfire would be highest under this alternative, and such an event would reduce habitat suitability for this species.

None of the action alternatives would affect existing late-succession (SS 5) stands. Proposed treatments would reduce acreage of other dense, mature pine stands (SS 4C) (**Table 38**). Habitat suitability of treated areas would decrease. Inadvertent loss of some individual birds or nests is possible under Alternatives 1, 2, and 3 if active nests are present in treated areas. Removal of mature trees in treatment units may decrease the availability of nesting trees. This effect may be most likely to occur under Alternative 1, which proposes commercial timber harvesting in the most SS 4C stands. Identified stands of potential roosting habitat (SS 3C) would decrease under all action alternatives. Proposed regeneration harvesting would create conditions for development of future roosting habitat. Under all action alternatives, cutting of snags would generally be prohibited except to protect worker safety. For further discussion of effects on snags, see page 62.

**Table 38: Effects on Northern Saw-whet Owl Habitat**

| Measure | Alternative | | | |
|---|---|---|---|---|
| | 0 | 1 | 2 | 3 |
| Nesting habitat (pine structural stage 4C/5) (acres) | 3,636 | 2,325 | 2,746 | 3,155 |
| Roosting habitat (pine structural stage 3C) (acres) | 232 | 187 | 187 | 203 |

Cumulative Effects: The cumulative effects analysis area for saw-whet owls is ponderosa pine habitat in the project area (9,885 acres). This area is selected because saw-whet owls are associated with pine forest and effects on this species from activities outside the project area are not expected to overlap temporally or spatially with effects of this project. The time span for the cumulative effects analysis is from 1990 to 2018 to account for past activities that are still affecting pine habitat and completion of all activities included in the Snyder proposals.

Recent and ongoing forest management projects have reduced pine stand density, though no SS 5 stands were treated. Planned prescribed burns (1,120 acres) will take place primarily in stands that already have low to moderate density, so effects on this habitat are expected to be minimal.

Effects of these projects on snags are unknown, but existing snag density complies with Objective 211.

Alternative 0 would not add to cumulative effects of stand density reduction. Forest succession and stand density would continue to increase in the absence of disturbance events. Alternatives 1, 2, and 3 would add to cumulative effects by decreasing density of SS 4C stands, but would increase acreage of younger structural stages that could develop into roosting habitat. These alternatives would contribute toward achievement of Forest-wide Objective 221 by maintaining existing late-succession forest, generally conserving snags, and creating conditions for development of sapling stands.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS. The Phase 2 Amendment FEIS determined that the northern saw-whet owl is likely to persist on the Forest over the next 50 years if Standards and Guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction.

### *Pygmy Nuthatch (Sitta pygmaea)*

Pygmy nuthatches are cavity nesters generally associated with open, mature ponderosa pine forests (Ghalambor 2003; Scott 1979) with less than 70 percent canopy cover (SS 4A, B, and open 5) (Clark et al. 1989). Because they rely on cavities for roosting and breeding, pygmy nuthatches typically reach their highest population densities in mature pine forests little affected by disturbance and with a large number of standing dead trees (Kingery and Ghalambor 2001). Keller (1992) demonstrated a dependence on snags and relatively large trees. This species is sensitive to forest alteration, and has shown declines when timber activities have removed snags (Ghalambor 2003).

The pygmy nuthatch is a rare but regular, and apparently widespread, resident in the Black Hills. In 2005, RMBO observed four pygmy nuthatches in burned areas and southern Black Hills ponderosa habitats (Beason et al. 2006). This species has been sighted more frequently in recent years, but is of uncertain status in the northern Black Hills (SDOU 1991). Pygmy nuthatches have not been documented in the Snyder project area or the Bear Lodge Mountains.

The project area contains 1,827 acres of open, mature pine forest. Snag density meets Objective 211 (see page 62).

Direct and Indirect Effects: Alternative 0 would have no direct impacts because no new activities would occur. Potential indirect effects include increased density of currently open stands. Snag density is likely to be highest under this alternative.

Alternatives 1, 2, and 3 propose treatments would decrease density of mature pine stands. Open, mature pine stands (structural stage 4A) would increase by about 32 percent under Alternative 1, 46 percent under Alternative 2, and 15 percent under Alternative 3. Inadvertent loss of some individual birds or nests is unlikely but possible if undetected nests are present in treated areas. Removal of mature trees within the treatment units may decrease the availability of nesting trees. Under all action alternatives, cutting of snags would generally be prohibited except to protect worker safety. For further discussion of effects on snags, see page 62.

Cumulative Effects: The cumulative effects analysis area for pygmy nuthatch is ponderosa pine habitat in the project area (9,885 acres). This area is selected because pygmy nuthatches are associated with coniferous forest. The time span for the cumulative effects analysis is from 1990 to 2018 to account for past activities that are still affecting habitat and completion of all activities included in the Snyder proposals.

Recent and ongoing forest management projects have reduced density of pine stands, increasing potential pygmy nuthatch habitat. Planned prescribed burning (1,120 acres) would be expected to enhanced potential nuthatch habitat by reducing competition within pine stands. Effects of these projects on snags are unknown, but existing snag density complies with Objective 211.

Alternative 0 would not add to cumulative effects. Forest succession and stand density would increase in the absence of disturbance events. The action alternatives would add to cumulative effects by decreasing density of pine stands. These alternatives may also add to cumulative effects on snags, as some may be cut for safety reasons or lost during prescribed burns. Alternatives 1, 2, and 3 would contribute toward achievement of Forest-wide Objective 221 by increasing potential habitat and generally conserving snags.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS, which determined that pygmy nuthatch is likely to persist on the Forest over the next 50 years if Standards and Guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction.

### *Black-and-white Warbler (Mniotitla varia)*

The black-and-white warbler breeds in mature deciduous forests of the eastern United States and throughout Canada. In the Black Hills, black-and-white warblers are found primarily in bur oak woodlands and associated edges. They also use mature aspen stands, bur oak woodlands and forested riparian areas (Panjabi 2005, Tallman et al. 2002), foraging on insects and spiders.

Because the preferred woodland habitats occur mainly in canyon bottoms at low elevations, much of this species' habitat in the Black Hills may be on private lands. However, several black-and-white warblers have been recorded each year on point transects on NFS lands. These warblers are too rare and local on the National Forest to be adequately monitored by point transects. Overall, populations are stable throughout North America (Sauer et al. 2003). Habitat fragmentation is probably the main threat to this species.

One black-and-white warbler was documented in 2004 on the northeast border of the Snyder project area. This species was also observed along Beaver Creek in 2005 and 2006.

The project area contains 379 acres of aspen cover type in the project area, 98 acres of birch, and 2,130 acres of oak. These and other hardwood species are also present in the understory of many pine stands. There are approximately 200 acres of riparian habitat.

Direct and Indirect Effects: There would be no direct effects under Alternative 0 because no new activities would occur. In the absence of disturbance events, forest succession that favors pine and contributes to loss of aspen and other hardwoods would be expected to occur. Risk of stand-replacing wildfire would be highest under this alternative. Wildfire would be expected to have short-term (three- to five-year) negative effects, but long-term (five- to 50-year) beneficial effects by expanding and stimulating hardwood stands.

Alternatives 1, 2, and 3 would benefit warbler habitat by removing pine from aspen stands and prescribed burning (**Table 39**). Alternatives 2 and 3 include oak enhancement. These activities may also have short-term (less than five-year) negative effects such as individual mortality, habitat loss, or disturbance.

**Table 39: Activities that could Affect Habitat for Black-and-white Warbler**

| Measure | Alternative | | | |
|---|---|---|---|---|
| | 0 | 1 | 2 | 3 |
| Enhancement of aspen habitat (acres) | 0 | 290 | 60 | 40 |
| Oak enhancement (acres) | 0 | 0 | 111 | 111 |
| Prescribed burning (acres) | 0 | 4,808 | 825 | 894 |

Cumulative Effects: The cumulative effects analysis area for black-and-white warbler is NFS lands in the project area (13,084 acres). This area is selected because, while this species is primarily associated with hardwoods and riparian areas, many pine stands in the project area have an understory hardwood component that may provide suitable or transitory habitat. The time span for the cumulative effects analysis is from 1990 to 2018 to account for past activities that are still affecting this habitat and completion of all activities included in the Snyder proposals.

Recent and ongoing forest management projects have removed pine from 102 acres of aspen. These actions, as well as 1,120 acres of planned burning (North Bearlodge project), would be expected to positively affect potential warbler habitat by enhancing hardwood stand condition.

Alternative 1 would not add to cumulative effects. Forest succession to pine would continue in the absence of disturbance events. Alternatives 1, 2, and 3 would add to cumulative effects by reducing pine competition with aspen. These alternatives would also enhance conditions for understory hardwoods through pine stand density reduction and prescribed burning. All alternatives would contribute toward achievement of Forest-wide Objective 221 by enhancing hardwood conditions.

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

#### *Northern Myotis (Myotis septentrionalis), Small-footed Myotis (M. ciliolabrum), Long-eared Myotis (M. evotis), and Long-legged Myotis (M. volans)*

Similarities in habitat preferences and effects allow these bat species to be addressed together.

The northern myotis ranges across most of eastern North America. It has been documented across the Black Hills region (Higgins et al. 2000, Cerovski et al. 2004). The northern myotis is found in wooded riparian zones in badlands and prairies to higher elevation coniferous and deciduous woodlands (Schmidt 2003). Hibernacula for this species include mines and caves. Day roosts have been reported in buildings, under shingles, underneath bark, inside tree cavities, and in caves, mines, and quarries. Northern myotis bats have been documented using ponderosa pine snags as summer/maternity roosts in the Black Hills (Tigner and Dowd Stukel 2003). Moths and beetles make up most of this bat's diet (Schmidt 2003). This species has not been documented in the project area.

