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Final Environmental Impact Statement

Bugtown Gulch Mountain Pine Beetle and Fuels Project

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

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Bugtown Gulch Mountain Pine Beetle and Fuels Project
Final
Environmental Impact Statement
Custer County, South Dakota

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Abstract: The Hell Canyon Ranger District of the Black Hills National Forest has prepared a Final Environmental Impact Statement in compliance with the National Environmental Policy Act and other relevant Federal and State laws and regulations. The Hell Canyon Ranger District proposes to implement multiple resource management actions within the Bugtown Gulch Mountain Pine Beetle and Fuels Project, project area, as guided by the Black Hills National Forest Land and Resource Management Plan (Forest Plan) as amended. This area is currently experiencing a mountain pine beetle epidemic. The focus of the actions proposed is to aggressively manage ponderosa pine stands to reduce the risk of widespread beetle-caused tree mortality and to reduce the risk for large scale, high intensity wildfire. Three alternatives are considered in detail. Alternative 1 is the No Action Alternative. Alternative 2 is the proposed and preferred action. A project specific Forest Plan amendment would be necessary to implement this alternative. The majority of pine stands available for treatment in the project area are included. Sanitation and thinning treatments are proposed to suppress and prevent beetle-caused stand mortality by removing live beetle brood from the project area and altering stand conditions to lower susceptibility to mountain pine beetle. Salvage is included with these treatments to capture some value before it is lost and reduce fuel loadings. Fuels treatments are included to reduce the potential for high intensity, large scale wildfire, particularly around private land. Alternative 3 responds to public comments regarding diversity by deferring thinning and fuels treatments in some stands and adjusting treatments to avoid the need for a project level Forest Plan amendment. This Final EIS discloses the direct, indirect, and cumulative environmental impacts resulting from the proposed action and alternatives.

The Bugtown Gulch Mountain Pine Beetle and Fuels Project is an "authorized project" under the Healthy Forest Restoration Act (HFRA), Title I, Section 102(a)(4).

SUMMARY

The Black Hills National Forest proposes to implement vegetative treatments to reduce the potential for widespread mountain pine beetle-caused tree mortality and large scale, high intensity wildfire. The Bugtown Gulch project area covers approximately 13,378 acres of National Forest System land and about 2,563 acres of interspersed private land and is located approximately 5 miles west of Custer, South Dakota. Resource management actions apply to National Forest lands only.

The focus of the proposed vegetative actions is to apply management strategies that address an existing mountain pine beetle epidemic and that treat hazardous fuels to reduce the potential for large-scale, high intensity wildfire. Actions proposed include sanitation harvest to remove pine trees that have live beetle brood in them. This suppression method physically removes beetles from the forest prior to their yearly flight that occurs in mid-summer. Within un-infested pine stands with a high risk for mountain pine beetle susceptibility, commercial thinning is proposed to reduce the susceptibility risk to low. Salvage is proposed to capture commercial value of trees killed during the epidemic.

Fuel treatments are proposed in areas where hazardous fuel conditions have been identified. These treatments include hand thinning, piling and burning of piles, and/or thinning and mastication of fuels through mechanical means. The purpose of these treatments is to reduce the potential for a large-scale, high intensity wildfire within the project area.

These actions are needed, because an existing mountain pine beetle epidemic is threatening to cause widespread tree mortality within the project area on Forest and private lands and could also spread beyond the project boundary. The Black Hills National Forest, Forest Supervisor has determined that an epidemic is occurring which poses a significant threat to ecosystem components (see Appendix G). Fuel treatments propose to break up the continuity of fuels and reduce the unnaturally high concentrations of biomass in the Forest.

During the mid-1990's, mountain pine beetle activity in the Black Hills was at endemic levels with mortality being light and scattered throughout the Forest. Increased tree mortality levels were detected on the Forest in 1997. By 1999, aerial survey results showed more than a two fold increase in mortality in just one year. Mortality levels continued to increase on the Forest with an exponential increase detected in the 2001 flight. These results showed an almost eight fold increase in estimated beetle-caused tree mortality in a single year. Approximately 38,000 dead trees were detected in 2000 and 299,000 dead trees were detected in 2001 with mortality becoming widespread across the forest (Allen, 2004). The Bugtown Gulch area has been identified as an area having concentrated pockets of beetle-caused tree mortality.

Locally and nationally, the public is demanding actions to reduce the potential for large-scale wildfires on public lands. The National Fire Plan and other initiatives such as the Healthy Forest Restoration Act were developed to address this issue. In the Bugtown Gulch project area, the proposed action has been developed to aggressively manage

ponderosa pine stands to decrease the potential for widespread mountain pine beetle caused mortality and reduce the potential for large scale, high intensity wildfire.

The Healthy Forest Restoration Act seeks to gain public support for authorized project decisions by emphasizing public involvement during the preparation phase. Collaboration has occurred between Federal, State, Local, and Tribal governments, and interested parties have participated in scoping efforts. Various opportunities for collaboration and public input included; Publishing the Notice of Intent (NOI) in the Federal Register on March 1, 2005, a public field review, an open house in the Black Hills National Forest Supervisor's Office, several news releases, and a scoping letter sent to approximately 200 individuals, groups and agencies.

Comments received during the scoping process were used to define significant issues, develop alternatives and analyze effects. Through review and analysis of the scoping comments and input, the Bugtown Gulch Mountain Pine Beetle and Fuels Project Interdisciplinary Team identified three (3) significant issues related to the proposed activities. The three issues are; Mountain pine beetle epidemic, Fuel and fire hazard and wildlife.

These issues led the agency to develop alternatives to the proposed action. As provided in Section 104 (c) of the Healthy Forest Restoration Act, only one alternative to the proposed action was considered in detail. The alternatives analyzed in detail in this EIS are briefly described below:

Alternative 1 – No Action: NEPA (National Environmental Policy Act) requires the study of the No Action Alternative and that it be used as a basis for comparing the effects of the proposed action and other alternatives. The No Action alternative assumes no implementation of any elements of the proposed action or other action alternatives would take place within the Bugtown Gulch project area.

This alternative represents no attempt to actively respond to the purpose and need for action or the issues raised during scoping. There would be no effort to modify existing vegetation or related fuel conditions in the project area. The current mountain pine beetle epidemic would not be suppressed and efforts to prevent widespread beetle-caused tree mortality and reduce hazardous fuels would not be undertaken. Opportunities to designate better quality stands for late succession management would be foregone.

Alternative 2 – Proposed Action: The proposed action includes aggressive management strategies designed for suppression of the epidemic, prevention of further infestations, and salvage of the mountain pine beetle epidemic area. Sanitation harvesting is proposed as a suppression method to remove trees which have live beetle brood in them. This action would remove as many beetles as possible prior to flight, in an attempt to lessen the size and extent of the epidemic. Sanitation harvest may occur for up to three consecutive years in any particular area to capture infested trees that have been missed or which became infested following harvest. Prevention methods include commercial thinning to reduce stand density thereby increasing tree vigor and reducing stand susceptibility to beetle attack. Salvage harvesting would remove dead trees which no longer have beetle brood in them. Other actions would include understory fuel treatments to reduce the future risk of large high intensity wildfires in the area. Due to the urgent nature of the project, it was decided that no new roads would be constructed and no road closures would be proposed. All treatments would utilize existing roads. All treatments

would occur within ponderosa pine stands or aspen stands with a pine component. A project specific Forest Plan amendment regarding big game habitat effectiveness in management area 5.4 would be necessary to implement this alternative.

Alternative 3: This alternative was developed to address input from the public that the proposed action would result in little diversity on the landscape and that options to increase diversity should be considered. Another component of this alternative is that it would meet all Forest Plan direction and would not require a project specific Forest Plan amendment for Big Game habitat in management area 5.4 as in Alternative 2. To address these concerns and meet the purpose and need, all treatments are deferred in management area 5.4 (998 acres) as well as select stands (1,639 acres) in management area 5.1. Sites deferred in management area 5.1 are those considered to be somewhat less susceptible to mountain pine beetle, thus improving the potential for these stands to persist. However, all deferred sites would continue to have a high risk for mountain pine beetle susceptibility. Where deferred sites are adjacent to private land, 300 foot fuel breaks would be constructed.

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

Table I: Management Indicators by Alternative

Mountain Pine Beetle Epidemic *Management indicators*	Existing Condition	Alternative 1	Alternative 2	Alternative 3
Ponderosa Pine in a High Risk condition for MPB Susceptibility	10,465 (82%)	10,465 (82%)	3,013 (24%)	5,246 (41%)
Expected pine mortality from MPB into the future	Increasing	Rapidly Increasing	Decreasing	Decreasing, but to a lesser degree than Alt 2.

Fuel and Fire Hazard Reduction *Management indicators*	Existing Condition	Alternative 1	Alternative 2	Alternative 3
Fire Regime Condition Class	3	3: no improvement	3: improved	3: less improved
Fuel Model 8-acres	1,035	1,035	6,298	5,239
Fuel Model 9-acres	11,831	2,412	5,866	5,709
Fuel Model 12-acres	0	9,419	702	1,918
Wildlife Habitat *Management indicators*	Existing Condition	Alternative 1	Alternative 2	Alternative 3
Snag Conditions (All Alts meet FP Direction) 1. Density 2. Large Snags 3. Recruitment	1. Snags obvious, but secondary on landscape. Exceed FP direction. 2. Snags generally 10-14" dbh. Low potential for future large snag development 3.Good snag recruitment potential in short term. Poor in long term.	1-Density is highest in short term., lowest in the long term. 2. Least potential to develop large trees for future snags. 3. Highest Recruitment in the short term, lowest for long term.	1. Density similar to existing in short and long term. 2. Best potential for development of large green trees for future snags. 3. Best for future snag recruitment potential long term	1.Density greater than Alt 2. in short term. 2. Less potential to develop large green trees for future snags, than Alt 2. 3. Snag recruitment potential increased over Alt 2 in the short term and decreased long term.
Ponderosa Pine Diversity	SomeVariety All structural stages, but 5 represented.	Least Variety Grass/forb and open stands dominate,	SomeVariety All structural stages, but 5 represented.	Most Variety All structural stages, but 5 represented. Acreages more balanced than Alt 2.

Wildlife Habitat *Management indicators*	Existing Condition	Alternative 1	Alternative 2	Alternative 3
Big Game Habitat Capability MA 5.1				
Elk Summer	.496	.417	.511	.492
Elk Winter	.488	.185	.349	.414
Deer Summer	.448	.416	.475	.477
Deer Winter	.470	.171	.345	.411
Big Game Habitat Capability MA 5.4				
Elk Summer	.469	.396	.469	.396
Elk Winter	.455	.000	.000	.000
Deer Summer	.467	.430	.469	.430
Deer Winter	.453	.000	.000	.000

The Bugtown Gulch project purpose and need provides the focus and scope of the proposal as related to National and Forest level policy and direction. Given the purpose and need, the Deciding Official (Forest Supervisor) will review the proposed action, the issues identified during scoping, and the environmental consequences of implementing the proposal and alternatives. This forms the basis for the Deciding Official to make the following determinations:

- Whether or not the information in this analysis is sufficient to make an informed decision.
- Whether or not the vegetative treatments should be implemented, and if so, in what manner and in which locations.
- Whether or not to amend the forest plan for this project.

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CHAPTER 1. PURPOSE OF AND NEED FOR ACTION

Document Structure

The Hell Canyon Ranger District of the Black Hills National Forest has prepared this Environmental Impact Statement in compliance with the NEPA (National Environmental Policy Act), the Healthy Forest Restoration Act, and other relevant Federal and State laws and regulations. This EIS (Environmental Impact Statement) discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into four chapters:

- *Chapter 1. Purpose and Need for Action:* The chapter includes information on the history of the project proposal, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.
- *Chapter 2. Alternatives, including the Proposed Action:* This chapter provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on significant issues raised by the public and other agencies. This discussion also includes mitigation measures. Finally, this section provides a summary table of the environmental consequences associated with each alternative.
- *Chapter 3. Affected Environment and Environmental Consequences*: This chapter describes the environmental effects of implementing the proposed action and other alternatives.
- *Chapter 4. Index*
- *Chapter 5. Bibliography and Literature Cited*
- *Chapter 6. List of Preparer's*
- *Chapter 7. Final EIS Distribution List*
- *Appendices:* The appendices provide more detailed information to support the analyses presented in the environmental impact statement.

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

Background

During the mid-1990's, mountain pine beetle activity in the Black Hills was at endemic levels with mortality being light and scattered throughout the Forest. Increased tree mortality levels were detected on the Forest in 1997. By 1999, aerial survey results showed more than a two fold increase in mortality in just one year. Mortality levels continued to increase on the Forest with an exponential increase detected in the 2001 flight. These results showed an almost eight fold increase in estimated beetle-caused tree mortality in a single year. Approximately 38,000 dead trees were detected in 2000 and 299,000 dead trees were detected in 2001 with mortality becoming widespread across the

forest (Allen, 2004). The Bugtown Gulch area has been identified as an area having concentrated pockets of beetle-caused tree mortality.

In November of 2004, after consultation with Forest Health Specialist, Kurt Allen, Brad Exton, Acting Forest Supervisor, declared that a Mountain Pine Beetle epidemic was occurring within this project area (see letter in Appendix G) and that the epidemic poses a significant threat to forest resources.

The Jasper fire, largest wildfire in Black Hills history, occurred in 2000 directly west of the Bugtown Gulch Mountain Pine Beetle and Fuels (hereafter referred to as Bugtown Gulch) project area and threatened to expand into the project area. This 82,000-plus acre arson fire resulted in large expanses of complete mortality as well as large numbers of live stressed trees. Increased beetle activity in the fire area was evident almost immediately. Several other large (more than 1,000 acres in size) fires have occurred on the Forest since the Jasper fire, with similar results.

The on-going drought has caused trees to remain in a stressed condition. This factor has contributed to the ability of beetles to quickly expand their population numbers. Portions of the project area currently show 100 percent beetle-caused tree mortality. These dead fuels contribute toward wildfire risk.

People who live, work, and recreate in this area have become increasingly concerned about the impact of beetle-caused tree mortality and the potential for wildfire on Federal and private lands. A number of private landowners in the project area have completed or are in the process of thinning the trees on their land to protect their stands from beetles and wildfire.

Locally and nationally, the public is demanding actions to reduce the potential for large-scale wildfires on public lands. The National Fire Plan and other initiatives such as the Healthy Forest Restoration Act were developed to address this issue.

The Bugtown Gulch Mountain Pine Beetle and Fuels Project (Bugtown Gulch) is located approximately 5 miles west of Custer, South Dakota within Custer and Pennington Counties (see map 1 in Appendix A). The project area includes approximately 15,941 acres, 13,378 acres of which are National Forest System lands and 2,563 acres which are private lands. Several housing subdivisions occur within or adjacent to the project area. All proposed activities would occur on National Forest lands. There are several arterial roads which access the project area including, NFSR (National Forest System Road) 284, 287, 292, and 293.

Management Direction

National Fire Plan September 2000, Healthy Forest Initiative (HFI) August, 2002 and Healthy Forest Restoration Act (HFRA) December, 2003

The National Fire Plan (September 2000) was developed as a result of an August 2000 directive by then-President Clinton to the Secretaries of USDA and USDI to develop a response to severe wildland fires, reduce fire impacts on rural communities, and ensure effective firefighting capacity in the future. In response to the risks posed by heavy fuels loads -- the result of decades of fire suppression activities, sustained drought, and increasing insect, disease, and invasive plant infestations -- the National Fire Plan established an intensive, long-term hazardous fuels reduction program. Hazardous fuels

reduction treatments are designed to reduce the risks of large scale, high intensity wildland fire to people, communities, and natural resources while restoring forest and rangeland ecosystems to closely match their historical structure, function, diversity, and dynamics. The Healthy Forests Initiative and the Healthy Forests Restoration Act have equipped land managers with additional tools to achieve long-term objectives in reducing hazardous fuels and restoring fire-adapted ecosystems.

The HFI (Healthy Forest Initiative) was launched by President Bush in August 2002 in response to public concerns over recent, severe wildfire activity and the resulting loss of life, property, and resource values. The intent of the HFI is to reduce the potential for severe wildfire and protect people, communities, and resource values. These goals are accomplished through both administrative reforms and legislative action.

The HFRA (Healthy Forest Restoration Act) was signed by President Bush in December 2003 and contains a variety of provisions to expedite hazardous fuel reduction on specific types of Federal land. The Bugtown Gulch project is an authorized hazardous fuel reduction project under section 102(a)(4) of the Healthy Forest Restoration Act of 2003. The area qualifies under section 102(a)(4) because there is an existing mountain pine beetle epidemic occurring within the project area which poses a significant risk to resource values on National Forest and private lands (see Appendix G).

The HFRA provides expedited procedures for complying with NEPA (National Environmental Policy Act) requirements. It also contains specific instruction pertaining to old growth stands and large tree retention under section 102(e) and 102 (f). However, the old growth and late succession instructions do not apply to projects authorized under section 102(a)(4), such as Bugtown Gulch. All authorized hazardous fuel reduction projects must be consistent with applicable Forest Plan direction. If the proposed action is not consistent with the Forest Plan, a plan amendment must be part of the proposed action or the action must be modified. Including a resource plan amendment does not preclude the use of the HFRA authorities.

Forest Plan Direction

The 1997 Revised Black Hills National Forest Land and Resource Management Plan (Forest Plan) supported by its Final Environmental Impact Statement (FEIS) 1997, is the Forest programmatic document required by the rules implementing the Forest and Rangeland Renewable Resources Act of 1974 (RPA), as amended by the National Forest Management Act of 1976 (NFMA). The Forest Plan was amended by the Phase I Forest Plan Amendment (Decision Notice dated May 18, 2001). This amendment provides revised and new Standards and Guidelines, as well as, additional protection measures applicable to a number of plant and wildlife species on the Black Hills National Forest.

The Black Hills National Forest is currently in the process of amending the Forest Plan, referred to as Phase II. The Phase II decision has been signed and implementation is pending following publication of the Notice of Availability in the Federal Register. The Bugtown Gulch project Record of Decision (ROD) will be signed prior to the effective date of the Phase II Amendment and therefore, is consistent with the current Phase I direction as described above.

The purpose of the Forest Plan is to provide direction for the multiple use and sustained yield of goods and services from National Forest System lands in an environmentally

sound manner. Moreover, the Forest Plan provides overall goals and objectives as well as associated standards and guidelines for management.

The Forest Plan establishes nine multiple use goals and associated objectives for management of the Forest. The first four goals are directed toward natural resource objectives for multiple use management of the Forest. Also, Goals 3 and 5 through 9 provide socio-economic emphasis for management of the Forest. The goals and objectives, applicable to specific resource management issues needing resolution, provide the basic direction for defining the purpose and need and ultimately developing the proposed action (Alternative 2). The nine Forest Plan goals are discussed in Chapter I of the Forest Plan. The Goal providing management emphasis and direction for the Bugtown Gulch project area is Goal 2.

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

The Forest Plan also sets management allocations for specific uses of land (management areas) within the Forest to meet multiple use objectives. The Bugtown Gulch ID Team reviewed the Management area designations and determined that no new information existed that would require reconsideration of Forest Plan allocations. However, they recognize that a site-specific amendment may be necessary in order to implement a needed action.

The project area is mainly (90 percent) within Management Area 5.1, Resource Production Emphasis (see Map 12 in Appendix A). These lands are to be managed primarily for wood products, water yield, and forage production while also providing other commercial products, visual quality, diversity of wildlife and a variety of other goods and services.

A small portion (10 percent) of the project area is within management area 5.4, Big Game Winter Range(see Map 12 in Appendix A). These areas are managed to provide high-quality winter and transitional habitat for deer and elk, high-quality turkey habitat, habitat for other species, and a variety of multiple uses.

Other Direction Specific to Fire and Fuels Management

A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment - 10 Year Comprehensive Strategy Implementation Plan, May 2002. This plan establishes a collaborative, performance-based framework for achieving specific goals, actions, guiding principles, performance measures and implementation tasks needed to reduce the risks of severe wildlife fire. This plan represents a unified national commitment endorsed by Secretaries, Governors, Tribes, local officials and others.

Protecting People and Sustaining Resources in Fire-Adapted Ecosystems – A Cohesive Strategy, October 2000. This strategy establishes a framework for actions designed to restore and maintain ecosystem health in fire-adapted ecosystems. The

strategy identifies types of land as priorities for treatments and incorporates elements of public concern, available budgets and Forest Service objectives.

Purpose and Need for Action

As described and referenced under the Management Direction section above, there are numerous Goals and Objectives identified in Chapter 1 of the Forest Plan. The Deciding Official for the Bugtown Gulch Project has chosen to propose resource management actions that focus on Forest Plan Goal 2 as well as the National emphasis on reducing the potential for large scale, high intensity wildfire.

In November of 2004, after consultation with Forest Health Specialist, Kurt Allen, Brad Exton, Acting Forest Supervisor, declared that a Mountain Pine Beetle epidemic was occurring within this project area (see letter in Appendix G) and that the epidemic poses a significant threat to forest resources.

Associated with this goal are specific resource objectives, as outlined in the Forest Plan. Some of these objectives are key to defining the purpose and need and developing the proposed action. Key objectives providing management emphasis for this project are summarized below. Note that other Forest Plan goals and numerous objectives not mentioned below also provide guidance and are achieved to varying degrees depending on project accomplishment.

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

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

  Existing snag densities currently exceed these averages due, in part, to beetle caused tree mortality in the project area.

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

  The mountain pine beetle epidemic is actively changing ponderosa pine habitat within the project area. Given current conditions and trend, it is expected that the epidemic will vastly alter habitat for sensitive species and management indicator species within the next 5 years.

- **Objective 224**: Reduce or otherwise treat fuels commensurate with risks (fire occurrence), hazards (fuel flammability), and land and resource values common to the area, using the criteria in Forestwide Guideline 4110.

- **Objective 227**: Manage activity and natural fuels consistent with the need to protect life, property, and natural resources from the threat of wildfire.

  There are approximately 2,563 acres of private land within the project area with many year-round and seasonal homes. The risk, hazard and land and resources values within the project area are considered to be moderate. The project area is

currently classified as having a Fire Regime Condition Class rating of 3, where fire regimes have been significantly altered from their historical range. The risk of loss of key ecosystem components is high.

- **Objective 228**: Where outbreaks of mountain pine beetle could threaten management objectives for ponderosa pine (especially where timber production is desired), maintain or reduce acreage of ponderosa pine stands that are in medium or high risk condition for infestation.

  Currently, there are approximately 10,465 acres (82 percent) of ponderosa pine stands in the project area that are in a high risk condition for mountain pine beetle infestation (see Entomology section of Chapter 3). An active mountain pine beetle epidemic is occurring within the project area with estimated beetle populations increasing by a factor of one to two-folds per year.

- **Objective 229**: Using analyses of insect and disease populations, determine where suppression strategies are needed to meet management objectives and minimize value loss of tree vegetation affected by outbreaks of insect and disease pests.

The Rocky Mountain Region Forest Health Management Rapid City Service Center monitors insect activity on the Black Hills. The Bugtown Gulch project area has been identified as an area with concentrated beetle mortality and increasing beetle populations as a result of this monitoring (Entomology reports are available in the project file). Suppression strategies include sanitation harvest which directly affects beetle populations by removing trees with live beetle brood in them from the area.

The purpose of this project is to reduce the potential for widespread mountain pine beetle related tree mortality and to reduce the risk of a large-scale high intensity wildfire in the project area. This project area contains many parcels of private land with year-round and seasonal homes, the Bear Mountain lookout and communication tower, and snowmobile and hiking trails, as well as vast areas of ponderosa pine habitat. Many of the landowners in the project area have either completed or are in the process of thinning trees on their land for this very same purpose.

Action is needed because there is an active mountain pine beetle epidemic occurring within the project area. This epidemic is continuing to gain strength in the project area where approximately 82 percent of the ponderosa pine stands on National Forest are in a high risk condition for mountain pine beetle susceptibility, based on tree diameter and stand density.

There is also a need to reduce fuel loadings, particularly around private lands. Relatively contiguous forest cover in Fire Regime Condition Class 3, coupled with dead fuels resulting from the beetle epidemic provide the potential for large-scale, high intensity wildfire to occur in this area which would threaten homes and other resource values.

Proposed Action

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

The proposed action was developed to address the purpose and need for action as previously described. The Hell Canyon District Ranger considers this proposal to be urgent and prudent within this area. Recommended management strategies provided by the Rocky Mountain Region Forest Health Management Rapid City Service Center were utilized in development of the proposed action (see Forest Health Evaluations in the project file). Fuel treatment needs were identified based on hazard, risk, and values.

The proposed action includes aggressive management strategies designed for suppression of the epidemic, prevention of further infestations, and salvage of beetle killed trees. Sanitation harvesting is proposed as a suppression method to remove trees which have live beetle brood in them. This action would remove as many beetles as possible prior to flight, in an attempt to lessen the size and extent of the epidemic. Sanitation may occur for up to three consecutive years in any particular area to capture infested trees that have been missed or which became infested following harvest. Prevention methods include commercial thinning to reduce stand density thereby increasing tree vigor and reducing stand susceptibility to beetle attack. Salvage harvesting would remove dead trees which no longer have beetle brood in them. Other actions would include understory fuel treatments to reduce the future risk of large high intensity wildfires in the area. Due to the urgent nature of the project, it was decided that no new system roads would be constructed and no road closures would be proposed. No road re-construction is proposed. All treatments would utilize existing roads. All treatments would occur within ponderosa pine stands or aspen stands with a pine component. A project specific Forest Plan amendment regarding big game habitat effectiveness in management area 5.4 would be necessary to implement this alternative.