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

The long-eared myotis ranges across much of montane western North America. This species is associated with coniferous montane habitats and has been reported foraging among trees and over woodland ponds. Hibernacula for this species include mines and caves, although long-eared myotis have not been documented hibernating in the Black Hills (Schmidt 2003b). Day and maternity roosts are found in buildings, rock crevices, snags, under loose bark, and caves and mines. Limited data suggest they use ponderosa pine snags as day and maternity roosts in other

regions. Moths and beetles are believed to be important prey items (Schmidt 2003b). This species has not been documented in the Snyder project area.

The long-legged myotis is common across the western United States. This species is considered the most common and widely distributed member of the genus *Myotis* and has been documented across the Black Hills region (Schmidt 2003c). It is primarily associated with montane forest, and forages over meadows, ponds, streams, and open mesic habitats in the Black Hills. Hibernacula include mines and caves. Day and maternity roosts have been documented rock crevices, buildings, under the bark of trees and in snags (Schmidt 2003c). Ponderosa pine snags are used as summer/maternity roosts in the Black Hills. Moths appear to comprise the majority of this species' diet, and it is known to feed on the spruce budworm moth (Schmidt 2003c). This species has not been documented in the project area.

Current snag densities meet Objective 211. The National Forest is largely conserving habitat for these species (USFS 2007).

Direct and Indirect Effects: Alternative 0 would have no direct impacts because no new activities would occur. Potential indirect impacts include loss of foraging habitat due to increasing pine stand density and encroachment of pine into meadow and riparian areas. Risk of potential negative impacts from wildfire, both direct (mortality) and indirect (roost habitat loss), would be greatest under this alternative. Risk of mountain pine beetle infestation would continue to increase; infestation may benefit these species by increasing roost habitat, foraging habitat, and insect prey availability. This alternative would be expected to maintain habitat in accordance with Objective 221 except possibly in the case of a stand-replacing fire.

There are no caves or mines in the project area, so there would be no effects on potential hibernacula. Proposed harvest of mature trees under Alternatives 1, 2, and 3 could result in direct impacts (mortality) and indirect impacts (loss of day or maternity roost habitat). Except on the sites proposed for overstory removal, patch cuts, or group selection, harvested areas would remain forested with mature trees that would continue to provide potential roosting habitat. Because Alternative 1 would conduct timber harvest and burning on the largest area, it would be expected to have the greatest potential for direct and indirect effects on bats and their habitat. Removal of snags for safety reasons may have similar direct and indirect effects. Incidental loss of snags would not be expected to substantially reduce densities or limit roosting habitat.

Under Alternatives 1, 2, and 3, lack of effects on caves or mines, creation of open pine habitat, and retention of most snags would be expected to maintain or enhance habitat in accordance with Objective 221.

Cumulative Effects: The cumulative effects analysis area for these bat species is NFS lands in the project area (13,804 acres). This area is selected because potential bat habitat is scattered across the project area. The time span for the cumulative effects analysis is from 1990 to 2018 to account for past activities that are still affecting this habitat and completion of all activities included in the Snyder proposals.

Recent and ongoing forest management projects have removed pine from 102 acres of aspen. These actions, as well as 1,120 acres of planned burning (North Bearlodge project), would be expected to positively affect potential bat habitat by enhancing hardwood stand condition.

Alternative 0 would not add to these cumulative effects. Forest succession and pine cover would increase in the absence of disturbance events. Snag density would be expected to be highest under this alternative. Alternatives 1, 2, and 3 would add to cumulative effects by decreasing pine encroachment. These alternatives would also be expected to add to cumulative effects on snags as some may be cut for safety reasons. Alternatives 1, 2, and 3 would contribute toward achievement of Forest-wide Objective 221 by maintaining potential foraging habitat and generally conserving

snags.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS, which determined that these bat species are likely to persist on the Forest over the next 50 years if Standards and Guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction.

### *Northern Flying Squirrel (Glaucomys sabrinus)*

The northern flying squirrel occupies forested areas in much of Canada and parts of the western United States, with a separate population in the Black Hills of South Dakota and Wyoming (Higgins et al. 2000). It inhabits mature, dense woodland habitats dominated by conifers or mixed conifer and deciduous forest. Anecdotal evidence suggests that, in the Black Hills, flying squirrels are habitat generalists and can be found in open pine habitat adjacent to more densely vegetated hardwood habitats. They are likely to benefit from any hardwood enhancement, as they have been documented in aspen stands and riparian hardwood stands. This squirrel nests in a leaf nest or tree cavity and is considered uncommon in Wyoming (Cerovski et al. 2004). They feed on lichens, fungi, conifer cones, fruit, buds, arthropods, bird eggs, and nestling birds (Cerovski et al. 2004). Flying squirrels have been documented in the project area.

The project area contains 379 acres of aspen, 3,636 acres of dense, mature pine forest (SS 4C/5), and 3,792 acres of pine SS 4B, which often includes a hardwood understory. Existing snag density meets Objective 211.

Direct and Indirect Effects: Alternative 0 would have no direct effects because no new activities would occur. Potential indirect effects include an increase in denning habitat over time as additional snags develop. This alternative may be the most beneficial for flying squirrels. Risk of a stand-replacing wildfire would be highest under this alternative, and such an event would reduce habitat suitability for this species.

Alternatives 1, 2, and 3 would reduce acreage of dense, mature pine stands (**Table 40**). Suitability of treated areas for flying squirrels may decrease, although possible increases in aspen and tree-form oak would be expected to benefit this species. Inadvertent loss of individuals is possible under Alternatives 1, 2, and 3 if trees with occupied dens are cut. Under all action alternatives, cutting of snags would generally be prohibited except to protect worker safety. For further discussion of effects on snags, see page 62.

**Table 40: Effects on Preferred Northern Flying Squirrel Habitat**

| Measure | Alternative | | | |
|---|---|---|---|---|
| | 0 | 1 | 2 | 3 |
| Hardwood enhancement (acres) | 0 | 290 | 60 | 40 |
| Oak enhancement (acres) | 0 | 0 | 111 | 111 |
| Dense, mature pine forest (SS 4C/5) (acres) | 3,636 | 2,325 | 2,746 | 3,155 |
| Moderately dense, mature pine forest (SS 4B) (acres) | 3,792 | 3,129 | 2,350 | 3,358 |

Cumulative Effects: The cumulative effects analysis area for flying squirrels is the NFS lands in the project area. This area is selected because flying squirrels are associated with various habitat conditions. The time span for the cumulative effects analysis is from 1990 to 2018 to account for past activities that are still affecting pine habitat and completion of all activities included in the Snyder proposals.

Recent and ongoing forest management projects have reduced pine stand density, though no SS 5 stands were treated. Planned treatments in the Cub and Chicago projects will not occur in SS 5 stands. The North Bearlodge prescribed burns (1,120 acres) are planned primarily in stands that

already have low to moderate density, so effects on preferred habitat would be expected to be minimal.

Alternative 0 would not add to these cumulative effects. Forest succession and stand density would continue to increase in the absence of disturbance events. Snag density would be expected to be highest under this alternative. Alternatives 1, 2, and 3 would add to cumulative effects by decreasing pine encroachment of aspen. These alternatives would also be expected to add to cumulative effects on snags, as some may be cut for safety reasons. Alternatives 1, 2, and 3 would contribute toward achievement of Forest-wide Objective 221 by maintaining potential denning and foraging habitat and generally conserving snags.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS, which determined that northern flying squirrel is likely to persist on the Forest over the next 50 years if Standards and Guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction.

#### *Meadow Jumping Mouse (Zapus hudsonius campestris)*

Meadow jumping mice occur across portions of Alaska east through much of Canada and in the eastern United States as far south as Georgia and Alabama (Higgins et al. 2000). In the United States, its range extends west to the eastern foothills of the Rocky Mountains (Higgins et al. 2000).

The Bearlodge jumping mouse is a separate subspecies that occurs in the Black Hills and Bear Lodge Mountains and is considered rare by the state of Wyoming (Cerovski et al. 2004). This species is associated with marshy areas and moist grasslands near streams, coniferous and deciduous forests, mixed shrublands and riparian shrublands (Cerovski et al. 2004). It feeds on buds, grasses, seeds, fungi, leaves, fruit, and insects.

Meadow jumping mice tend to occur at relatively low abundance and it is uncertain whether current abundance is different from that of the past. A recent survey (Cryan and Ellison 2005) found meadow jumping mice at all historic localities in the Bear Lodge Mountains and Black Hills. Meadow jumping mice were captured more frequently than all other species of mice in the Bear Lodge Mountains. In the Black Hills of South Dakota, meadow jumping mice and red-backed voles were the most frequently captured rodent species. Limits on abundance and distribution include reduction of understory shrubs, grasses, and forbs in low-to-mid elevation riparian areas (Cerovski et al. 2004, WYNDD 2002). Fragmentation of appropriate riparian habitat may limit this species' ability to disperse.

Direct and Indirect Effects: Alternative 0 would have no direct impacts because no new activities would occur. Continued encroachment of riparian meadows and aspen stands by pine may decrease habitat. Risk of mountain pine beetle infestation and fire would remain elevated. These events would be expected to diversify jumping mouse foraging habitat by increasing development of understory hardwoods, shrubs, forbs, and grasses.

Alternatives 1, 2, and 3 have the potential to cause mortality of individual mice. No road construction is proposed in riparian habitats. Decommissioning of roads in riparian habitat may reduce soil disturbance and potential for mortality. Enhancement of aspen areas adjacent to riparian habitat pine removal would be expected to benefit jumping mouse habitat. Prescribed fire and timber harvest may have negative impacts on habitat for one or two years by reducing hiding cover but would be expected to increase understory cover within two to three years.

Cumulative Effects: The cumulative effects analysis area for meadow jumping mouse is NFS lands in the project area. This area is selected because jumping mice are associated with riparian habitat but may use other vegetation communities. The time span for the cumulative effects

analysis is from 1990 to 2018 to account for past activities that are still affecting this habitat and completion of all activities included in the Snyder proposals.

Recent and ongoing forest management projects have had little effect on riparian shrub habitat. These projects took place or are taking place mostly in uplands and primarily in ponderosa pine stands. Planned burning adjacent to one side of the Reservoir Gulch riparian area (North Bearlodge project) could benefit this habitat by removing pine and rejuvenating hardwoods. Ongoing activities such as water diversion and livestock grazing affect riparian areas more directly. These activities have contributed to reduction in surface water and health of riparian shrub communities. Grazing system changes and spring fencing in the Farrall Allotment (North Zone Range 2005 decision) would be expected to reduce effects of livestock grazing on potential jumping mouse habitat. Revision of the Beaver Creek Allotment grazing management plan is scheduled for 2008 and may modify use to achieve desired range conditions and Forest Plan objectives.

Alternative 0 would not add to cumulative effects described above. Because Alternatives 1, 2, and 3 may improve aspen and riparian meadow habitat, they would not be expected to add to cumulative effects. All alternatives would contribute to achievement of Objective 221.

Population viability was analyzed at the Forest scale in the Phase 2 Forest Plan Amendment FEIS, which determined that meadow jumping mouse is likely to persist on the Forest over the next 50 years if Standards and Guidelines are followed, and if conditions move towards management objectives. All action alternatives would comply with Forest Plan direction.

### Migratory Birds

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

The highest priority (Level 1) bird species listed in the Wyoming Partners in Flight (PIF) Bird Conservation Plan for forest, montane riparian, and aspen habitat groups include bald eagle and northern goshawk. These species are discussed in previous sections (pages 75 and 82). The U.S. Fish and Wildlife Service's Birds of Conservation Concern (BCC) publication (USFWS 2002) partitions North America into 37 bird conservation regions (BCRs). The Black Hills is included in BCR 17 (Badlands and Prairies). Of the 24 bird species found in BCR 17, eleven are duplicated on the Regional Forester's sensitive species list and are evaluated starting on page 75 if they have potential to occur in the project area. Nine species are not expected to occur in the project area due to lack of habitat. A summary of these 20 species can be found in the project record. The four remaining species (golden eagle, prairie falcon, black-billed cuckoo, and red-naped sapsucker) or their habitats have potential to occur in the Snyder project area and are evaluated below.

#### *Golden Eagle (Aquila chrysaetos)*

Golden eagles occur throughout North America. The species is fairly common in the plains of the western U.S., Alaska, and western Canada. They are year-round residents of Wyoming and western South Dakota, inhabiting open country primarily in hilly or mountainous regions but also in deserts and grasslands. Golden eagles prefer to nest on cliff ledges, but will occasionally use trees for nesting (DeGraff et al. 1991).

Within the Black Hills, this eagle prefers to nest on sandstone and limestone cliffs (Pettingill and Whitney 1965). There have been numerous recorded observations of golden eagles on the Bearlodge District as well as observations by the RMBO (Panjabi 2005). This species has been documented in the Snyder project area.

Proposed activities may slightly increase suitability of treated areas as foraging habitat by creating openings. Prescribed fire could have a small positive effect by enhancing prey habitat. No other vegetation treatments or access proposals would be expected to affect the eagle or its habitat. Any golden eagle nests found during project implementation would be protected in accordance with the Bald and Golden Eagle Protection Act and Forest Plan Standard 3204.

#### *Prairie Falcon (Falco mexicanus)*

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

Observations of prairie falcons in the Black Hills are primarily along the perimeter of the forest, where high cliffs provide nest sites adjacent to open grasslands for hunting (Panjabi 2003). This species has been observed on Bearlodge District, though not in the Snyder project area.

Proposed actions would create more open and diverse habitats, potentially benefitting falcons and their prey. None of the alternatives would create large grasslands, so prairie falcon use of the area would not be expected to increase noticeably. Any falcon nests found during project implementation would be protected under Forest Plan Standard 3204.

#### *Red-naped Sapsucker (Sphyrapicus nuchalis)*

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

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

Treatments that remove pine could have a negligible negative effect on potential nesting habitat, since sapsuckers may excavate cavities in pine but are more likely to use aspen. The action alternatives include treatments to enhance aspen areas, which would be expected to increase preferred habitat. Proposed burning may benefit this species by enhancing and expanding aspen stands and providing a substrate for insect prey (Cerovski 2002).

#### *Black-billed Cuckoo (Coccyzus erythropthalmus)*

The black-billed cuckoo breeds from Alberta and Montana east to the maritime provinces and south to northern Texas, Arkansas, and South Carolina. This species favors a variety of wooded

or brushy habitat, avoiding extremely dense woods (DeGraff et al. 1991). It forages among leaves for caterpillars, insects, spiders, and fruit. Nests are usually in groves of trees, forest edges, moist thickets, or overgrown pastures.

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

Proposed activities would be expected to increase habitat suitable for the black-billed cuckoo. Prescribed fire and removal of pine should result in greater diversity of vegetation and understory production. Prescribed fire may also increase prey abundance.

## Fire and Fuels

Ponderosa pine is the dominant tree species in the project area, occurring at all elevations, on all soil types, and on all aspects. Bur oak covers a substantial amount of the project area, particularly in the western half. Smaller areas of aspen and birch occur on moister, cooler sites (**Table 41**; Map 6, Appendix A).

**Table 41: Vegetation Cover Types in the Project Area**

| Cover Type | Acres | Percent of NFS acres |
|---|---|---|
| Grass/meadow | 555 | 4% |
| Ponderosa Pine | 9,885 | 76% |
| Quaking Aspen | 379 | 3% |
| Paper Birch | 98 | <1% |
| Bur Oak | 2,130 | 16% |
| Other Hardwoods | 18 | <1% |

The topography of the analysis area includes gently sloped plateaus and valleys as well as relatively deep canyons and rimrock cliffs. Slopes over 40 percent exist around plateaus and along ridges. Ridge-to-valley vertical distance is 500 feet or less. Elevation is 4,000-5,200 feet.

### Fire History

The project area has experienced large wildfires, though not for many years. The largest recent fire was the 2003 Puma fire, an escaped prescribed burn, which burned 55 acres in the project area and 420 acres outside the project area.

Hunting is a popular use of the area, primarily in the fall, and for a month in the spring. This brings a seasonal increase in risk of human-caused wildfire. Hunters and logging equipment are on record as the main cause for non-lightning ignited fires. Lightning is, however, by far the primary cause of wildfires in the project area.

### Existing Fuel Conditions

#### *Fire Regime*

Increased fire hazard rating, which is based on a combination of torching and crowning indices, reflects increased flammability. Fire hazard ratings were calculated using the Forest Vegetation Simulator (FVS) and fire hazard rating tables. As shown in **Table 42**, about 38 percent of the project area has low or medium ratings, with the remaining 62 percent in the high or very high category. The project area does not currently meet Forest Plan Objective 10-01 (50 percent low or

medium fire hazard outside wildland-urban interface areas).

**Table 42: Existing Fire Hazard Summary**

| Fire Hazard Rating | Acres | Percent of Project Area |
|---|---|---|
| **Low** | 1,067 | 8% |
| **Medium** | 3,898 | 30% |
| **High** | 3,895 | 30% |
| **Very High** | 4,240 | 32% |
| **Not Vegetated** | 20 | 0.2% |

Historically, fire regime played an important role in creating the mosaic of vegetation in the project area and across the Black Hills. Fire regime has been altered by fire suppression, livestock grazing, and other factors. Several fire history studies in the Black Hills have shown a pre-settlement fire return interval of 20 to 30 years in ponderosa pine forests. Since settlement, this interval has increased substantially and many stands have not burned in over 100 years (Sheppard and Battaglia 2002). Longer intervals between fires has permitted fuel buildup and formation of larger patches of closely spaced trees and, consequently, increased severity of fire behavior across larger areas than in ponderosa pine forests that burned more often (Brown and Seig 1996).

A number of studies have documented the historical fire regime of different regions in the Black Hills (Fisher et al. 1987, Brown and Sieg 1996, Brown and Sieg 1999, Brown et al. 2000, Wienk 2001). Most of these studies have taken place at National Monuments, National Parks, or wilderness areas. Two studies, however, describe fire regimes in areas close to the Snyder project area.

In ponderosa pine savannah at Devils Tower National Monument, 13 miles west of the project area, Fisher et al. (1987) reported average fire intervals for the period from 1632 to 1770 to be 27 years and for the period from 1770 to 1900 to be 14 years. After 1900, the interval increased to an average of 42 years.

Brown and Sieg (1996) examined fire frequencies at a number of locations in the Black Hills, including two sample plots adjacent to the Snyder project area. Their findings indicate fire return intervals of 11 to 41 years at one plot, and 3 to 30 at the second. Mean fire intervals were 20.8 and 10.1 years, respectively. Across all locations, Brown and Sieg found mean fire intervals between 1700 and 1900 ranged from 10 to 15 years in lower elevation forests to 30 to 33 years in more mesic interior forests.

Research indicates that frequent, low-intensity fires were normal, but that climate cycles altered fire regime periodically. Evidence indicates that if a somewhat wetter period (perhaps a few years of much higher-than-average precipitation) caused the interval to increase, fuels would accumulate and stand density would increase until the next dry cycle. Then a larger, more intense, stand-replacing fire burned though the area, which would be outside the norm of regular, low-intensity surface fire (Brown 1996).

Like ponderosa pine-dominated forests in the Black Hills and the Southwest, fire regime in the Snyder project area has been substantially altered because of fire suppression and its effects on fuel structure. Prior to fire suppression efforts, frequent, low-severity surface fires kept dry ponderosa pine stands sparse and open by killing young, newly established trees. With fire suppression and livestock grazing (which reduces the amount of grass fuel), fire intervals have lengthened, and dense stands have developed in which fine grass fuels are less abundant and dense ladder fuels are capable of carrying fire up into the canopy. Consequently, high-severity fires can occur in dry ponderosa pine forests where historically they were rare because of the scarcity of ladder fuels and lack of contiguous tree crowns (Schoennagel et al. 2004).