This action responds to the goals and objectives outlined in the Black Hills National Forest Land and Resource Management Plan, as amended, and helps move the project area towards desired conditions described in that plan.

Decision Framework

The Bugtown Gulch Mountain Pine Beetle and Fuels project purpose and need provides the focus and scope of the proposal as related to the programmatic goals of the Forest Plan as amended by the Phase I Amendment, the policy and direction provided by National level guidance from the National Fire Plan, and the Presidents Healthy Forest initiative. Given the purpose and need, the Deciding Official will review the proposed action, the issues identified during scoping, the other alternative, the environmental consequences of implementing the proposal and alternatives, and public comments on the Draft EIS. This forms the basis for the Deciding Official to make the following determinations:

- Whether or not the information in this analysis is sufficient to make an informed decision.
- Whether or not the vegetative treatments should be implemented, and if so, in what manner and in which locations.
- Whether or not to amend the forest plan for this project.

Public Involvement

The Healthy Forest Restoration Act seeks to gain public support for authorized project decisions by emphasizing public involvement during the preparation phase. Collaboration has occurred between Federal, State, Local, and Tribal governments, and interested parties have participated in scoping efforts. Various opportunities for collaboration and public input include the following:

- 11-9-04 News Release: Black Hills National Forest Advisory Board to Consider HFRA Project, Phase II
- 11-9-04 News Release: Hell Canyon Ranger District Offers Bugtown Gulch Project Field Trip
- 11-17-04: Project proposal was presented to the National Forest Advisory Board and input from the board was requested.
- 11-18-04: A public field trip to the project area was attended by 10 members of the public and media.
- 11-19-04: Project proposal was presented to tribal representatives at the Forest Heritage Meeting and input was requested.
- January, 2005: A scoping letter and scoping document were sent to 199 tribal members, groups, agencies, government leaders, landowners, and other interested members of the public. The document summarized the purpose and need for action, guiding management direction, the proposed action, and requested comments on the proposed action. This letter also notified the public of an open house scheduled for January 20, 2005.
- 1-11-05 News Release: Bugtown Gulch Open House Announced.
- 1-14-05 Copies of the scoping letter, scoping document, and vicinity map are posted to the Black Hills www site.
- 1-17-05 Article in the Rapid City Journal: Healthy Forest Thinning Starts
- 1-19-05 Article in the Custer Chronicle: Bugtown Gulch Open House to be Held Jan. 20.
- 1-20-05: Open house at the Forest Supervisor's Office in Custer. Twenty-two people signed in, more attended but didn't sign in. The attendees voiced concerns about the beetle epidemic and hazardous fuels loadings and expressed support for the project.
- 1-24-05: The proposed action map was posted to the Black Hills www site.
- 2-1-05: The Bugtown Gulch project was discussed on a local radio station, KOTA.
- 2-10-05: The project was discussed in a meeting with representatives from Congresswoman Herseth's, Senator Thune's, and Senator Johnson's offices.
- The Notice of Intent (NOI) was published in the Federal Register on March 1, 2005. The NOI asked for public comment within 30 days of publication of the notice.

- A Revised NOI was published in the Federal Register on July 11, 2005. The Revised NOI notified the public that there may be project specific Forest Plan amendments included with the project and that the Decision Maker would be the Forest Supervisor.

Issues

The ID (Interdisciplinary) Team separated the issues into two groups: significant and non-significant issues. Significant issues were defined as those directly or indirectly caused by implementing the proposed action. Non-significant issues were identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. The CEQ (Council on Environmental Quality) NEPA regulations explain this delineation in Sec. 1501.7, "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3). The ID Team identified the following Significant issues during scoping:

Mountain Pine Beetle Epidemic

A mountain pine beetle epidemic is occurring within the project area (see Appendix G). The need to suppress the infestation and prevent it from spreading as much as possible is currently of foremost concern with the agency and the public in this project area.

The mountain pine beetle epidemic is the major focus on the Bugtown Gulch project. The importance of addressing this issue is magnified by the fact that a significant majority of the ponderosa pine stands (approximately 82 percent) within the project area are at high risk for mountain pine beetle susceptibility and there is a great deal of private land in and around the project area. Many private landowners within the area have indicated that they either have thinned, or intend to thin their property as a protection measure against insects and wildfire. The issue will be approached by emphasizing that insect infestation and subsequent tree mortality cannot be eliminated, but through sanitation and thinning, the potential for mortality can be reduced.

Comments and feedback from the public and other agencies during the scoping process indicates that, in general, there is broad public support for addressing this epidemic utilizing active management practices including sanitation and thinning. In addition to supporting management actions, the public advocates that implementation of these actions occur as soon as possible. Two commenters do not support the project. One commenter questions whether the proposed thinning to reduce stand density will actually reduce mountain pine beetle susceptibility and tree mortality while another advocates no action and letting the infestation run its course.

The following parameters are the measurement indicators for this issue.

- Ponderosa pine stands in a high risk condition for mountain pine beetle susceptibility (acres and percentage)
- Mountain Pine Beetle-caused Tree Mortality (increasing to decreasing)

Fuel and Fire Hazard Reduction

Reduction of standing and down fuels to reduce wildfire hazard is also a concern within the project area. The beetle epidemic has increased dead fuels in the project area. A large, high intensity wildfire in the project area would threaten not only important ecosystem components on National Forest lands, but private lands as well. This issue has become more of a concern in recent years given the massive wildfires and drought in the western United States in general and the Black Hills, specifically. The 82,000-plus acre Jasper fire burned along the western side of the project area under extreme weather conditions in 2000 and threatened to burn through this area as well.

The issue will be addressed in terms of reducing the potential for a large scale, high intensity fire on National Forest and private land. Nationally, a series of initiatives and streamlining of processes related to fuels and fire hazard reductions have been made available for use at the local level to address this issue.

Public comments and feedback are nearly unanimous in support of the proposed actions to address this issue in the project area. Some input suggests additional methods or treatments to further reduce wildfire risk. One commenter disagrees that efforts to alter or control future fire behavior through fuels reduction treatments will be effective and that these efforts will have detrimental effects to the environment.
The parameters listed below are measurement indicators for the multiple aspects of the fuels and fire issue for this project.

- Condition Class (value and whether or not improved)
- Fuel Model 8 (acres)
- Fuel Model 9 (acres)
- Fuels Model 12 (acres)

Wildlife Habitat

Specific public concerns regarding wildlife were limited to providing diversity of habitats across the landscape and the impact on snag dependent and associated species. Concern was raised that efforts to reduce the potential for wildfire in the project area may negatively impact wildlife species by reducing the complexity and diversity of available habitat. Concern was also raised that efforts to suppress and prevent the beetle epidemic will result in reduced snag densities, diameters, and longevity across the landscape. Providing for big game habitat is a management concern, particularly within Management Area 5.4, big game winter range. Wildlife habitat, including snags, will be addressed in terms of what the desired future condition is, given that the existing beetle epidemic is actively changing habitat on the landscape.

The parameters listed below are measurement indicators for the multiple aspects of the wildlife habitat issue for this project

- Snag Conditions:
- Ponderosa Pine Structural Diversity:
- Big Game Habitat Capability (HABCAP values)

CHAPTER 2. ALTERNATIVES, INCLUDING THE PROPOSED ACTION

Introduction

This chapter describes and compares the alternatives considered for the Bugtown Gulch Mountain Pine Beetle and Fuels project. It includes a detailed description of the Proposed Action (Alternative 2) and one other action alternative (Alternative 3) as well as the No Action Alternative (Alternative 1). There is also a brief overview of those alternatives that were considered by the ID Team but eliminated from detailed development and study. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for choice among options by the decision maker and the public.

Alternatives Considered in Detail

The Healthy Forest Restoration Act states in Section 104 (c)(1)(C) that for authorized projects not within the Wildland Urban Interface (WUI), such as Bugtown Gulch, no more than 1 additional alternative, beyond the proposed action and no action alternatives, should be studied, developed, and described. The Forest Service developed three alternatives in detail, including the No Action and Proposed Action alternatives, in response to issues raised by the public. Also, described under applicable alternatives are any Forest Plan amendments considered potentially necessary to fully implement a given alternative. The determination of need for any specific amendment will be made in a Record of Decision. Maps of each alternative considered in detail are located in Appendix A (maps 5 and 6) of this EIS.

It is important to note that the amount (e.g., acres, miles, etc.) of a particular activity in any alternative is approximate (based on inventory and survey estimates). Actual figures may increase or decrease somewhat during “on-the-ground” preparation of the project due to such things as topography, or for this project, the extent of mountain pine beetle infestation and mortality.

The law generally prohibits the harvest of stands before they reach their maximum growth rate (National Forest Management Act, NFMA, 16 U.S.C. 1604(m)). Exceptions in the law allow the harvest of individual trees, or even parts of whole stands of trees, before this time to thin and improve timber stands, and salvage damaged stands of trees, (part 1604 m1 of the law). The following harvest treatments are consistent with part m1 of this law:

- Commercial thinning, including variable density commercial thinning
- Precommercial thinning
- Sanitation/Salvage

Further exceptions are allowed in order to achieve multiple-use objectives other than timber harvest (part 1604 m2). The following treatment is consistent with the exceptions provided in part m2 of the law:

- Fuel Treatment thinning

This treatment is designed to reduce the potential for large-scale, high intensity wildfire within the project area.

Alternative 1 – No Action

NEPA (National Environmental Policy Act) requires the study of the No Action Alternative and that it be used as a basis for comparing the effects of the proposed action and other alternatives. The No Action alternative assumes no implementation of any elements of the proposed action or other action alternatives would take place within the Bugtown Gulch project area.

This alternative represents no attempt to actively respond to the purpose and need for action or the issues raised during scoping. There would be no effort to modify existing vegetation or related fuel conditions in the project area. The current mountain pine beetle epidemic would not be suppressed and efforts to prevent widespread beetle-caused tree mortality and reduce hazardous fuels would not be undertaken. Fuel breaks or thinning would not occur adjacent to private land. Opportunities to designate better quality stands for late succession management would be foregone.

Features Common to Both Action Alternatives

Goshawk Nesting Habitat and Post Fledgling Areas (PFAs)

There is one historic goshawk nest site in the project area. Treatments would be deferred within the nest stand and the protected nest area totaling 197 acres. A 412-acre PFA is established around that protected nest area. A second area of protected nesting habitat of 190 acres is deferred from all treatment. This nest area is entirely within sites designated for late succession management. A 417-acre PFA is established around this nesting habitat in the French Creek area in the southern part of the project area. Approximately 209 acres of the French creek PFA is also designated as late succession. Variable density commercial thinning and sanitation is proposed within PFA stands which are not late succession. Refer to maps 5 and 6 in Appendix A to view proposed alternative treatments and designated nesting and PFA habitat.

Late Succession

Under the 1997 Forest Plan, 486 acres were designated for late succession management in the project area. These acres are spread out across the project area in relatively small patches. Approximately 251 acres of these designated late succession stands have experienced heavy mountain pine beetle activity and have recently completed sanitation and thinning treatments under the Elliot and Bear sales. Forest Plan Objective 207 allows for ‘exchanging’ late succession acres when the goal is to improve ‘quality and size’. The action alternatives propose to increase the acres of area designated for late succession management to 494 and to concentrate late succession in the French creek area where better quality habitat exists (see map 15 in Appendix A). Sanitation treatments are proposed within designated late succession management stands which are not part of the protected goshawk nest area.

Roads

Due to the urgent nature of the project, it was decided that no new system roads would be constructed and no road closures would be proposed. All treatments would utilize existing roads (see map 10 in Appendix A).

Post-Sale Projects

Summaries of the proposed post-sale improvements in the project area are provided below. These projects are proposed under both action alternatives, and their effects have been considered in the analysis. For further information on these projects, refer to the project file.

Riparian/Wetland Habitat Improvement Projects

French Creek Riparian Habitat Improvement
This project will improve the riparian habitat on French Creek and reduce the sediment from eroding banks at closed old road crossings. It will also remove some of the conifers that have encroached into the area. The channel is incised where the stream flows through meadows. The proposal is to build up to 10 rock check dams at five meadow sites along French Creek for permanent grade control. In addition, the proposal is to build three rock barriers and buck and pole fences to discourage motorized use within the creek and keep the area closed to motorized use. The stream banks at the crossing would be rebuilt to stop the erosion and rebuild the stream bank.

North Fork French Creek Riparian Habitat/Wetland Improvement
This project would improve the riparian habitat on a short section of North Fork French Creek. From above Camp Custer Dam downstream to private property, the stream channel is incised and deep. This incised channel is draining the valley bottom and wetland, lowering the water table and decreasing water storage. The proposal is to build two to three rock check dams to provide for a permanent gradient control.