Brown and Cook (2006) describe the development of the modern-day landscape resulting from historic changes in ponderosa pine forests in the Black Hills:

> Ponderosa pine forests in the Black Hills historically consisted of a diverse landscape mosaic that varied from non-forested patches and open stands of very few trees to quite dense stands with many trees. Although much of the forest was relatively open, dense patches also were present and contributed to considerable spatial heterogeneity. Historic photographs and written accounts from the late nineteenth century also document a highly diverse landscape containing abundant openings, open stands of larger ponderosa pine trees, and closed canopy stands of younger and smaller trees (Graves, 1899; Progulske, 1974; Grafe and Horsted, 2002). The existing forest contains about the same basal area on average as the historic forest, but existing basal area is comprised of smaller trees. This suggests that there has been a simplification in structure, with increased tree density leading to fewer gaps and more even spacing and size distributions within groups. Repeat photographs of originals taken in 1874 show relatively homogeneous and for the most part continuous canopies in many areas that were formerly more structurally diverse (Progulske, 1974; Grafe and Horsted, 2002). Relative increases in tree density have contributed to greater vertical and horizontal fuel continuity, and thus increases the likelihood for incidence and larger extent of crown fire (Fulé et al, 2002). More pole-sized trees within stands also increase the likelihood of bark beetle outbreaks, especially a concern in the Black Hills where mountain pine beetles have been a major disturbance agent during the twentieth century (Shepperd and Battaglia, 2002).

*Condition Class*

The Phase 2 Amendment to the Forest Plan (Glossary pages 10 and 11) defines “Condition Class” as the depiction of the degree of departure from historical fire regimes, possibly resulting in alterations of key ecosystem components. These classes categorize and describe vegetation composition and structure conditions that currently exist inside the Fire Regime Groups. Based on coarse-scale national data, they serve as generalized wildfire risk rankings. The risk of loss of key ecosystem components from wildfires increases from Condition Class 1 (lowest risk) to Condition Class 3 (highest risk). Based on coarse-scale national data, Fire Condition Class measures general wildfire risk as follows:

Condition Class 1: For the most part, fire regimes in this class are within historical ranges. Vegetation composition and structure are intact. Thus, the risk of losing key ecosystem components from the occurrence of fire remains relatively low.

Condition Class 2: This term means the condition class description developed by the USDA Forest Service Rocky Mountain Research Station (RMRS) in the Development of Coarse-Scale Spatial Data for Wildland Fire and Fuel Management (RMRS-GTR-87, http://www.fs.fed.us/rm/pubs/rmrs_gtr87.html ), dated April 2000, under which:

- Fire regimes on the land have been moderately altered from historical ranges;
- A moderate risk exists of losing key ecosystem components from fire;
- Fire frequencies have increased or decreased from historical frequencies by one or more return intervals, resulting in moderate changes to (1) the size, frequency, intensity, or severity of fires; (2) or landscape patterns; and (3) vegetation attributes have been moderately altered from their historical ranges.

Condition Class 3: This term means the condition class description developed in RMRS-GTR-87 (see above), under which:

- Fire regimes on the land have been significantly altered from historical ranges;
- Risk of losing key ecosystem components is high;
- Fire frequencies have increased or decreased from historical frequencies by multiple return intervals, resulting in dramatic changes to the size, intensity, severity, or landscape patterns of fires and significant alterations to vegetation attributes relative to their historical range.

Existing condition class rating for forested areas of the Snyder project area are best described as Condition Class 3. Fire regimes have been substantially altered from the historical range, changing the structural stage, stand age, and canopy closure. Primarily due to suppression, most of the project area has not experienced a fire for 100 years or more. Therefore, most of the project area has missed two to three historical fire return intervals. Grasslands in the project area can be considered Condition Class 1 or 2, depending on the extent of livestock grazing and pine encroachment.

### Direct and Indirect Effects

Under Alternative 0 (no action), no new activities would occur in this planning cycle. Untreated portions of the project area would be expected to continue to grow new surface and ladder fuels. Canopy closure would increase over time. Potential for surface fires to transition to the forest canopy would increase as ladder fuels increase and torching indices decrease. Presence of more available fuel at the canopy layer would cause crowning index to decrease, resulting in increased potential for crown fire.

Under Alternatives 1, 2, and 3, silvicultural treatments and fuel reductions would be applied to reduce stand density, decrease fire hazard, lower susceptibility to infestation by mountain pine beetle, increase diversity, and produce wood fiber. The objective of the proposed fuel treatments is to reduce horizontal continuity of fuels across the landscape, vertical continuity of fuels (ladder fuels), and the amount of fuel available to carry a wildfire.

Prescribed burns would generally take place in the fall of the year, one to five years after commercial treatments are conducted. Fires would be low- to moderate-intensity broadcast burns, scorching a maximum of 20 percent of the canopy mass. This treatment, applied alone or following mechanical thinning, would be effective in returning treated forested stands to a fire regime more closely aligned with natural conditions. Broadcast burning does more to return acres to Condition Class 1 than most non-burning treatments. Newly burned stands would need to be burned again within about 35 years to reach Condition Class 1, according to the Phase 2 Amendment definition.

Alternatives 2 and 3 would establish a trend toward uneven age structure in stands treated with group selection or individual tree selection. Uneven age structure can mean that ladder fuels are present, indicating that crown fire transition might occur more readily. Following these treatments, however, the canopy would generally not be expected to carry a sustained crown fire due to the distance between trees. Occasional torching might still occur, but serious damage to the overstory canopy would be unlikely.

Alternatives 2 and 3 includes understory mulching. This treatment would involve chipping or shredding existing natural fuels and pine reproduction, fuels that would probably be consumed or killed with low-intensity understory burning. Treated areas would be expected to show a trend toward improved Condition Class, but Condition Class 1 might not be attained because of the lack of fire return intervals within the historical range.

Alternatives 1, 2, and 3 would reduce overall fire hazard. Improvement compared to the existing condition would be achieved by moving areas with high or very high hazard ratings to the low or medium category. Alternatives 1 and 2 would achieve Objective 10-01 in the project area by moving the percent of the project area in the low or medium fire hazard class from 38 percent to 55 and 59 percent, respectively. Alternative 3 would increase area in low or medium fire hazard class to 45 percent, moving toward Objective 10-01 (**Table 43**).

**Table 43: Fire Hazard Rating by Alternative**

| Fire Hazard Rating | Alternative | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0 | | 1 | | 2 | | 3 | |
| | Acres | Percent | Acres | Percent | Acres | Percent | Acres | Percent |
| **Low** | 1,067 | 8% | 1,276 | 10% | 1,155 | 9% | 1,448 | 11% |
| **Medium** | 3,898 | 30% | 5,945 | 45% | 6,488 | 50% | 4,421 | 34% |
| **High** | 3,859 | 30% | 3,324 | 26% | 2,393 | 18% | 3,503 | 27% |
| **Very High** | 4,240 | 32% | 2,519 | 19% | 3,028 | 23% | 3,692 | 28% |

## Cumulative Effects

The cumulative effects analysis area for fuels and fire resources is the project area plus a buffer of up to one mile outside the project area boundary. For this application, activities that occurred prior to 1997 are considered to have contributed to the existing condition. These boundaries were chosen for this analysis because the adjacent Planting and Hemler timber sales could affect fuels and potential fireline intensities.

The Cub timber sale has cut about 1,212 acres in the analysis area since 1999. The effect on fuels has been a reduction in pine stand density and creation of numerous mechanical harvester slash piles. Mechanical harvester piles consist of the branch and top wood brought to the landings during a whole-tree yarding harvesting operation. These piles are generally disposed of (usually burned, sometimes chipped) two or three years after harvest; this time is allowed for drying so that fire will consume as much of the pile as possible. Some of the Cub piles have been burned while others are still drying. Logging slash remains in the site where conventional yarding was used. Fuels have been created and disposed of gradually, and the addition to fuels and fire hazard in the analysis area has been minimal.

The purpose of the North Bearlodge project is fuel reduction. Completed activities have reduced pine stand density and enhanced fire-resistant aspen stands. Planned burning is expected to reduce surface and ladder fuels.

Planting and Hemler timber sales are conducting commercial timber harvest within one mile of the Snyder project area on 231 and 444 acres, respectively. Treatments are a mix of commercial thin, shelterwood seedcut, and overstory removal. The Hemler project also includes non-commercial hardwood restoration, thinning of pine regeneration, and prescribed fire.

The combination of these actions would be expected to moderate potential fire growth rates and severity. Under the no action alternative, these parameters would remain essentially stable for five to 10 years in the absence of disturbance such as widespread mountain pine beetle infestation, but would be expected to increase rapidly beyond that timeframe. By adding to cumulative effects, Alternatives 1, 2, and 3 would be expected to further reduce fuels and fire hazard and to maintain these conditions further into the future.

## Noxious Weeds

An estimated 80 percent of NFS lands in the Black Hills National Forest are infested with varying levels of noxious weeds (USFS 2003). Human-caused disturbances, including timber harvesting, recreation, mining, grazing, road development, and fire, have historically contributed and continue to contribute to the introduction, establishment, and spread of noxious weeds. Any ground disturbance can allow noxious weeds to spread from existing infestations and colonize new areas. Many noxious weeds out-compete native and other desirable species because they are early-succession species, can be allelopathic[8], produce abundant seed, grow rapidly, and have the ability to exploit the soil profile for nutrients and water. Many noxious weed species have no natural enemies and are not palatable to grazing animals (Sheley and Petroff 1999).

Inventory and treatment of noxious weeds is ongoing in the project area. All treatment is done under the 2003 Black Hills National Forest Noxious Weed Management Plan. The environmental analysis under which the Weed Management Plan was developed covers all NFS lands and cooperative jurisdictions within the Black Hills National Forest boundary. The plan states that the actual areas to be treated will be those areas where ground-disturbing activities result in noxious weed infestations.

Mature stands of timber are common in the project area, creating large contiguous areas of similar structure. This provides the potential for wildfire and beetle infestation. Both could play a role in noxious weed spread. Little inventory of noxious weeds has has been conducted in the project area. The following noxious weeds (**Table 44**) occur or have the potential to occur.

**Table 44: Noxious Weeds That May Occur in the Project Area**

| Species (Common Name) | Scientific Name |
|---|---|
| Canada thistle | *Cirsium arvense* |
| Common tansy | *Tanacetum vulgare* |
| Houndstongue | *Cynoglossum officinale* |
| Spotted knapweed | *Centaurea maculosa* |
| Common mullein | *Verbascum thapsus* |
| Musk thistle | *Carduus nutans* |
| St. Johnswort | *Hypericum perforatum* |
| Yellow toadflax | *Linaria vulgaris* |

Incidental observations have confirmed the presence of Canada thistle, houndstongue, and musk thistle in the project area.

### Direct and Indirect Effects

#### *Alternative 0 (No Action)*

Under Alternative 0, no new Federal actions would occur this planning cycle. Ongoing activities such as road maintenance and inventory and treatment of noxious weeds would continue. The potential for spread or increase of weeds in the Cub, Chicago, and North Bearlodge projects is addressed by design criteria and mitigation measures prescribed by the relevant environmental documentation. Chemical treatment of weeds is scheduled in the Cub sale area and planned in the Chicago sale.

[8] Allelopathic plants produce chemicals that inhibit growth in other plant species.

The large, contiguous stands of timber would remain unchanged. This provides the potential for wildfire and beetle infestation. Both could play a role in noxious weed spread. An increase in downed timber from beetle kill would increase the potential for wildfires to spread and burn with increased intensity, creating large areas of bare ground on which weeds could establish and compete with more desirable species. As trees mature and canopy cover and needle cast increases, existing grass/forb communities may decrease in health and vigor as light needed for photosynthesis is reduced. This hampers the ability of these communities to recover from intense fires. When the canopy cover is opened up due to wildfire or beetle kill, grass/forb communities may not be able to out-compete noxious weeds in areas where infestations already exist. Fires expose ground surfaces, reduce shade and increase light, and create a flush of nutrients (Goodwin et al. 2002). As a result, weed infestations would be expected to increase due to their ability to recover more quickly than native plants. Removal of a rhizomatous weed's top growth by fire stimulates production of new shoots from the vegetative root buds. Because of nutrient reserves in the roots, these new shoots are immediately aggressive and highly competitive (Goodwin et al. 2002). Canada thistle is a rhizome-spreading noxious weed species known to be present in the project area.

Roads and trails would continue to be avenues for the spread of noxious weeds. Off-roading by recreation vehicles would continue to promote the spread of noxious weeds by providing a means of transport. Seeds collect in wheel-wells and grills of ATVs and other off-road vehicles and are dispersed as machines travel. In areas where resource damage has occurred and bare soil is exposed, opportunities exist for the establishment of new infestations.

### *Alternatives 1, 2, and 3*

Design criteria (see Chapter 2) and weed treatment included with these alternatives would reduce the likelihood of introduction of new species and substantial spread of existing infestations. With the level of activities proposed in this project, however, weeds would be expected to appear in new areas. The persistence of potential new and existing infestations depends in large part on availability of funding for treatment of noxious weeds.

An increase of infested acres resulting from proposed activities would have negative impacts both ecologically and economically. An increase in acres of infestation means a direct increase in cost. Ecologically, noxious weeds indirectly affect wildlife and livestock as they displace native vegetation and reduce the ability of ecosystems to function properly. This impacts mostly grass/forb communities, specifically riparian areas, upland grasslands, and meadows. When these areas become infested with noxious weeds, forage for wildlife and livestock is reduced (see Rangeland section, page 68).

Due to the larger areas of mechanical treatment and road work, Alternative 2 would be expected to result in a higher potential for weed infestation, followed by Alternatives 1 and (distantly) 3. Because actual acres of infestation have not been inventoried, potential additional noxious weed infestation (**Table 45**) was estimated based on USFS 1996 (page III-192).

**Table 45: Proposed Activities and Potential Noxious Weed Infestation by Alternative**

| Activity/Potential Infestation | Alternative | | | |
|---|---|---|---|---|
| | 0 | 1 | 2 | 3 |
| Mechanical treatments with potential to cause ground disturbance (acres) | 0 | 3,406 | 4,173 | 1,789 |
| Estimated noxious weed infestation resulting from mechanical treatments (acres) | 0 | 102 | 125 | 54 |
| Ground-disturbing road work (miles) | 0 | 47.8 | 49.4 | 33.6 |
| Estimated noxious weed infestations resulting from road work (acres) | 0 | 6 | 6 | 4 |
| Total estimated additional infestation (acres) | 0 | 108 | 131 | 58 |

Additional acres may be infested as a result of prescribed fire. Control lines, staging areas, and areas burned so that mineral soil is exposed are susceptible to weed infestation. At this time there is no formula to estimate acres infested due to prescribed fire. Many variables, such as soil temperature, fire intensity, and time of year, determine the effects prescribed fire has on noxious weeds. While beneficial to forest health, fire can also be conducive to the spread of noxious weeds. Broadcast burning is proposed to be low-intensity, but there would probably be pockets of higher-intensity fire that could result in exposure of mineral soil and loss of understory herbaceous species. The loss of existing grasses and forbs provides an opportunity for weeds to become established. Many noxious weed species are very competitive and may prevent re-establishment of desirable grasses and forbs. Seeding of these areas would be required. Pre-treatment of weed infestations prior to prescribed fire implementation is important to reducing the risk of spread. Movement of equipment needed during fire operations can contribute to the spread of weeds. There is a risk of new species being introduced to the area when equipment is brought in from out of the local area. Therefore, the acreage totals in Table 45 may be low. This is true particularly for Alternative 1, which includes 4,808 acres of prescribed burning. Alternative 2 has the least potential with 825 acres of prescribed burning.

Closure of various areas to off-road use of motorized vehicles may reduce the potential for spread of weeds in the closure area. Alternative 1 would apply year-round closures to the largest area (10,897 acres), followed by Alternatives 3 (5,729 acres) and 2 (5,067 acres).

Alternative 2 may have slightly greater potential than Alternative 1 to increase noxious weed infestations due to the largest proposed area of mechanical activity. When prescribed fire is included in the total activity acres, however, Alternative 1 could be expected to have the greatest potential for noxious weed infestation.

### Cumulative Effects

The cumulative effects analysis area for noxious weeds is the project area plus private land inholdings. Acres of infestation on private land are unknown. The time span for the cumulative effects analysis of noxious weed is five to 10 years. These spatial and temporal boundaries were chosen because effects in these areas overlap in time and space. Previous and foreseeable activities such as timber harvest, off-road vehicle use, road construction and maintenance, and livestock concentration around water sources appear to have resulted in a cumulative effect of patchy infestation by noxious weeds. Weeds appear to be scattered across the cumulative effects analysis area, and concentrations are known to exist in certain locations, such as some log landings, roadsides, and water developments. Based on the limited information available, activities and effects on private land appear to be much the same as those on NFS lands.

Noxious weeds have been and will continue to be treated under previous and ongoing projects. According to the Cub timber sale K-V plan, there are approximately 140 acres requiring chemical treatment of noxious weeds. Treatment of weeds in the Cub sale is planned for 2008-2011. The Chicago timber sale includes chemical treatment of 35 acres. The North Bearlodge and Truck Trail projects do not include noxious weed treatment, though increased infestation was noted following the Truck Trail project. Estimated cumulative acres of noxious weed infestation is displayed in **Table 46**.

**Table 46: Estimated Cumulative Noxious Weed Infestation**

| Project | Alternative | | | |
|---|---|---|---|---|
| | 0 | 1 | 2 | 3 |
| Snyder project (estimated acres) | 0 | 108* | 131 | 58 |
| Cub timber sale (acres) | 140 | 140 | 140 | 140 |
| Chicago timber sale (acres) | 35 | 35 | 35 | 35 |
| Truck Trail project (estimated acres) | 80 | 80 | 80 | 80 |
| **Cumulative Total (acres)** | **255** | **363*** | **386** | **313** |

*See direct/indirect effects section re prescribed fire contribution

All action alternatives have the potential to add to cumulative effects on noxious weed infestation. There is no estimate available of acres of infestation on private lands.

An increase in infested acres would have negative impacts both ecologically and economically. An increase in acres of infestation means a direct increase in cost. Ecologically, noxious weeds indirectly affect wildlife and livestock as they displace native vegetation and reduce the ability of ecosystems to function properly. This impacts mostly grass/forb communities, specifically riparian areas, upland grasslands, and meadows. When these areas become infested with noxious weeds, forage for wildlife and livestock is reduced.

All action alternatives are likely to add to cumulative effects on weed infestation. Design criteria and weed treatment would reduce the likelihood of introduction of new species and substantial spread of existing infestations. With the level of treatment proposed and probable resulting ground disturbance, however, weeds are likely to appear in new areas. The persistence of these new and existing infestations depends in large part on availability of funding for treatment. Alternatives 1 and 2 would be expected to be the most costly to implement. If funding is not available, the chance of noxious weed spread increases.

## Social Environment

### Land Uses, Recreation, and Travel Management

The “land uses” resource area addresses special uses by groups, individuals, or other agencies. Special uses include items such as wells, waterlines, phone lines, electrical lines, communication sites, and road easements.

The recreation resource includes both developed and dispersed recreational activities. Developed recreation refers to facilities constructed for public enjoyment, such as campgrounds. Dispersed recreation includes activities that occur across the landscape such as trails, camping, driving for pleasure, and hunting.

Travel management addresses opportunities for motorized and non-motorized travel. The Forest Plan’s current travel management direction states that motorized travel in management area 4.1 is to be limited to designated routes and that “generally the road system will be closed to motorized

travel" (Guideline 4.1-9102). Off-road motorized travel is to be prohibited between Dec. 15 and May 15 in management area 5.4 (big game winter range, Standard 5.4-9101). In management area 5.1, the Forest Plan currently allows motorized travel both on and off roads.

## Affected Environment

There are no current or pending lands activities in the project area. There are 10 active special use permits. Five are held by outfitter/guides. The remainder include two road easements, one telephone line, a hay pasture, and a grazing pasture.

Recreation uses in the Snyder project area include both developed and dispersed types. The eight-unit Bearlodge Campground is located in the northeastern part of the project area just off Wyoming Highway 24, and Cook Lake Campground is a half-mile south of the project area. Both are Forest Service facilities. The non-motorized Cliff Swallow Trail is on the project area boundary near Cook Lake. Dispersed camping occurs in the area, primarily during hunting seasons.