Range Structures and Improvements

Several range structures and improvements are proposed within the Junction, Tenderfoot, French Creek, and Limestone Allotments. These activities include building an elk fence (pasture fence with top wire cable), constructing reservoirs, fencing springs and dams, pumping water to holding tanks away from springs and dams, installing improvement signs, dredging reservoirs, developing springs, removing un-needed fence, and constructing a well house.

Wildlife

Wildlife related projects include replacement/repair of an existing riparian exclosure at French Creek and non-commercial thinning within the PFAs to encourage development of stand structure.

Weeds

Treatment of noxious weeds is proposed for up to 5 years following the end of activity and on up to 640 acres per year. This treatment would be monitored on a yearly basis (see Appendix C).

Silviculture

Post-sale silviculture treatments include thinning of non-commercial trees.

Alternative 2 – Proposed Action

The proposed action includes management strategies designed for suppression of the beetle epidemic, prevention of further infestations, and salvage of the mountain pine beetle epidemic area (see map 5 in Appendix A).

Sanitation

Sanitation cutting is the removal of trees to improve stand health by stopping or reducing the spread of insects and disease. Sanitation harvesting is proposed in the project area as a suppression method to remove actively infested green trees which have live beetle brood in them. No live uninfested trees would be removed under sanitation treatments in this project. Trees removed in a sanitation harvest are treated; either moved to at least one mile from the nearest live host type or processed at the mill, prior to beetle emergence. This action is aimed at removing as many beetles as possible prior to flight, in an attempt to lessen the size and extent of the epidemic.

Infested trees are already dead, but the needles do not turn brown until the following summer. Sanitation may occur for up to 3 consecutive years in any particular area to capture trees which become infested following initial harvest.

The amount of infested trees removed for sanitation would be dependent upon the extent of the infestation. In general, the epidemic is occurring within dense stands which have a high hazard rating for mountain pine beetle susceptibility. Low risk stands which have recently been thinned are generally not experiencing beetle caused mortality. Therefore, suppression efforts will be concentrated in the high risk stands and will be implemented in conjunction with thinning treatments. Yearly monitoring will be conducted in low risk stands (currently low risk or thinned under this project) to determine if there is a need for sanitation treatments within them (see Appendix C). Determination of treatment need in these low risk stands will be based on the level of infestation, location and economic viability.

It is recognized that suppression efforts would not be effective in protecting stands where beetle populations have become too severe. However, active sanitation treatments in these stands could help protect surrounding stands on the landscape by directly decreasing the beetle population in the area. Monitoring of the infestation is integral to identifying when that threshold has been reached. For this project, if field monitoring indicated that beetle-caused mortality had occurred to the extent that the structural stage of a stand was reduced to below a 3A or 4A condition, depending on the average stand

diameters, then sanitation efforts would cease in those stands. If prevention methods are implemented in a timely manner as described under 'Thinning' below, beetle-caused mortality to this degree is not expected to occur in the project area.

Sanitation is proposed in susceptible pine stands which are not deferred for other resource concerns or which are within other sale areas. Approximately 160 acres of aspen stands with a pine component are also prescribed for sanitation treatments if beetle infestations in those areas occur. This includes High and Low risk stands, stands within PFAs, and stands designated for late succession management.

All size classes of pine would be included with this treatment. The Healthy Forest Restoration Act provides requirements for maintaining large trees outside of old growth in section 102(f). This project is an "Authorized project" under section 102 (a)(4) of the Healthy Forest Restoration Act (HR 1904). Section 102(e)(1)(B) of the Act defines 'covered project' for subsections (e) and (f). It excludes authorized projects under section 102 (a)(4). Therefore, the large tree retention requirements of the Act do not apply to commercial thinning or sanitation treatments proposed in this project. Furthermore, fuels treatments would not remove any trees over 9" dbh.

Thinning

Intermediate thinning, as described here, strives to retain the highest quality trees on site. These are generally the largest trees which have out-competed surrounding trees. Trees targeted for removal will generally be the smaller, merchantable trees. Design criteria for this project includes retention of 5-8 of the largest green trees available per acre. The purpose of this is to insure retention of larger trees on sites which may be of a different size class or age than the overall stand being thinned.

Management actions that increase tree vigor and reduce stand susceptibility to beetle attack through reducing basal area or controlling other stand conditions is a proven management strategy for reducing risk. Prevention methods are applied in stands, or portions of stands, which have not experienced heavy beetle-caused mortality. The purpose is to reduce stand density and create stand conditions unfavorable to the mountain pine beetle. For this project, prevention methods would include commercial thinning and variable density commercial thinning.. These activities would be applied within stands or portions of stands not infested by mountain pine beetles and which have been determined to have a High risk of mountain pine beetle susceptibility. The purpose is to reduce the risk of susceptibility to a Low hazard rating.

Commercial thinning is the dominant treatment proposed within the project area. Target basal area for this prescription would be 40 square feet per acre. This aggressive level of thinning is proposed because of the active beetle epidemic in the area and the threat of significant mortality in these stands. Commercial POL thinning and Sanitation would also be applied on these acres where suited conditions exist within the stands. This treatment is proposed in pine stands with larger than 7 inches average diameter.

Variable density commercial thinning is an adaptation of commercial thinning designed to leave varying densities within stands, rather than a more uniform tree spacing

condition. This treatment is proposed in stands designated for Goshawk PFA (post-fledging area) habitat which are not in late succession or the Wabash Timber Sale. Target basal areas would vary throughout the PFA stands, and would maintain a 50 percent canopy closure. The objective is to reduce the overall risk of loss to mountain pine beetles while providing a range of structural conditions within this habitat. POL thinning and Sanitation would also be applied on these acres where suited conditions exist.

POL thinning is proposed where stand diameters are generally smaller than stands with a typical commercial thinning prescription, averaging in the 6 to 7 inches range. Target basal area would be 40 square feet per acre.

All size classes of pine would be included in commercial and variable density commercial thinning. The Healthy Forest Restoration Act provides requirements for maintaining large trees outside of old growth in section 102(f). This project is an "Authorized project" under section 102 (a)(4) of the Healthy Forest Restoration Act (HR 1904). Section 102(e)(1)(B) of the Act defines 'covered project' for subsections (e) and (f). It excludes authorized projects under section 102 (a)(4). Therefore, the large tree retention requirements of the Act do not apply to commercial thinning or sanitation treatments proposed in this project. Furthermore, fuels treatments would not remove any trees over 9" dbh.

Salvage

Salvage harvesting would remove dead trees which no longer have beetle brood in them. This activity is neither a suppression or preventative measure in regard to mountain pine beetle. Rather, it would allow for commercial utility of beetle-killed trees and reduce fuel loadings. The extent of salvage harvesting must be balanced with the needs of snag associated wildlife and potential environmental impacts. Therefore, salvage harvesting would not occur in designated PFAs or stands designated for late succession management or on soils identified as sensitive to this activity. Up to 250 acres of salvage harvesting may occur within the project area. Design criteria in Appendix B would require that at least four snags per acre, of the largest size available, would be retained within all salvage stands

Fuel Treatments

Other actions would include understory fuel treatments to reduce the potential of large-scale, high intensity wildfire in the area. This involves either mechanical or hand treatment of understory fuels and includes some thinning of trees up to 7 inches dbh (diameter at breast height) where commercial treatments have been implemented. In areas where commercial treatments have not been implemented (300 foot fuelbreaks along private land), fuels thinning may include trees up to 9 inches dbh. Very few commercial sized trees would be removed as part of fuels treatments. Fuel treatments are proposed around private land.

All treatments would occur within ponderosa pine stands or aspen stands with a pine component. Design criteria and monitoring relative to this alternative is described in

Appendices B and C, respectively. See Map 5 in Appendix A for a display of locations of proposed treatments. Features of Alternative 2 are summarized below:

Commercial Harvest Treatments

- Commercial thinning/POL (CT)– 7,561 acres
- Variable Density Commercial Thinning/POL (VDCT) – 412 acres:
- Products Other than Logs (POL) – 112 acres
- Sanitation – up to 2,655 acres outside commercial thin acres
- Salvage – up to 250 acres

Non-commercial Treatments

- Fuel Treatments – 5,500 acres:
- Non-commercial thinning – 3,703 acres:

Commercial Volume (sawtimber)

- 24.9 mmbf (22.7 mmbf from thinning and 2.2 mmbf of possible sanitation and salvage)

Forest Plan Amendment

During analysis the ID Team identified the potential need for a site-specific Forest Plan amendment to fully implement this alternative. The effect of implementing each alternative is presented in Chapter 3. The following is a description of the situation that would require an amendment and the purpose for proposing this amendment.

Alternative 2 results in Habitat Effectiveness values for deer and elk which are below those stated in Forest Plan guideline 5.4-3203 for management area 5.4.

Forest Plan Direction

Deer and Elk Habitat Effectiveness (Guideline 5.4-3203).—Deer and elk habitat effectiveness values in a planning unit should at least meet the following values. Vegetative management projects in planning units currently below these values should result in increased habitat effectiveness.
Elk Summer = 54 percent
Elk Winter = 47 percent
Deer Summer = 45 percent
Deer Winter = 46 percent

Habitat Effectiveness

Table 2.1 displays Habitat Effectiveness values calculated for the existing condition and Alternative 2. These values were calculated using the HABCAP model.

Table 2.1: Existing and Alternative 2 Habitat Effectiveness

Species	MA 5.4 Guideline	Exisiting Condition	Alt. 2
Elk (Summer)	**54%**	47% (.469)	47% (.469)
Elk (Winter)	**47%**	46% (.455)	0% (.000)
Deer (Summer)	**45%**	47% (.467)	47% (.469)
Deer (Winter)	**46%**	45% (.453)	0% (.000)

The alternative does not meet HE values for Elk and Deer winter or Elk summer habitat. While the elk summer HE values do not change from the existing condition, they do not improve as is required under guideline 5.4-3203 for vegetation projects where the existing HE is below the stated value. The only method for increasing this value would be to reduce open road density by closing roads. Road closures or construction are not part of this project and therefore, this value cannot be improved with this project.

Winter HE, as calculated by the HABCAP model is currently below the guideline values and is reduced to zero with the alternative. The reason for the reduction is a result of reducing the density of pine stands with a 4B structural stage to a 4A condition. This lowers the cover value of these stands, but does not eliminate their value. However, the HABCAP model also incorporates a distribution value which measures the juxtaposition of cover and forage on the landscape. In this case, because all pine would have the same structural stage (4A) the distribution value is zero. Consequently, calculated HE values are zero.

In reality, the area does provide a winter habitat value and this situation demonstrates the limitations of the HABCAP model. The area will continue to provide winter foraging habitat until snow depths 1-2 feet or more. Topography and understory vegetation will provide some winter cover habitat.

The HABCAP model is intended to be utilized for areas at least 5,000 acres in size which is significantly larger than the 1,024 acres modeled here. The larger area represents a reasonable home range for big game. On smaller areas, HE values are less meaningful as they do not represent a full home range, rather only a portion of a home range. Habitat deficiencies are magnified at the smaller scale. More information on this analysis is provided in the Big Game section of Chapter 3.

The proposed amendment would be for alternative 2 only and would allow for elk and deer winter HE to be reduced from 47 percent and 46 percent, respectively, to 0 percent, and elk summer HE to be reduced from 54 percent to 47 percent.

Rationale for Amendment

The 5.4 management area is located in the far southwestern edge of the project area and encompasses 1,024 acres of National Forest. The Jasper fire boundary lies within ½ mile to the west. There are 15 acres of aspen and 1,009 acres of ponderosa pine forest. Approximately 693 acres (68 percent) of the pine stands are at a high risk for mountain

pine beetle susceptibility. An estimated 25 to 35 percent of the area has been identified as having active beetle infestation in the 2004 aerial survey. The beetle activity is almost exclusively within the high risk stands. There is a large area of private land on the eastern side of this management area and extending southward. Much of this private land has been subdivided within the past 5 years and new homes have been built. Beetle activity is also evident on the eastern side of this private land.

There is a mountain pine beetle epidemic occurring within the project area. The epidemic is centered around dense stands which are most susceptible to mountain pine beetles. It is estimated that within 5 years, beetle caused mortality within high risk stands will be extensive if no action is taken to reduce susceptibility. Suppression and prevention treatments are proposed which would physically remove beetles from the area as well as reduce risk in the uninfested stands. Without these treatments within the 5.4 area, beetle populations will increase and are likely to spread onto both surrounding National Forest and private land with the next 5 years. The resulting tree mortality would present an increased fuels hazard to these lands as well. It is estimated that the current structural stages will change more drastically than as proposed in alternative 2, within the next 5 years. A comparison of HE values for the existing condition, Alternative 2 and No Action within 5 years is presented in Table 2.2.