Two Special Orders closing areas to motorized vehicles are in place in the project area. These include 3,486 acres of the Wood Canyon Walk-in Hunting Area, which takes in most of the area west of NFSR 838.5, and the Cook Lake closure in MA 3.32, which covers 55 acres in the southern corner of the project area. Numerous individual roads are closed elsewhere in the project area. Some of these closures are quite effective, but members of the public circumvent others, especially during hunting seasons.

Off-highway vehicle use occurs in the project area, primarily during hunting seasons. There are approximately 11 miles of gravel roads in the project area enrolled in the Wyoming all-terrain vehicle system.

The following discussion of effects analysis for lands, recreation, and travel management resources is limited to the Snyder project area, including the discussion of cumulative effects.

## Direct and Indirect Effects

### *Alternative 0 (No Action)*

Special uses and recreation would be expected to continue. Fire hazard and risk of epidemic mountain pine beetle infestation would be expected to increase over time. A stand-replacing fire could affect special uses by threatening the utility line. Damage to this system could disrupt service and cost thousands of dollars to repair. In the absence of these events, Alternative 0 would not be expected to affect special uses or recreation. The ongoing National Forest-wide travel management project could affect motorized vehicle access in the project area under any alternative.

### *Alternatives 1, 2, and 3*

With implementation of design criteria requiring protection of permitted improvements such as utility lines (page 12), Alternatives 1, 2, and 3 would not be expected to affect special uses. Proposed activities would be expected to reduce fire hazard and risk of beetle infestation, decreasing the risk of damage to the telephone line.

During and immediately after vegetation treatments, those using the project area for recreational activities may view the treatments negatively. Timber harvest can cause ground disturbance and change the landscape's appearance. Logging slash, whether scattered or piled, is often viewed unfavorably. Mechanical treatments are proposed on the largest area under Alternative 3, which may have the greatest effect, and the smallest under Alternative 3. Prescribed burning results in blackened ground and understory vegetation and occasional red-needled trees. Burning is

proposed on the largest area under Alternative 1 and the smallest under Alternative 2. Within three to five years of completion, however, forest management activities are generally not evident to most visitors (see also Scenery section, below).

Proposed activities could also benefit recreation resources in the project area. Reducing the density of timber stands results in a more park-like atmosphere that many visitors find pleasing. The openness of the forest improves sight distance into the woods for the casual recreationist, providing a better opportunity for viewing wildlife.

Alternatives 1 and 2 would decommission 15 miles of unclassified roads, while Alternative 3 would decommission 16 miles. Unclassified roads are often user-created routes, or they may have been used in the past for timber harvest or other resource management activities. Some are the original route of system roads that were relocated to protect resources. Decommissioning activities could include recontouring the road surface, revegetating with native species such as grasses or trees, or blocking with debris. The objective of decommissioning is to prevent a road from being used by motorized vehicles, generally in order to protect resources such as soil, water, or wildlife. One effect of decommissioning roads, particularly those considered unclassified or user-created, is the reduction of opportunities for motorized recreation.

All alternatives would retain the Wood Canyon area closure, which is located in MA 4.1. In addition, Alternative 1 would close MA 5.4, MA 5.1 north of Highway 24, and the remainder of MA 4.1 year-round. This would reduce off-road motorized opportunities in the project area by 77 percent. Alternative 2 would close MA 5.4 between Dec. 15 and May 15 and the remainder of MA 4.1 year-round; off-road motorized opportunities in summer and fall would decrease by 14 percent. Alternative 3 would close MA 5.4 between Dec. 15 and May 15, MA 5.1 north of Highway 24, and the remainder of MA 4.1 year-round, a decrease of 21 percent in summer and fall.

Current levels of off-road motorized use appear to be highest during fall hunting seasons. Motorized hunters who typically use this area may be displaced or would have to travel by foot to access their favorite hunting areas. Hunting outfitter/guides holding permits in the Snyder area could be affected by the additional area closures if they are accustomed to driving off-road. Decommissioning of unclassified roads could also reduce motorized access for guides. Timber harvest and broadcast burning could temporarily displace hunters from accustomed hunting areas.

Under all alternatives, the Forest Service would continue to repair and maintain roads and trails under its jurisdiction as funding allows. New and existing user-created roads causing resource damage would be rehabilitated or removed, also as funding allows. Emergency restrictions would be implemented if needed. These may include temporarily closing roads during wet conditions to prevent rutting and erosion or closing an area to off-road motorized use during periods of high fire danger. The Forest Service would continue to patrol and enforce regulations to protect surface resources. None of the alternatives would affect county or private road management. All NFS lands in the project area would remain open to non-motorized uses such as hiking, biking, and horseback riding. No new trail construction is proposed under any alternative. None of the alternatives would affect Bearlodge Campground. Logging activities may be visible from a tenth-mile stretch of the Cliff Swallow Trail. Design criteria regarding placement of landing piles away from the trail would be expected to minimize effects on scenic values.

### Cumulative Effects

The cumulative effects analysis area for special uses is the project area, because permitted uses would be affected only by actions in their immediate vicinity. The cumulative effects analysis area for recreation and travel management is NFS lands in the project area plus NFS lands within one mile of the boundary (approximately 23,400 acres). This area was chosen because actions and

conditions on land adjacent to the project area may affect recreation in the project area, and vice versa. Private land is not included because access is generally restricted by the landowner. The time span for the cumulative effects analysis of recreation, lands, and travel management is 1997 through 2018 to allow for completion of proposed activities.

Past, present, and foreseeable activities have positively affected permitted special uses by reducing fire hazard. Alternatives 1, 2, and 3 would add to this cumulative effect while Alternative 0 would not.

Recreation and travel management have been affected by recent activities. The Dean forest management project (2006) closed NFS lands southeast of the project area to off-road motorized travel. The Planting forest management project, also authorized in 2006, prohibited off-road motorized travel year-round in MA 4.1 north of the Snyder area, and in winter in MA 5.4. The Phase 2 Forest Plan Amendment designated the Hay Creek Research Natural Area (RNA) just northeast of the project area. Off-road motorized travel is not allowed in the RNA. There was little use prior to the closure due to terrain, so the effect of the closure on motorized recreation was minimal. Cumulatively, about 68 percent of the cumulative effects analysis area is open to off-road motorized travel year-round or in summer and fall. Closures may have displaced motorized use to other areas of the National Forest. Following implementation of Alternative 1, 36 percent of the cumulative effects area would be open year-round or summer and fall. Alternative 3 would result in 61 percent being open, and Alternative 2, 58 percent. These figures should be considered tentative, however, given the ongoing Forest-wide travel management project. Most of the alternatives being considered for this project would close NFS lands to off-road motorized travel unless designated open.

Most road closures in the analysis area predate the actions being considered in analysis of cumulative effects. The Cub timber sale included decommissioning of sections of unauthorized roads. The Snyder action alternatives would continue to decrease open road miles, but mainly through decommissioning unauthorized roads. NFS roads that are currently open to the public would remain open. Newly constructed roads would be closed following use. None of the alternatives would add to cumulative effects on NFS roads available for motorized use.

## Scenery Management

### Affected Environment

Scenic integrity is a measure of the degree to which a landscape is visually perceived to be complete. The highest scenic integrity ratings are given to those landscapes that have little or no deviation from the character valued by constituents for its aesthetic appeal. Scenic integrity in the Snyder project area varies by location and depends on a number of factors. In addition to the variety of natural aspects of the scenic resource (geology, vegetation, landforms), human developments affect the scenic conditions of some areas. These developments include roads, vegetation management, and range facilities such as fences and water tanks.

Scenic integrity is classified as high (little visible evidence of human activities), moderate (appearance slightly altered), or low (appearance moderately altered). Timber harvest, prescribed fire, and other vegetation management activities have occurred in the project area. Human activities are evident in the foreground of many roads. The middle ground viewed from these roads appears slightly altered due to these activities. The project area maintains a natural appearance when viewed in the background from main roads and private land outside the project area. The project area’s existing scenic integrity is generally high when viewed as the background, moderate or high when viewed as middle ground, and moderate as foreground.

Scenic integrity objectives (SIOs) are a set of measurable goals for management of forest scenic resources. In the Snyder project area, 1,210 acres (nine percent of NFS lands) should meet an SIO of high, 6,760 acres (52 percent) moderate, and 5,114 acres (39 percent) low.

Little of the project area is visible from major travelways or developed recreation sites. Over six miles of Wyoming Highway 24 are in the project area, though only about a mile is on NFS lands. Where Highway 24 crosses the project area, it ascends one drainage, crosses a pass, and descends another drainage. Hillsides adjacent to the road are mostly under private ownership. Vision Peak in section 13 and a few acres of NFS lands in the northern parts of sections 10 (T54N R63W) and 30 (T54N R62W) can be seen from the road. Bearlodge Campground is located on flat ground with limited views. Main gravel roads that are open year-round and provide views of the project area include NFSRs 830.4, 832.1, and 838.5. A small area in the southwestern part of the project area is visible from the Cliff Swallow non-motorized trail.

Terrain in the project area is characterized by relatively flat plateaus cut by steep drainages, often with cliffs. Away from Highway 24, openings consist mainly of small, often linear meadows. Ponderosa pine is the dominant forest type, but oak, aspen, and other hardwoods are a frequent sight.

Main roads through the project area have generally been accepted over time as part of the positive cultural landscape character attributes. Past vegetation treatments generally tend to blend in with the landscape. The location and nature of past management activities have combined to maintain the mostly natural appearance of the forest.

### Direct and Indirect Effects

#### *Alternative 0 (No Action)*

Alternative 0 would allow the appearance of the project area to continue to be governed primarily by natural processes. Wildland fires would continue to be extinguished as quickly as possible, limiting the ecological role of fire and visual evidence of the effects of fire. As a result, forest density would be expected to continue to increase, reducing visibility. Any wildfires in dense pine stands with ladder fuels could burn into the canopy, killing mature trees. In the Snyder project area, hardwoods such as oak and aspen are likely to reforest these openings. Larger burned areas could be highly visible on the landscape, especially in winter. These areas may or may not be similar in shape and size to meadows and other existing openings. Widespread tree mortality due to wildfire or mountain pine beetle infestation may not meet high or moderate SIO. In these areas, large numbers of downed trees would probably dominate the landscape. Fire- or beetle-caused openings of less than 10 acres in a mosaic of tree sizes and openings would move toward the desired condition.

In areas where no disturbance occurs, competition for light, water, and nutrients may decrease occurrence of hardwoods and understory vegetation. Scenic variety may decrease. This dense vegetation also provides the greatest potential for disturbance (fire or insect) that could greatly change the appearance of the landscape.

#### *Alternatives 1, 2, and 3*

Vegetation treatments that leave most large trees intact can usually blend into the characteristic landscape. Treatments that remove most or all large trees, such as overstory removal, are generally the most visible, especially in large, contiguous treatment areas.

Alternatives 1 and 2 propose a relatively large, contiguous area of overstory removal/shelterwood seed cut treatment in location 010305, stands 16, 45, 51, 54, and 79 (259 acres). These stands are located on a plateau. The treatment would result in open areas with scattered groups of large trees

and an understory of pine seedlings and saplings. Understory pine was precommercially thinned under a previous timber sale, adding to the open appearance. Assigned SIO is low and moderate. Due to the distance from primary travelways and use areas (Guideline 5610) and the flat terrain, which limits views into the area from open roads, these units would be expected to achieve the assigned SIO.

Most treatments are proposed in areas with a low or moderate SIO. Treatments proposed in areas with a high SIO are summarized in **Table 47**. No road construction or conversion is proposed in areas with a high SIO.

**Table 47: Treatments Proposed in Areas with High Scenic Integrity Objective**

| Activity (acres) | Alternative 1 | Alternative 2 | Alternative 3 |
|---|---|---|---|
| Group Selection | 0 | 92 | 0 |
| Patch Cut | 0 | 0 | 92 |
| Patch Cut/Aspen Enhancement | 43 | 0 | 0 |
| Precommercial Thin | 0 | 0 | 10 |
| Prescribed Burn | 557 | 0 | 0 |
| Shelterwood Seedcut/Overstory Removal/Precommercial Thin | 10 | 10 | 0 |
| Variable Density Thin | 49 | 0 | 0 |
| Interface Thin (Non-commercial) | 46 | 0 | 0 |
| **Total** | **705** | **102** | **102** |

Alternative 1 proposes the most treatment in areas with a high SIO. Most of this treatment is prescribed fire. Under all alternatives, areas proposed for burning are minimally visible from open roads. Proposed burning would generally be expected to benefit the scenic resource by removing dead plant material and slash and stimulating the growth of plants, shrubs and hardwoods. For one to three years after a burn, ash and blackened tree bark may be clearly evident across the landscape. Normally, these burn marks are no longer visible once new grasses and other vegetation grow the following spring. Effects of underburning on SIO depend on burn intensity. Observations suggest that most prescribed burns conducted in the Black Hills meet a high SIO within one year. Because Alternative 1 proposes burning large blocks, including numerous stands where no mechanical treatment is proposed, there is greater potential for pockets of intense fire than under Alternatives 2 and 3. Effects of intense fire may not meet high SIO.

All action alternatives propose treatment in an approximately 40-acre area in stand 0104010125 (section 30, T54N, R62W) that is visible from Wyoming Highway 24. The area is about one-quarter mile from the road. Alternative 1 proposes patch cut/aspen enhancement, Alternative 2, group selection, and Alternative 3, patch cuts. Design criteria (chapter 2) require treatment boundaries to be irregular, avoiding straight lines, so that the resulting stand structure looks natural. The objective of all treatments proposed in this stand is to diversify stand structure, which would be expected to enhance scenery as viewed from the highway.

Under each alternative, the proposed mix of treatments would be expected to create a variety of tree sizes and spacing within the natural range of vegetative patterns (Guidelines 5605, 5611). These treatments should also reduce the potential for stand-replacing wildfires and mountain pine beetle attacks, both of which may have negative effects on scenic integrity.

Alternative 3 proposes less overstory removal than the other alternatives and no overstory removal/shelterwood seedcut. It includes additional group selection treatments. Effects of the individual treatments would be similar to those described above. Overall, Alternative 3 would alter stand conditions across a smaller area than the other alternatives, and the degree of change would be less due to reduced acreage of treatments incorporating overstory removal. The larger

area of uneven-aged management would result in a greater degree of scenic diversity.

Alternatives 2 and 3 would meet assigned SIOs within the timeframe specified by Guideline 5606. Alternative 1 would also be expected to meet assigned SIOs with the possible exception of areas of high SIO proposed for burning.

### Cumulative Effects

The cumulative effects area for scenery management is the project area, because this identified area is the landscape that is evident in the foreground and middle ground from the main travel routes. The time span for the cumulative effects analysis of scenery management is from 1990 to 2018 to account for past activities that are still affecting scenery resources and completion of all activities included in the Snyder proposals.

Under all alternatives, activities planned under the Cub, North Bearlodge, and Chicago projects would continue. Activities would take place primarily in areas with low or moderate SIO. Effects of these activities are expected to meet the assigned SIO within one to three years of completion of the activities.

The no action alternative would not add to cumulative effects of past, present, and foreseeable actions described above. Under all action alternatives, proposed activities would overlap actions accomplished under the Cub timber sale and planned under the North Bearlodge project. Effects of activities related to these projects that would overlap spatially and temporally with the effects of the proposed activities include diversification of tree spacing and size in pine stands and an increase in open pine stands and hardwood forest. These effects would decrease as pine stands grow and spread. The proposed activities would add to the effects of the previous and ongoing projects, acting against pine succession and maintaining or increasing forest diversity.

Because activities related to these projects have met or will meet assigned SIOs within the timeframe specified by Guideline 5606, and proposed activities would meet assigned SIOs, the action alternatives would not be expected to have a cumulative effect on scenic integrity.

## Heritage

The National Historic Preservation Act of 1966 (NHPA) provides specific guidance to federal agencies on considering potential effects on heritage resources resulting from agencies' management activities. These guidelines or protocols are found in 36 CFR 800, Section 106. Federal agency heritage programs are also mandated by policies and standards set forth in the National Environmental Policy Act of 1969, Executive Order 11593 of 1971, the Archeological Resource Protection Act of 1979, the American Indian Religious Freedom Act of 1978, the Native American Graves Protection and Repatriation Act of 1990, and Executive Order 13175 of 2000.

The Black Hills National Forest manages and protects heritage resources on public land for the purpose of public interpretation, cultural importance to Native Americans and other cultural groups, and for scientific research. Under Section 106 of NHPA, heritage properties are evaluated for their eligibility for nomination to the National Register of Historic Places (NRHP). Potential effects on sites considered to be eligible, potentially eligible, or Traditional Cultural Properties must be considered. Protection or mitigation treatments are used to avoid or reduce adverse effects.

NFS lands in the project area were inventoried for this project in 2006. Nine sites on NFS lands are considered eligible to the NRHP, and one is unevaluated. All of the sites are prehistoric and include lithic scatters, lithic procurement areas, and rock shelters. A report detailing probable

effects and proposed mitigation was submitted to the Wyoming State Historic Preservation Officer (SHPO) and Tribal Historic Preservation Officers (THPOs).

Mitigation or protection measures such as site avoidance, capping or plating site surfaces, and altering adverse effects are possible in consultation with the SHPO, Native American tribes, and other applicable interested parties. Effects on sites can also be reduced through archeological recordation, structure recordation, interpretation, monitoring, and restrictive covenants.

### Direct, Indirect, and Cumulative Effects

Under Alternative 0, changes may occur through ongoing activities (such as road maintenance), natural processes, or other management decisions in the future. This alternative does not provide mitigation measures, resource protection, or stabilization of currently affected sites. If forest stand densities remain high, potential for large, high-intensity crown fires would also remain elevated. Such a fire may damage and/or destroy heritage resource sites in its path through soil erosion and exposure to the elements. Effects also may include compromised radiometric dates, damage to rock features and rock art due to heat spalling[9], and destruction of wooden structures and features.

Proposed timber harvest, fuel reduction, and road work using mechanized equipment would result in varying degrees of soil disturbance, which has the potential to adversely affect heritage resources. Alternative 2 proposes these actions on a total of about 4,113 acres, 26 percent more than Alternative 1 and 139 percent more than Alternative 3. Alternative 1 proposes treatments at seven NRHP-eligible or unevaluated properties, Alternative 2 at eight, and Alternative 3 at six. Design criteria (page 12) require avoidance of all eligible and potentially eligible sites. With specified design criteria, there would be no direct effects on known heritage resources. Any new heritage properties found during implementation would be protected from disturbance until evaluated. Direct adverse effects could occur if unknown heritage properties occur where activities are proposed. If, however, previously unknown heritage properties are located during implementation, all activities would cease until the site has been evaluated by a qualified archaeologist, in consultation with the Wyoming SHPO. Field inventory that has been conducted in affected areas minimizes the potential for this event to occur.

The primary indirect effect on any heritage resource site is likely to be exposure of contributing cultural features and artifacts resulting from removal of surface vegetation due to timber harvest and fuel reduction. Until understory vegetation becomes an obstacle to travel, proposed treatments may allow increased access. This could result in increased incidences of vandalism or looting. Elsewhere, proposed road decommissioning may discourage motorized prospecting.

The cumulative effects area for heritage is considered the project area. The time span for the cumulative effects analysis of heritage is the length of the project activities. Recent and ongoing activities (page 26) are not known to have adversely affected any NRHP-eligible or unevaluated properties. Alternatives 1, 2, and 3 would act against cumulative fuel buildup resulting from fire suppression, but construction of new roads would result in a small addition to the potential cumulative effects of increased access. Because other roads would be decommissioned and new roads would be closed after construction until needed for future activities, the additive effect would be expected to be negligible.