Table 2.2: Habitat Effectiveness of Existing Condition, Alternative 2 and No Action

Species	MA 5.4 Guideline	Exisiting Condition	Alt. 2	No Action within 5 years
Elk (Summer)	**54%**	47% (.469)	47% (.469)	40% (.396)
Elk (Winter)	**47%**	46% (.455)	0% (.000)	0% (.000)
Deer (Summer)	**45%**	47% (.467)	47% (.469)	43% (.430)
Deer (Winter)	**46%**	45% (.453)	0% (.000)	0% (.000)

Alternative 3

This alternative was developed to address input from the public that the proposed action would result in little diversity on the landscape and as an option which meets all Forest Plan direction. To address these concerns and meet the purpose and need, all commercial treatments are deferred in management area 5.4 (998 acres) as well as select stands in management area 5.1 (1,639 acres). Understory fuel treatments in management area 5.4 would occur along private land. These fuel treatments would not result in structural stage changes. The projected HE values for Alt 3 represent expected structural stage changes that would occur as a result of the mountain pine beetle epidemic in management area 5.4, not active management. Therefore, a Forest Plan amendment is not necessary to implement this alternative.

Sites deferred in management area 5.1 are those considered to be somewhat less susceptible to mountain pine beetle, thus improving the potential for these stands to persist. However, all deferred sites would continue to have a high risk for mountain pine beetle susceptibility. Approximately 2,233 acres of commercial thinning, 404 acres of

potential sanitation, and 1,350 acres of fuels treatments would be deferred in this alternative. All other features of Alternative 2 are included in this alternative.

Sites deferred in management area 5.1 are those with habitat structural stages of 3B and 3C. These sites were deferred because they are considered to be somewhat less susceptible to mountain pine beetle than sites in the 4B and 4C structural stages due to average stand diameters. In general, stands are considered to be most susceptible when a majority of the stand is in the 7 to 13 inch diameter range. Stands with a size 3 structural stage contain trees 1 to 9 inches in diameter. In general, these structural stage 3 stands would contain many smaller diameter trees which are less susceptible, while size 4 stands consist of trees greater than 9 inches diameter and would be most likely to have a majority of the stand within the most susceptible diameter range. Diversity would be provided by deferring structural stage 3 stands with greater than 40 percent canopy closure. However, all deferred sites would continue to have a high risk for mountain pine beetle susceptibility. Where deferred sites are adjacent to private land, 300 foot fuel breaks would be constructed. Fuelbreaks are areas where standing and ground fuels are reduced to a low hazard level. This includes mechanical or hand piling or crushing of slash and thinning of dense understory trees to up to an18 foot spacing.

Design criteria and monitoring relative to this alternative is described in Appendices B and C, respectively. See Map 6 in Appendix A for a display of locations of proposed treatments. Features of Alternative 3 are summarized below. For more information on these treatments, review the Alternative 2 proposed action discussion presented previously in this Chapter.

Commercial Harvest Treatments

- Commercial thinning/POL (CT)– 5,328 acres
- Variable Density Commercial Thinning/POL (VDCT) – 412 acres:
- Products Other than Logs (POL) – 112 acres
- Sanitation – up to 2,251 acres outside commercial thin acres
- Salvage – up to 250 acres

Non-commercial Treatments

- Fuel Treatments – 4,150 acres:
- Non-commercial thinning – 3,026 acres:

Commercial Volume (sawtimber)

- 16.7 mmbf (15.3 mmbf from thinning and 1.4 mmbf of possible sanitation and salvage)

Design Criteria

Design criteria has been developed and is to be implemented as part of the action alternatives. These measures would be applied in order to protect resources and forest users. Appendix B lists all design criteria applicable to this project.

Monitoring

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

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

Alternatives Considered but Eliminated from Detailed Study

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). The Healthy Forest Restoration Act states in Section 104 (c)(2) that for authorized projects not within the WUI (Wildland Urban Interface), where multiple alternatives to the proposed action are proposed during scoping and meet the purpose and need, only one should be fully studied, developed, and described and reasoning for the selection must be written. Public comments received in response to the Proposed Action provided suggestions for alternative methods for achieving the purpose and need. Some of the alternatives suggested in scoping would meet the purpose and need, but were not selected for detailed study. The alternatives dismissed from detailed consideration and the reasons for dismissal are summarized here.

Increase Diversity

Several members of the public expressed concern with the proposed action in that the landscape would be thinned to a consistent 40 BA (basal area). Recommendations for providing more diversity across the project area landscape were suggested. The premise of providing more diversity on the landscape was the focal point in development of Alternative 3. However, the particular approaches discussed here were not utilized to achieve this purpose for the reasons stated.

Uneven-aged Management: This approach involves creating openings within stands for regeneration purposes. Mountain pine beetle activity is actively creating openings within stands. To purposefully create openings within stands at this juncture could result in larger openings than desired due to the beetle activity. Larger openings would present concerns for regeneration and wildlife habitat. Also, the stands proposed for thinning are not physically ready for a regeneration treatment. The proposed thinning would not preclude the use of uneven-aged management systems in the future.

Use of Patch Clearcutting: As described under uneven-aged treatment above, there will be openings created by beetle mortality. Efforts to create additional openings through commercial treatments are not advised because of the potential result of larger than desired openings resulting from the combination of beetle activity and harvest.

Variable Density Thinning: This treatment would vary within stand basal areas from 40 to 100 square feet per acre. Variable density thinning is proposed for use

only within the PFAs in Alternatives 2 and 3. One commenter suggested that this treatment be expanded to other areas of the project to provide more diversity. This recommendation would meet the purpose and need for action since the resulting mountain pine beetle risk for treated stands is expected to be low overall. However, the more dense areas within these stands would remain more susceptible to beetles and the risk of mortality would increase. In the PFAs, that risk was accepted because of the need for varying structural stages within that habitat and because areas surrounding the PFAs would be aggressively thinned, providing a buffer. Diameter and density are the two factors which determine a stand's susceptibility to mountain pine beetles. Given the intensity of the existing epidemic, the preferred method of providing more diversity is by leaving dense stands where stand diameters are considered to be of a size less susceptible to beetles, as in Alternative 3. Therefore, the approach of increasing the acres of variable density thinning was dismissed from detailed study.

Vary remaining Basal Area from 40 to 60 Square feet per acre: Some input received from the public suggested that the remaining basal areas be varied by stand from 40 to 60 square feet per acre. This approach would meet the purpose and need for action for this project because the resulting stands would be considered to have a low risk of mountain pine beetle susceptibility. However, this approach would not provide for dense cover areas (80-120 square feet per acre). Alternative 3 would provide these dense areas in pole sized trees. Given the intensity of the existing epidemic, the preferred method of providing more diversity is by leaving dense stands where stand diameters are considered to be of a size less susceptible to beetles, as in Alternative 3. In terms of providing diverse wildlife habitat and visual differentiation, this approach would be less effective than the approach proposed in Alternative 3.

Hardwood Restoration

Some public input suggested that removal of conifers from aspen stands be included in an alternative to provide diversity, wildlife habitat, and reduced fire risk. Aspen restoration treatments have been accomplished within the project area in recent years. There are currently 273 acres of delineated aspen stands in the project area. Aspen also occurs in conifer stands as within stand clones. The IDT identified 160 acres of aspen stands that contain pine. These stands would be included for sanitation treatments in Alternatives 2 and 3. It is expected that aspen stems will increase under all alternatives as pine competition is removed, either as beetle mortality or from commercial treatments. Aspen is not susceptible to mountain pine beetle and therefore, restoration treatments would do nothing to address that portion of the purpose and need. Restoration treatments would do little to reduce the potential for a large-scale high intensity wildfire within the project area. Therefore, since this proposal does not fully meet the purpose and need for action, hardwood restoration was not included as part of the alternatives considered in detail.

Use of Prescribed Fire:

The use of prescribed fire to address the purpose and need was an internal alternative considered by the ID Team. Trees within the project area are in a stressed condition due to the continuing drought and this has likely contributed to the beetle epidemic conditions. Any use of prescribed burning to reduce fuel loadings would likely further the stressed condition of residual trees and could result in additional mortality. Therefore, the use of prescribed fire is not included as part of the alternatives considered in detail.

Comparison of Alternatives

This section provides a summary of the effects of implementing each alternative. Information in Table 2.3: is focused on activities proposed and

Table 2.4 displays effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives.

Table 2.3: Alternative Comparison

Commercial Treatments	Alt 1 Acres	Alt 2 Acres	Alt 3 Acres
CT/POL/Sanitation	0	7,561	5,328
VDCT/POL/Sanitation	0	412	412
POL	0	112	112
Estimated Thinning Acres	**0**	**8,085**	**5,852**
Estimated Thinning Volume	**0**	**22.7 mmbf**	**15.3 mmbf**
Sanitation	0	2,655 (potential)	2,251 (potential)
Salvage	0	250 (potential)	250 (potential)
Potential Sanitation/Salvage Acres	**0**	**2,905**	**2,501**
Potential Sanitation/Salvage Volume	**0 mmbf**	**2.2mmbf**	**1.4 mmbf**
Non-commercial Treatments			
Fuels Treatments	0	5,500	4,150
Non-commercial thin	0	3,703	3,026

Table 2.4: Effects to Key Issues by Alternative

Mountain Pine Beetle Epidemic *Management indicators*	Existing Condition	Alternative 1	Alternative 2	Alternative 3
Ponderosa Pine in a High Risk condition for MPB Susceptibility	10,465 (82%)	10,465 (82%)	3,013 (24%)	5,246 (41%)
Expected pine mortality from MPB into the future	Increasing	Rapidly Increasing	Decreasing	Decreasing, but to a lesser degree than Alt 2.

Fuel and Fire Hazard Reduction *Management indicators*	Existing Condition	Alternative 1	Alternative 2	Alternative 3
Fire Regime Condition Class	3	3: no improvement	3: improved	3: less improved
Fuel Model 8-acres	1,035	1,035	6,298	5,239
Fuel Model 9-acres	11,831	2,412	5,866	5,709
Fuel Model 12-acres	0	9,419	702	1,918
Wildlife Habitat *Management indicators*	Existing Condition	Alternative 1	Alternative 2	Alternative 3
Snag Conditions (All Alts meet FP Direction) 1. Density 2. Large Snags 3. Recruitment	1. Snags obvious, but secondary on landscape. Exceed FP direction. 2. Snags generally 10-14" dbh. Low potential for future large snag development 3.Good snag recruitment potential in short term. Poor in long term.	1-Density is highest in short term., lowest in the long term. 2. Least potential to develop large trees for future snags. 3. Highest Recruitment in the short term, lowest for long term.	1. Density similar to existing in short and long term. 2. Best potential for development of large green trees for future snags. 3. Best for future snag recruitment potential long term	1.Density greater than Alt 2. in short term, lower in long term. 2. Less potential to develop large green trees for future snags, than Alt 2. 3. Snag recruitment potential increased over Alt 2 in the short term and decreased long term.
Ponderosa Pine Diversity	SomeVariety All structural stages, but 5 represented.	Least Variety Grass/forb and open stands dominate,	SomeVariety All structural stages, but 5 represented.	Most Variety All structural stages, but 5 represented. Acreages more balanced than Alt 2.

Wildlife Habitat *Management indicators*	Existing Condition	Alternative 1	Alternative 2	Alternative 3
Big Game Habitat Capability MA 5.1				
Elk Summer	.496	.417	.511	.492
Elk Winter	.488	.185	.349	.414
Deer Summer	.448	.416	.475	.477
Deer Winter	.470	.171	.345	.411
Big Game Habitat Capability MA 5.4				
Elk Summer	.469	.396	.469	.396
Elk Winter	.455	.000	.000	.000
Deer Summer	.467	.430	.469	.430
Deer Winter	.453	.000	.000	.000

CHAPTER 3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

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

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

Analysis of cumulative effects includes past, present, and reasonably foreseeable future activities that could affect the biological or social environments. See Appendix E for a listing of past, present and future activities considered in the Bugtown Gulch cumulative effects analysis. The area analyzed for cumulative effects is the project area for most resources. Resource cumulative effects analyses which were completed on other than the project area boundary are noted in the individual resource sections.

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

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

Reasonably foreseeable actions include those management activities that are on-going or are scheduled to occur within the next five years. These activities may occur regardless of the alternative selected for implementation under this analysis. Foreseeable future actions include the Wabash Timber Sale, continued livestock grazing, road maintenance, noxious weed treatment, range developments, insect infestations, wildfires and fire suppression, and private land development.

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

WATERSHED, GEOLOGY AND SOILS

Affected Environment

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

Watersheds are comprised of different components and each component applies its signature to the watershed, making each watershed unique. These components include watershed boundaries, precipitation and climate, geology, soils, slope, CDAs (Connected Disturbed Areas), watershed conditions, streams, floodplains, wetlands, beneficial uses, water quality and quantity, private land, and roads. These components are discussed below as they relate to the Bugtown Gulch project area. See the Watershed Specialist Report in the project file for detailed information on each component.