### Consultation

The Forest consults with the Wyoming SHPO and various THPOs. Reports sent to THPOs also request additional recommendations for the protection of any known American Indian spiritual use sites. If a site is eligible or has been identified as a sacred site, Forest Service heritage personnel consult with Tribal government officials and the appropriate SHPO on protection,

[9] Cracking of rocks due to high heat

avoidance, or mitigation measures. The heritage specialist may also request field visits by Tribal representatives to identify and verify sacred site locations.

Per 36 CFR 800.4(d)(1)(i), if the SHPO or THPOs do not object within 30 days of receipt of an adequately documented finding, the agency official's responsibilities under 106 are fulfilled. The Wyoming SHPO concurred with the determination of "no historic properties affected" on January 9, 2008 (project 1207JPL007).

The Forest also consulted with the THPOs for the Standing Rock Sioux, Rosebud Sioux, Ogallala Sioux, and Three Affiliated Tribes during the initial project scoping. These tribes have requested that heritage resource inventories with identified Adverse or No Adverse Effects be submitted to their offices.

### Environmental Justice

Executive Order 12898 (February 11, 1994) directs Federal agencies to focus attention on human health and environmental conditions in minority and low-income communities. The purpose of the Executive Order is to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States.

There are few permanent residences in the Snyder project area. As a whole, Crook County's population is less than two percent minority (Wyoming Economic Analysis Division 2004). During the course of this analysis, no alternative resulted in any identifiable effects or issues specific to any minority or low-income population or community. The agency has considered all input from persons and groups regardless of age, race, income, status, or other social or economic characteristics.

### Socioeconomics

Figures generated by economic analysis of timber projects are usually used as a means to compare alternatives (rather than as an absolute measure) because timber prices tend to fluctuate widely. Average sawtimber stumpage price in the Black Hills was $228.00 per thousand board feet in 1999, while the current value is about $86.00 per thousand board feet. It is not possible to predict the selling price of a future timber sale, though the actual economic efficiency of this project depends on that prediction.

Economic analysis of Alternatives 1, 2, and 3 using current stumpage rates indicates that costs would exceed revenues. Various costs and benefits were not included in this analysis. Some of these, such as recreational activities, take place across the National Forest and the Black Hills region. Recreation has an economic effect on local communities, but there is insufficient information to determine this specific project's contribution to this effect. Fuel reduction projects are often costly in the short term, but the cost of a wildfire that may have been prevented by the fuel reduction could be exponentially higher. This benefit cannot be fully taken into account in economic analysis. Other non-market factors, such as the value of habitat for rare species, are problematic to quantify and compare directly to commodities.

The economic analysis was generated using QuickSilver, a Forest Service economic analysis program customized for the Rocky Mountain Region and the Black Hills National Forest. Present net value (the future benefit of the project discounted to the present) is -$4,170,000 for Alternative 1, -$1,988,000 for Alternative 2, and -$1,659,000 for Alternative 3. The benefit/cost ratio is 0.19 for Alternative 1, 0.38 for Alternative 2, and 0.27 for Alternative 3, indicating costs to the government would exceed direct monetary returns under all action alternatives.

The Black Hills area economy was dominated by mining, timber harvest, and agriculture for many years. The region's economy is now well diversified. The proposed actions would

contribute to the local economy by producing forest products and employment and through procurement of services and products associated with project implementation.

# ACRONYMS AND REFERENCES

## Acronyms

| | |
|---|---|
| **AMD** | Average Maximum Density |
| **ASQ** | Allowable Sale Quantity |
| **ATV** | All-Terrain Vehicle |
| **BA** | Basal Area or Biological Assessment |
| **BE** | Biological Evaluation |
| **BMP** | Best Management Practice |
| **BTU** | British Thermal Unit |
| **CDA** | Connected Disturbed Area |
| **CEQ** | Council on Environmental Quality |
| **CFR** | Code of Federal Regulations |
| **CWU** | Common Water Unit |
| **DBH** | Diameter at Breast Height |
| **EA** | Environmental Assessment |
| **EPA** | Environmental Protection Agency |
| **FEIS** | Final Environmental Impact Statement |
| **FSM** | Forest Service Manual |
| **FVS** | Forest Vegetation Simulator |
| **GIS** | Geographical Information System |
| **HUC** | Hydrologic Unit Code |
| **ID** | Interdisciplinary |
| **KV** | Knudson-Vandenberg |
| **LRMP** | Land and Resource Management Plan |
| **MA** | Management Area |
| **MFI** | Mean Fire Interval |
| **MIS** | Management Indicator Species |
| **MMBF** | Million Board Feet |
| **MMCF** | Million Cubic Feet |
| **NEPA** | National Environmental Policy Act |
| **NFMA** | National Forest Management Act |
| **NFPA** | National Fire Protection Assessment |
| **NFS** | National Forest System |
| **NFSR** | National Forest System Road |
| **NRHP** | National Register Of Historic Places |
| **NWI** | National Wetlands Inventory |
| **POL** | Products Other than Logs |
| **R2** | Region 2 of the US Forest Service (Rocky Mountain Region) |
| **RMBO** | Rocky Mountain Bird Observatory |
| **RMRS** | Rocky Mountain Research Station |
| **SHPO** | State Historic Preservation Office |
| **SIO** | Scenic Integrity Objective |
| **SOLC** | Species of Local Concern |
| **SS** | Structural Stage |
| **THPO** | Tribal Historic Preservation Office |
| **TMDL** | Total Maximum Daily Load |
| **USDA** | United States Department of Agriculture |
| **USFS** | United States Forest Service |

| | |
|---|---|
| **USFWS** | United States Fish and Wildlife Service |
| **WCPH** | Watershed Conservation Practices Handbook (FSH 2509.25) |
| **WGFD** | Wyoming Game and Fish Department |
| **WUI** | Wildland-Urban Interface |
| **WYNDDB** | Wyoming Natural Diversity Database |

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## Individuals, Groups, Tribes, and Agencies Consulted

Backcountry Horsemen of America
Baron, Joe (Crook County Attorney)
Barrasso, U.S. Senator John
Bearlodge Snowmobile Association
Biodiversity Conservation Alliance
Black Hills Forest Resource Association
Black Hills Land Analysis
Bureau of Land Management (Newcastle, Wyoming)
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Cheyenne River Sioux Tribal Chairman
Cheyenne River Sioux Tribal Historic Preservation Officer
Cheyenne River Sioux Tribal Vice-Chairman
Cheyenne/Arapaho Tribes of Oklahoma
Cheyenne/Arapaho Tribes of Oklahoma, Cultural and Heritage Program
Craig, Charles
Croell, Roger
Crook County Commissioners
Crook County Growth and Development
Crow Creek Sioux Tribal Chairman
Cubin, Congresswoman Barbara
Dacar, Jim and Roxie
Dakota Territory Cruisers/Black Hills 4-Wheelers
Deliramich, Pete
Diamond Bar 7 Limited Partnership
Dirks, Charles Jr. and Pat
Dirks, James Bowie and Lara
Dungey, Gary
Dungey, Wade
Eastern Shoshone Tribal Chairman
Ellsbury, Larry
Enzi, U.S. Senator Michael
Eothen Corporation
Fisher, Susan
Flandreau Santee Sioux Tribal Chairman
Gantz, Edward and Donna
Geis, James
Goodson, Ralph and Patricia
Gordon, Walter J.
Grey Eagle Society
Griffith, Jackie
Hejde, Chester

Hilding, Nancy
Kaiser, Dorothy and Vincent
King, Dennis and Mike
Kiowa Ethnographic Endeavor for Preservation
Lanning, William
Leopold, Harvey and Margaret
Lower Brule Sioux Tribal Chairman
Lower Brule Sioux Tribal Cultural Resource Office
Maertens, Joel
Marchant, Ray and Sharon
Motorized Recreation Council of Wyoming
National Wild Turkey Federation
Native Ecosystems Council (Willow Creek, Montana)
Native Ecosystems Council (Rapid City, South Dakota)
Neiman Sawmill
Nicholas, Charles
Norbeck Society
Northern Arapaho Business Council
Northern Arapaho Tribal Historic Preservation Officer
Northern Cheyenne Tribal Historic Preservation Officer
Northern Cheyenne Tribal Planner/Director
Northern Cheyenne Tribal President
Oglala Sioux Tribal Historic Preservation Officer
Oglala Sioux Tribal President
Oster, James and Deborah
Pope & Talbot, Inc.
Prairie Hills Audubon Society
Rau, Jacob
Rauth, Donald and Sara
Rauth Ranches, Inc.
Ripley, Claire and Maxine
Rocky Mountain Elk Foundation
Rosebud Sioux Tribal Historic Preservation Officer
Rosebud Sioux Tribal President
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Santee Sioux Tribal Chairman
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Sierra Club, South Dakota Chapter
Sierra Club, Wyoming Chapter
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Sisson, Rober and Cheryl
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Southern Arapaho Tribe NAGPRA, NHPA
Spirit Lake Sioux Tribe
Spirit Lake Sioux Tribal Chairman
Standing Rock Sioux Tribal Chairman
Standing Rock Sioux Tribal Historic Preservation Officer
State of Wyoming Board of Land Commission
State of Wyoming Transportation Commission
Steele, Kathleen

Sundance Rod and Gun Club
The Nature Conservancy
Three Affiliated Tribes, Cultural Resource Office
Three Affiliated Tribes, Tribal Cultural Preservation Officer
Three Affiliated Tribes, Tribal Chairman
Townsend, State Senator Chuck
Trailhead Mountain Bike Club
Troxel, Tom
U.S. Fish and Wildlife Service
Ulmer, Clarence
Whalen, George and Jeanette
Whalen, John Jr. and Sandy
White Woman, Harvey
Whiteface, Charmaine
Wood-Tetrault Trust
Wyoming Division of Forestry
Wyoming Game and Fish Department
Wyoming State Historic Preservation Officer
Wyoming State Planning Coordinator's Office
Wyoming Stock Growers Association
Wyoming Trail Riders Association
Wyoming Trails Program
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## Preparers

This section lists the individuals who worked on this project. Not all team members served simultaneously.

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