Watershed Boundary

The Bugtown Gulch project area boundary was developed around mountain pine beetle activity and no attention was paid to the watershed boundaries. As a result of this, the project area crosses several watersheds.

The project area is within parts of eight HUC (Hydrological Unit Code) 7 watersheds (see Map 13 in Appendix A). HUC 7 watersheds are generally 5,000 to 10,000 acres in size. Table 3.1 displays the acreages and percentage of each HUC 7 watershed that occurs within the project area.

Table 3.1: HUC 7 Watersheds

HUC 7 Watersheds			
HUC 7 Number	Watershed Name	Watershed Acreage	% Within Project Area
10120106040101	Lightening Creek	7,451	<1%%
10120107050101	Upper Bear Springs Creek/Lemming Draw	8,636	14%
10120107050103	Lower Bear Springs Creek/Sourdough Draw	7,036	28%
10120109030101	North Fork French Creek	6,157	91%
10120109030102	South Fork French Creek	7,554	64%
10120109030103	Ruby Creek	6,125	<1%%
10120109060101	Spring Creek Headwaters	7,928	<1%%
10120109060102	Vanderlehr Creek	5,597	41%
Total		56,484	

(Black Hills National Forest, 2001)

Precipitation and Climate

Elevation in the project area ranges from 5,580 feet on French Creek on the southeast side to 7,166 feet on Bear Mountain on the northern side. The climate is semi-arid with low humidity throughout the year. Temperatures range from near 100° F during the summer months to well below 0° F in winter. Average annual precipitation estimates from an Isohyetal Map for the area ranges from 19 to 20 inches, increasing from South to North (Driscoll, Carter, Williamson and Putnam, 2002). The largest precipitation amounts typically occur during May and June, and the smallest amounts typically occur during November through February (Driscoll, Carter, Williamson and Putnam, 2002). Approximately 51 percent of the annual precipitation occurs May, June and July and approximately 66 percent of the annual precipitation occurs April through August. Localized intense thunder cells associated with the monsoons can produce much greater rain than surrounding areas within one storm event (Fact Sheet Team, 2001).

Geology

The geology underlying the Bugtown Gulch project area has eight different hydrogeologic units. These are displayed in Table 3.2.

Table 3.2: Geology

Geology	
Description	% of Planning Area
Alluvium	<1%%
Deadwood Formation	7%
Metamorphosed Graywacke	47%
Madison Limestone	26%
Undifferentiated Igneous Rock	1%
Undifferentiated Metamorphosed Phyllite & Schist	7%
Undifferentiated Metamorphosed Sedimentary Deposits	12%
Water	<1%%

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

The above units are grouped in to broader categories. Alluvium is part of the Unconsolidated Unit. Deadwood Formation and Madison Limestone are aquifers. Metamorphosed Graywacke, Undifferentiated Igneous Rock, Undifferentiated Metamorphosed Phyllite & Schist and Undifferentiated Metamorphosed Sedimentary Deposits are grouped into Precambrian Igneous and Metamorphic Unit.

Soils

There are 18 different soil map units within the project area. Three units, BuE, BvC, and SycE, comprise 75 percent of the total and the rest of the different soil types occupy 5 percent or less each.

Approximately 7 percent of the project area contains soils with a very high EHR (Erosion Hazard Rating). These areas are generally on slopes above 40 percent. About half of these soils also have a high mass movement potential and are concentrated in the steeper slopes along French Creek. Approximately 45 percent of the project area contains soils which are subject to compaction when wet. A very small amount of the area (less than 1 percent) contains soils which have low topsoil organic matter.

Current conditions of the soils were observed when five soil types were visited in the field. They were soils BuC, BuE, SyaC, SycE and TuG. The goal was to find old landings and skid trails to see if there are any residual effects from past activities. Six sites were observed. Most sites showed no lasting effects with vegetation on the landings and skid trails the same as surrounding area and these areas had not been compromised. One site on SyaC did show some possible lasting effects as wheel tracks were still visible and the landing vegetation did not appear as lush as the surrounding area. Soil TuG did not have any landings or skid trails on it but a road was observed and it was not causing any problems. This soil has a severe erosion hazard. Soil RlG was not visited on the ground as no roads or cutting units were found on this soil. The results of the field visit shows that soils can be impacted but they generally are not.

Slope

The project area has a variety of slopes from 0 to 50 percent, but as a whole, generally has very gentle slopes. Ninety-three percent (93 percent) of the project area has slopes of 30 percent or less and 99 percent has slopes of 40 percent or less.

Connected Disturbed Area (CDA)

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

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

During the field inventory of the project area, five CDAs were identified. They are road low water crossings. One is currently on an unclassified road and the other four are along French Creek on an old road prism that is not on the system. ATVs are currently using the road. There were also 15 other areas identified as being impacted by cattle. These areas could be considered CDAs when the cattle are present

Watershed Condition

WCA (Watershed Condition Assessments) were completed for each sixth level watershed in the process of developing the 1997 Black Hills National Forest LRMP (Land and Resource Management Plan). The WCA were based on the watershed sensitivity, known impacts, and available monitoring data. Since the LRMP has been completed, a new watershed computerized map layer was completed and the WCA that were done does not match up with the new watershed layer. As part of this existing conditions report, new NWSI (Natural Watershed Sensitivity Index) and Impact Indexes were recalculated on the 7th level watershed. Only five of the HUC 7 watersheds identified in the watershed section are being recalculated because the other three HUC 7 watersheds have only a tiny fraction of the project area within them.

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

- Low Sensitivity, 0-29 percent
- Moderate Sensitivity, 30-65 percent
- High Sensitivity, 66-100 percent

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

Table 3.3 indicates the Sensitivity and Impact Index for each of the five HUC 7 watersheds.

Table 3.3: Watershed Condition

Watershed Condition			
HUC 7 Number	Watershed Name	Sensitivity Index %	Impact Index %
10120107050101	Upper Bear Springs Creek/Lemming Draw	3%	1%
10120107050103	Lower Bear Springs Creek/Sourdough Draw	9%	2%
10120109030101	North Fork French Creek	8%	1%
10120109030102	South Fork French Creek	14%	1%
10120109060102	Vanderlehr Creek	10%	0%
Average		9%	1%

Sensitivity Index - All watersheds fall into the very low end of the Low Sensitivity category. Average of the watersheds is 9 percent and all watersheds vary from each other by 11-percentage points from high to low, not a very large range. The lack of severely erodible soils, steep slopes and a low stream density are the factors that contribute to the low ratings.

Impact Index – All watersheds fall into the category that is considered minor and they are on the lower end of the scale. The reason for the low ratings is because there are not many roads near streams in the project area.

Streams

Of the estimated 37 miles of stream within the project area, 31 percent are perennial, 14 percent are intermittent, and 55 percent are ephemeral. Ephemeral streams are those with a generally grassy lined valley bottom with no defined channel. Intermittent streams have a defined channel with evidence of flow, but not yearlong flow. Perennial streams have a defined channel with water flowing yearlong. (Black Hills National Forest, 2000) Furthermore, 56 percent of the stream mileages are on private land.

Floodplains

There are 265 acres of mapped 100-year floodplains within the project area. A floodplain is any area susceptible to inundation by floodwaters. The 100-year flood is a flood having a one percent chance of being equaled or exceeded in magnitude in any given year. It is not a flood occurring once every 100 years. The floodplains are mapped by FEMA (Federal Emergency Management Agency).

The floodplains within the project area are generally located on the eastern and southern area and the majority occurs on private lands. Floodplains are located on Loues Creek, Bear Springs Creek, North Fork French Creek, Middle Fork French Creek, South Fork French Creek and French Creek.

Wetlands

There are 9 acres of mapped wetland polygons and almost 16 miles of mapped linear wetlands within the project area. They are classified as Palustrine. Wetlands within this category include inland marshes and swamps as well as bogs, fens, tundra, and floodplains. Palustrine systems include any inland wetland which lacks flowing water and contains ocean derived salts in concentrations of less than .05 percent. The majority of wetlands in the project area occur on private lands.

Beneficial Uses

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

stock watering. Within the project area, French Creek and Vanderlehr Creek have the additional designated beneficial uses of Limited Contact Recreation and Coldwater Marginal Fish Life Propogation. All the streams within the project area fully support the designated beneficial uses (SD Department of Environment and Natural Resources, 2004).

Water Quality and Quantity

No streams or waterbodies within the project area are listed in the South Dakota 303(d) Waterbody List (SD Department of Environment and Natural Resources, 2004). This list is a list of waterbodies that need the development of TMDLs (Total Maximum Daily Loads) because they do not meet water quality standards. TMDLs are a tool for the management of water quality.

The following statements were taken from the 2004 South Dakota Integrated Report for Surface Water Quality Assessment:

> "The Black Hills region traditionally has some of the best surface water quality in the state. This is due in a large part to a cooler climate and higher rainfall than the surrounding plains as a result of greater elevation and forest cover. Also contributing to the water quality in this region is the nature of local bedrock formations which are much less erodible that the highly erosive and leachable marine shales and badlands on the surrounding plains."
>
> "Black Hill streams…usually have good to satisfactory water quality and fulfill their fishable/swimmable designated uses. They are, however, relatively small streams vulnerable to losses of flow exacerbated by periodic droughts in the Black Hills and high evapotranspiration rates characteristic of a dense and extensive ponderosa pine and spruce forest canopy. Grazing of streamside vegetation, which increase stream bank erosion, water temperature and nutrient loading, also continues to be a problem in a number of Black Hills streams."
> "The entire monitored length of French Creek fully supported designated beneficial uses during the present reporting cycle and the last several assessments. Overall water quality has remained in the good to satisfactory range for more than 15 years."
> "Upper Spring Creek was listed as moderately impaired in two reporting periods of the early 1990s due to excessive fecal coliform. During the current and the last two assessments, the stream rated as fully supporting. This is a reasonably good indication that water quality is now consistently acceptable over the entire length of Spring Creek." (SD Department of Environment and Natural Resources, 2004).

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

Peak flows on French and Spring Creeks and contributing streams can occur any month from March to October. From limited USGS streamflow records on French Creek above

Stockade Lake, Spring Creek at Oreville, and Spring Creek above Sheridan Lake, the month with the most peak flows is June followed by May and July (Surface Water for USA, 2005). Peak flows from the western side of the project area are rare, as direct runoff is very uncommon from outcrops of the Madison Limestone that encompasses 26 percent of the project area (Driscoll, Carter, Williamson and Putnam, 2002).

Flow regimes, for the typical hydrograph, follow the precipitation regime. Low or base flows occur during the late fall and winter months. Flows increase in the spring as the precipitation occurs. These increased flows are maintained by the precipitation. As the precipitation decreases, as the summer proceeds, so does the streamflows until it reaches the base flow of late fall. This is a very generalized discussion of the flow regime because it varies from year to year with peaks in streamflow occurring in association with the precipitation as discussed above.

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

Private Land

Land ownership patterns are part of the watershed and could potentially affect conditions. There are 2,563 acres of private land within the project area. Table 3.4 shows the distribution of National Forest and private land in the watersheds that are included in the project area.

Table 3.4: Private Land

Private Land					
HUC 7 Number	Watershed Name	National Forest Acres in Water-shed	% of Water-shed on National Forest	Private Land Acres in Water-shed	% of Water-shed on Private Land
10120106040101	Lightening Creek	6,511	87%	940	13%
10120107050101	Upper Bear Springs Creek/Lemming Draw	8,035	93%	601	7%
10120107050103	Lower Bear Springs Creek/Sourdough Draw	6,425	91%	611	9%
10120109030101	North Fork French Creek	4,608	75%	1,549	25%
10120109030102	South Fork French Creek	6,278	83%	1,276	17%
10120109030103	Ruby Creek	3,353	55%	2,772	45%
10120109060101	Spring Creek Headwaters	7,423	94%	505	6%
10120109060102	Vanderlehr Creek	4,658	83%	939	17%
Total		47,291	84%	9,193	16%

(Black Hills National Forest, 2002)

The private land is mostly from homesteads and there may be an occasional mining claim. They are scattered across the landscape. As seen in Table 3.4, the private lands occupy a varying percentage of the area within the watersheds. The amount of private land within the watersheds can have an impact on the watersheds, depending on the amount of development or degree of use. There are homes on some of the private land and more are being added each year.

Roads

Roads are often the number one watershed or project area concern. They tend to concentrate water on the roadway and runoff can contribute sediment into streams and wetlands. There are 60 miles of classified roads and 26.8 miles of unclassified roads.

A road analysis is not being completed for this project, so there are no watershed ratings of the roads. Observations during the field work did not see many roads that are causing problems and need attention. As outline above there are 5 CDAs identified and these are road related even though four are not on a road identified in Forest Service records. Attention to these newly identified locations will improve the stream and aquatics.

Environmental Consequences

The proposed project may affect the following watershed components: aquatic ecosystems, soil productivity, geologic hazards, and special areas. Aquatic ecosystems include physical conditions (sediment, bed/bank stability, and flow regimes), chemical conditions (temperature/oxygen and water purity) and biological conditions (aquatic life). Soil productivity includes soil erosion, soil compaction, nutrient removal, soil heating, and regeneration hazard. Geologic hazards include landslides, soil failure, and earthquakes. Special areas include riparian ecosystems, wetlands, and floodplains. Maps of Alternatives 2 and 3 can be found in Appendix A (maps 5 and 6, respectively). The cumulative effects analysis considered past, present and future activities summarized in Appendix E.

Direct and Indirect Effects

Aquatic Ecosystems (Physical)

Sediment

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

There are 72 road/stream crossings, 38 on Forest Service roads and 34 on private roads. Of those on National Forest lands, 28 are on ephemeral streams and 10 are on intermittent or perennial streams.

The source zone along the streams is often referred to as the WIZ (Watershed Influence Zone). The WCP (Watershed Conservation Practices) Handbook (USDA Forest Service, 2005) defines the WIZ as 100 feet minimum from each bank. BMPs (Best Management Practices) (South Dakota State University, 2004) define it as a strip of at least 50 feet wide on each side of the stream. The width of the WIZ for the project area will be 50 feet either side of the stream . Based on field observation and experience, this is by far an adequate distance for the Black Hills and this project area. If any sediment is produced from the WIZ it is generally produced in the first 25 feet from the stream. There is usually adequate lush vegetation to filter out the sediment.

Bed and Bank Stability

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

Ground Water

Important groundwater resources in the Bugtown project area include the Madison aquifer, Deadwood aquifer, and Precambrian aquifers. The Madison and Deadwood aquifers are important sources of water for residential and municipal uses in the Black Hills region. In addition, these aquifers provide an important source of base flow for streams flowing east across the Precambrian crystalline core of the Black Hills (Driscoll et al., 2002).

Flow Regimes

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

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

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

ALTERNATIVE 1 – No Action

Sediment: No new activities would occur within the project area under Alternative 1, although existing approved projects would be completed. There are 20 CDAs, which were identified within the project area, five road/trail related and 15 related to cattle grazing. All of the CDAs would continue to contribute sediment. Refer also to the Riparian/Instream Fisheries Habitat discussion in this Chapter.

There would be no overall change in sediment being delivered to the streams unless a wildfire occurred, which could deliver a large amount of sediment to the channels. The potential for a large wildfire would be the greatest under this alternative.

Bed and Bank Stability: No new activities would occur within the project area so stream bed and bank stability would generally not be affected and would remain unchanged from its current state.

Ground Water: Direct and indirect effects to groundwater resources could occur in the event of extensive ponderosa pine mortality and/or a severe wildfire in the Bugtown project area. Extensive ponderosa pine mortality could increase groundwater infiltration in a manner similar to that described below for Alternatives 2 and 3. However, because this mortality would occur gradually, growth of immature pine trees may offset decreases in evapotranspiration related to mortality of the large trees. In the event of a severe wildfire in the project area, infiltration of water through the soil horizon and into the bedrock aquifers may decrease due to changes in the soil profile caused by the fire. This would cause adverse direct and indirect effects to ground water resources.

Flow Regime: This alternative would not have any new activities within the project area. No activities means that the biomass would continue to increase which would generally reduce the amount of water available for streamflow and ground water recharge. However, in the project area it is estimated that in five years, with no active treatment, a larger percentage of the area will have dead trees due to the mountain pine beetle. This will have a positive effect on the flow regime by making more water available for streamflow or ground water recharge that has been lost in the past due to fire suppression.

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

ALTERNATIVE 2 – PROPOSED ACTION

Sediment: Commercial timber harvest is proposed to treat approximately 11,175 acres in this alternative. Of these acres, only 33 are located in the WIZ. The prescriptions for these commercial harvest acres within the WIZ include commercial thin, and sanitation/salvage. The potential to generate sediment would be very low, especially with the small amount of acres being treated within the WIZ. Design criteria requires that cut-

to-length harvest systems will be used where harvesting may occur within the WIZ. This method will essentially eliminate the potential for erosion. With implementation of the FPS&G (Forest Plan Standards and Guidelines), which include WCPs and BMPs, design criteria and the small amount of acres to be treated in the WIZ, very little sediment would be generated. Therefore, no impact to aquatic is expected (refer to Riparian/Instream Fisheries discussion in Chapter 3) The potential for large scale, high intensity wildfire, and therefore potential for increases in sediment generated following a large scale wildfire, would be reduced with this alternative.

No new systems roads or temporary roads would be created, maintained or used in the WIZ. Maintenance and temporary use of roads at stream crossings would also have the potential to produce sediment. There are 0.6 miles of road within the WIZ on Forest lands. With the implementation of the FPS&Gs, which include WCPs and BMPs, the amount of sediment would be expected to be minimal and should not have an impact on the aquatics. Refer also to the Riparian/Instream Fisheries Habitat discussion in this Chapter.

This alternative includes post-sale watershed projects to correct all five of the road/trail related CDAs identified. As a result, sediment to the streams would be reduced in the long-term. The 15 CDAs related to cattle grazing would not change with the implementation of this alternative. These would continue to contribute sediment as long as the current grazing practices continue. Thinning of the stands will not provide better or easier cattle access to the WIZ, so increased impacts are not expected.

Bed and Bank Stability: The proposed activities of commercial and non-commercial vegetation management, fuel treatments, weeds treatments, range, and wildlife projects would be away from the bed and banks of the streams. Therefore, these activities would have no effect on bed and bank stability. The proposed watershed projects include measures which would improve bed and bank stability, including reconstruction of stream banks and improvement of stream crossings.

Flow Regime: The commercial timber harvest of 11,175 acres in this alternative would have a positive effect on flow regime. The most biomass would be removed with this alternative which would result in the greatest reduction in evapotranspiration losses. This would move the flow regime back towards where it was prior to the era of fire suppression, but not entirely back to pre-settlement conditions. The non-commercial timber activities would have a short-term positive effect, treating another 3,703 acres, because of the reduction of the biomass. The effect would be short-term because the remaining adjacent trees would soon grow to take up the space that was occupied by the removed trees.

ALTERNATIVE 3

Sedimentation: Commercial timber harvests are proposed to treat approximately 9,866 acres in this alternative. Of these acres, only 29 are located in the WIZ. The prescriptions for these commercial harvest acres within the WIZ include commercial thin, and sanitation/salvage. The potential to generate sediment would be very low, especially with the small amount of acres being treated within the WIZ and design criteria which

requires the use of cut-to-length systems in the WIZ. With implementation of the FPS&G, which include WCPs and BMPs, and the small amount of acres to be treated in the WIZ, very little sediment, if any would be generated.

There are 0.6 miles of road within the WIZ on Forest lands. No new systems roads or temporary roads would be created, maintained or used in the WIZ. With activities at stream crossings and roads in the WIZ, there would be some sediment produced. With the implementation of the FPS&Gs, which include WCPs and BMPs, the amount of sediment would be expected to be minimal and should not have an impact on the aquatics. Refer also to the Riparian/Instream Fisheries Habitat discussion in this Chapter.

This alterative includes post-sale watershed projects to correct all 5 of the road/trail related CDAs identified. As a result, sediment to the streams will be reduced in the long-term. The 15 CDAs related to cattle grazing will not change with the implementation of this alternative. These will continue to contribute sediment as long as the current grazing practices continue. Thinning of the stands will not provide better or easier cattle access to the WIZ, so increased impacts are not expected.

Bed and Bank Stability: The proposed activities of commercial and non-commercial vegetation management, fuel treatments, weeds treatments, and range and wildlife projects would be away from the bed and banks of the streams. Therefore, these activities would have no effect on bed and bank stability. The proposed watershed projects include measures which would improve bed and bank stability, including reconstruction of stream banks and improvement of stream crossings.

Ground Water: Alternatives 2 and 3 have the potential to cause short-term beneficial direct and indirect effects to ground water and surface water resources in the vicinity of the project area. Potential increases in groundwater infiltration are discussed in relation to reductions in the density of timber in section III of the Final Environmental Impact Statement for the Forest Plan. Anderson (1980) discusses the potential for increased water yields in response to thinning of timber to 70 square feet per acre basal area. Current basal area values in the Bugtown project area range from approximately 80 to 200 square feet per acre. The thinning proposed by Alternatives 2 and 3 would reduce this basal area to 40 square feet per acre within the majority of the project area. This would have the potential to cause beneficial direct effects to ground water resources by increasing infiltration into aquifers in the Bugtown project area. Infiltration of precipitation into Madison aquifer, in particular, would likely increase. Although infiltration of precipitation into deep bedrock aquifers is a very slow process, this would provide additional ground water resources to supply area wells and springs. Ground water discharging from the Madison and Deadwood Aquifers in the vicinity of the Bugtown project area would also provide base flow to streams flowing east from project area. Alternatives 2 and 3 therefore would also have the potential to provide beneficial indirect effects to surface water resources and aquatic habitat in French Creek and Spring Creek east of the project area. These beneficial effects would be short-term in nature because the timber in the Bugtown project area would eventually regenerate and return to conditions of higher basal area unless future vegetation management actions to thin the timber occurred.

Flow Regime: The commercial timber harvest of 9,866 acres in this alternative would affect flow regime. This alternative would not remove as much biomass as Alternative 2, but it would still reduce the evapotranspiration losses. This would move the flow regime back towards where it was prior to the era of fire suppression. It would not entirely move back to pre-settlement conditions and would not be quite as good as Alternative 2, but better than Alternative 1 unless a wildfire were to occur. The non-commercial timber activities would have a short-term positive effect, treating another 3,026 acres. Because of the reduction of the biomass, it would be short-term because the remaining adjacent trees would soon grow to take up the space that was occupied by the removed trees. This alternative does the second best to restore flow regimes.

Aquatic Ecosystems (Chemical)

"Summer water temperature is increased, and winter water temperature is decreased, by removing shade, reducing low flows, or damaging banks so streams are wider and shallower. Dissolved oxygen is usually reduced when summer water temperature is increased. Such impacts impair or destroy the suitability of water bodies for aquatic biota," (USDA Forest Service, 1996).

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

ALTERNATIVE 1 – No Action

Temperature/Oxygen: This alternative would not have any new activities within the project area. However, it is estimated that the beetle would dramatically reduce the stand density in the project area within the next five years. This reduction in timber stand density would have a positive effect on stream temperature and oxygen. Biomass would be reduced, resulting in more water being available for streamflow. More water would help maintain stream temperatures.

Water Purity: This alternative would not have any new activities within the project area, so water purity would not be affected and would remain at existing purity.

ALTERNATIVE 2 – PROPOSED ACTION

Temperature/Oxygen: This alternative includes treatments which would reduce stand density on 70 percent of the project area. These activities would have a positive effect on stream temperature and oxygen. Biomass would be reduced, resulting in more water being available for streamflow. More water would help maintain stream temperatures. This alternative would have the greatest positive effect on water temperature and oxygen.

The proposed watershed projects would improve the riparian habitat at locations on French Creek and North Fork French Creek. This would have a positive impact on water temperature and oxygen.

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

ALTERNATIVE 3

Temperature/Oxygen: This alternative includes commercial and non-commercial vegetation management, fuel treatments, weeds treatments, range, and wildlife projects and watershed projects. Reducing the stand density on 62 percent of the project area with commercial and non-commercial timber activities would have a positive effect on stream temperature and oxygen. Biomass would be reduced, resulting in more water being available for streamflow. More water would help maintain stream temperatures. This alternative would have a positive effect on water temperature that was not quite as good as Alternative 2 but better than Alternative 1.

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

Soil Productivity

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

As part of the Best Management Practices (BMP) monitoring that is occurring on the Hell Canyon and Mystic Ranger Districts, some new information was obtained during the summer of 2005 to monitor Forest Plan Standard 1103; Manage land treatments to limit the sum of severely burned and detrimentally compacted, eroded, and displaced land to

no more than 15 percent of any land unit (Black Hills National Forest, 2005a &2005b). Ten randomly picked units were picked on each district, picking two units harvested each year over the last five. To sum up the results, all units were under the 15% number of detrimentally impacted soils, averaging about 4½%. The range was 0% to 14%. There were two units on the Mystic Ranger District that had 14% detrimentally impacted soils. The reason why the numbers on those two units are high is because those units were within the Jasper Fire and on portions of those units the vegetation has not recovered from the fire to date. Taking out the two units affected by fire out of the mix, the range is 0% to 7%, averaging about 3½%. Impacts captured on the surveys included timber harvest, fire, cattle trails, snowmobile and ATV trails.

This information shows that the Black Hills National Forest is complying with Forest Plan Standard 1103, even with major disturbances such as forest fires.

The field work identified in the existing conditions report, reported that most areas looked at did not have any residual effects. If transects were to be placed in the BTGPA, it is expected to have similar or lower numbers as the BMP monitoring. The reason why lower numbers are expected is because it has been some time since logging has occurred in this area. The areas surveyed this summer all had been harvested within the last 5 years.

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

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

Activities on soils subject to compaction when wet can change the characteristics of these soils, causing more runoff or resulting in poor plant growth. Implementing FPS&G restrictions on these soils would mitigate these problems. These restrictions would include allowing activities only when the soils are dry or frozen or with low impact equipment. This would minimize the overall impacts as the result of the activities.

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

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

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

ALTERNATIVE 1- NO ACTION

Soil Erosion: This alternative would not have any new activities within the project area so soil erosion would generally not be affected and remain unchanged. Problems where erosion is currently occurring would continue to occur. Erosion problems are generally road related and there are approximately 1.6 miles of open road on soils with a very high erosion rating. These roads on high erosion rating soils are not known to cause any problems currently.

Soil Compaction: There would be no effect under the No Action Alternative.

Nutrient Removal: There would be no effect under the No Action Alternative.

Soil Heating: There would be no effect under the No Action Alternative. The biomass and fuels would not be treated and would continue to accumulate. If a wildfire were to occur, the soils could be adversely affected. A wildfire, with an affect to the soil from soil heating, has the greatest chance of occurring with this alternative because no treatments to reduce the fuels would occur.

Regeneration Hazard: There would be no effect under the No Action Alternative.

ALTERNATIVE 2- PROPOSED ACTION

Soil Erosion: Of the acres proposed for treatment, an estimated 1,000 acres or 9 percent of the treated acres are located on soils with a very high erosion hazard rating. Some soils identified from the soil survey as having high erosion were visited in 2004 field surveys for this project. The conclusions here are based, in part on that field review. These commercial units have a variety of treatments. Minimal soil erosion may occur from the commercial activities but implementing the FPS&G, which includes WCPs and BMPs, there would be very little soil erosion occurring. Erosion problems related to roads would be corrected through maintenance in conjunction with the timber harvest. There would be approximately 1.6 miles of open road on soils with a very high erosion rating. These roads on high erosion rating soils are not known to cause any problems currently.

This alternative has the greatest potential for soil erosion because of the amount of acres of activity on soils with a very high erosion hazard rating. Based on recent field reviews on the Hell Canyon District and Black Hills National Forest (refer to previous discussion under “Soil Productivity”) implementing the FPS&G would prevent or minimize erosion from occurring on these soils and therefore, minimal erosion would be expected.

Soil Compaction: Of the proposed activities, approximately 5,690 acres or 51 percent of the treated acres are located on soils subject to compaction. This alternative has the greatest potential to impact soils by compaction because it has the most acres being treated. Minimal soil compaction may occur from the commercial activities but would be within acceptable limits as defined in Forest Plan standard 1103. Based on recent field reviews on the Hell Canyon District and Black Hills National Forest (refer to previous discussion under “Soil Productivity” implementation of soil protection measures contained in Forest Plan standards and guidelines, Watershed Conservation Practices and

Best Management Practices would insure that very little soil compaction would occur. If soil compaction were to occur it would be a short term effect.

Nutrient Removal: Of the acres proposed for treatment, it is estimated that 21 acres or 0.2 percent are located on soils that have low organic matter. Treatment prescriptions in these stands are commercial thin, POL, or sanitation. These prescriptions would leave enough residual material in the stand so no special design criteria would be needed. There would be no effect on soil nutrients with this alternative.

Soil Heating: No prescribed fire is proposed with this alternative so no soil heating would occur from the action alternatives. Indirect effects would include reducing the potential for a large, high intensity wildfire to occur within the project area.

Regeneration Hazard: There are no soils with regeneration hazards within the project area. Regeneration of these acres, if desired, would not be a problem. Ponderosa pine tends to reproduce well in the Black Hills (Orr, 1975). This alternative would not have an effect on regeneration hazard.

ALTERNATIVE 3

Soil Erosion: Of the acres proposed for treatment, an estimated 900 acres or 9 percent of the treated acres are located on soils with a very high erosion hazard rating. Some soils identified from the soil survey as having high erosion were visited in 2004 field surveys for this project. The conclusions here are based, in part on that field review. These commercial units have a variety of treatments. Minimal soil erosion may occur from the commercial activities, but implementing the FPS&G, which includes WCPs and BMPs, there would be very little soil erosion occurring for short distances and the potential would be slightly less than Alternative 2. Erosion problems related to roads would be corrected through maintenance or reconstruction in conjunction with the timber harvest. There would be approximately 1.6 miles of open road on soils with a very high erosion rating. These roads on high erosion rating soils are not known to cause any problems currently.

This alternative has the second greatest potential for soil erosion, not far behind Alternative 2, because of the amount of acres of activity on soils with a very high erosion hazard rating. Based on recent field reviews on the Hell Canyon District and Black Hills National Forest (refer to previous discussion under “Soil Productivity”) implementing the FPS&G would prevent or minimize erosion from occurring on these soils and minimal erosion would be expected.

Soil Compaction: See soil compaction discussion under Alternative 2. This alternative has the second greatest potential to impact soils by compaction because it has the second most acres being treated. Based on recent field reviews on the Hell Canyon District and Black Hills National Forest (refer to previous discussion under “Soil Productivity”), potential compaction would be minimal.

Nutrient Removal, Soil Heating, and Regeneration Hazard: The potential effects are the same as described under Alternative 2.

Geologic Hazards

Landslides: "Soil creep, debris avalanches and flows, slumps, and earthflows can occur on unstable slopes if roads overload or undercut them, vegetation is removed from them, or runoff is emptied onto them. Hazard depends on type of disturbance, nature of earth material, and water content," (USDA Forest Service, 1996). Forest Plan standard 1108 states that an on-site slope stability exam is required on slopes >30%, on stated soil types, prior to design of roads or activities that remove most or all of the timber canopy. There are 16 acres or <1% of the whole project area which occurs on the stated soil types where slopes are >30%.

Soil Failures: "Soil failures include land subsidence, shrinking and swelling soils, and collapsing soils. Removal of subsurface fluids or materials, or changed hydrology on certain soil types, can induce soil failures," (USDA Forest Service, 1996). The project area does not contain soils subject to soil failures. Therefore, no soil failures would occur under any alternative.

ALTERNATIVE 1 – NO ACTION

Landslides: There would be no effect under No Action Alternative.

ALTERNATIVE 2 – PROPOSED ACTION

Landslides: Of the approximately 11,175 acres proposed for treatments, approximately 247 acres are on slopes greater than 20 percent on soils with mass wasting potential. Design criteria of the project would exclude treatments on these soils where slopes were greater than 40 percent and activities restricted to dry or frozen condition on slopes 20 to 40 percent. Activities on these soils would follow the design criteria in Appendix B to reduce the risk of landslides and will meet the FPS&G.

In relation to Forest Plan Standard 1108, this alternative proposes approximately 13 acres of commercial thinning on soils >30% of the type mentioned. This treatment will not remove all of the timber canopy. Implementing the design standards would minimize or eliminate the risk of landslides.

ALTERNATIVE 3

Landslides: Of the approximately 9,866 acres proposed to treat, approximately 231 acres are on slopes greater than 20 percent on soils with mass wasting potential. Design criteria of the project would exclude treatments on these soils where slopes were greater than 40 percent and activities restricted to dry or frozen condition on slopes 20 to 40 percent. Activities on these soils would follow the design criteria to reduce the risk of landslides and would meet the FPS&G.

In relation to Forest Plan Standard 1108, this alternative does not propose treatments on any soils >30% of the type mentioned.

Special Areas

Riparian Ecosystems: "Riparian ecosystems provide shade, bank stability, fish cover, and woody debris to aquatic ecosystems. They also provide key wildlife habitat, migration corridors, sediment storage and release, and surface-ground water interactions. Composition and structure of riparian vegetation can be changed by actions that remove certain species age classes," (USDA Forest Service, 1996).

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

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

ALTERNATIVE 1 – NO ACTION

Riparian Ecosystems: There would be no effect under the No Action Alternative. However, the potential for large scale, high intensity wildfire to occur would increase under this alternative. Wildfire has the potential to affect riparian ecosystems by removing vegetation and altering soil structure.

Wetlands: There would be no effect under the No Action Alternative. However, the potential for large scale, high intensity wildfire to occur would increase under this alternative. Wildfire has the potential to affect wetlands by removing vegetation and altering soil structure.

Floodplains: There would be no effect under the No Action Alternative.

ALTERNATIVE 2 AND 3

The results of the cumulative effects analysis for both of these alternatives is essentially the same. Therefore, they are presented together here.

Riparian Ecosystems: There would not be any commercial activities within any riparian areas so there would not be any new impacts as a result of the proposed projects. The proposed post-harvest range, wildlife, and watershed projects would improve riparian areas.

Wetlands: There would not be any new impacts as a result of the proposed projects because no vegetative treatments or new road construction would occur in wetlands. The post-harvest range, wildlife, and watershed projects would improve the wetlands.

Floodplains: No new road building or stream crossings would occur in the project area. Therefore, there would be no effect to floodplains.

Cumulative Effects to Watershed, Geology and Soils

The project area is located within eight HUC 7 watersheds. Only five of these watersheds have sizeable areas (more than 1 percent) located inside of the project area. The cumulative effects boundary for this report is the 5 individual HUC 7 watersheds. Each watershed can stand alone in the analysis and in most cases one watershed does not affect the other. Time frame for the effects on the watersheds will be 10 years into the past and into the future. This will encapsulate all the potential effects on the watershed. The persistence time of effect by activities varies and depends on the activity. For example roads will be on the landscape indefinitely with some having more impacts, depending on use and whether or not there is vegetation on the road prism. Timber activities effects depend on what parameter you are looking at. Sediment or soil erosion, the effects are very short term, usually less than 3 years based on personal observation. Flow regimes can be affected over a period of time up to 10 years or more. There are a number of factors, such as annual precipitation, species being treated, site characteristics, intensity of treatments, size of area receiving treatments, re-growth rate, and length of time between treatments that affect how long it will persist (Schumann, 2005).

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

During field review for this project, OHV use over the area was noticed. There does not appear to be prolific establishment of new trails by OHVs. The potential exists for new trails to be created by OHV, but based on observed conditions, the potential impact is expected to be minor. Areas of OHV trails were included in recent BMP monitoring on soil productivity (as described under “Soil Productivity” earlier in this section.

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

ALTERNATIVE 1 – NO ACTION

Sediment: There would be continued cumulative impacts from sediment in the project area with this alternative. The CDAs would continue to produce sediment and stream crossings would be present. The predicted increase of mountain pine beetle and tree mortality has the potential to increase the cumulative impacts from sediment if a large wildfire were to occur.

Ground Water: Potential direct and indirect effects of the No Action alternative on ground water resources were discussed in the previous section. The potential for severe wildfire in the project area to damage soil structure and reduce infiltration of precipitation

into area aquifers has the potential to cause adverse cumulative effects in conjunction with the current drought conditions.

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

Water Purity: There are no known concentrated pollutant sources in the project area from the past or expected in the future and no known harmful chemicals applications near water bodies in the past or expected in the future within the project area. There would be no cumulative impacts to water purity within the project area with this alternative.

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

- **Soil Erosion and Compaction:** There have been past activities or events in the project area that have caused minor soil erosion. These are generally road related, where water has been concentrated. Past activities have also caused minor soil compaction. There are no known areas of severe erosion or detrimentally compacted areas. There would be no cumulative impacts on soil erosion or compaction in the project area with this alternative because no new activities would occur.

- **Nutrient Removal:** There would be no cumulative impacts to the soil nutrients in the project area with this alternative because no new activities would occur.

- **Soil Heating:** Past events that could affect soil heating are large wildfires. Large wildfires generally occur when the environment is dry and result in soil heating. There was one large wildfire in 2000 on the west side and west of the project area. Any soil heating impacts that may have occurred then are well on their way to recovery because this area was generally an understory burn. There would be no cumulative impacts from soil heating in the project area with this alternative because no activities are planned. The potential for large scale, high intensity wildfire and thus soil heating, would increase with this alternative.

- **Regeneration Hazard:** Past activities have not affected regeneration in this project area. This project area is generally overstocked with trees. There would be no cumulative impacts from regeneration hazards in the project area with this alternative because no new activities are planned.

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

Riparian Ecosystems, Wetlands and Floodplains: There would be no cumulative effects to these special areas because no direct or indirect effect would occur as a result of this project.

ALTERNATIVE 2 AND 3

The results of the cumulative effects analysis for both of these alternatives is essentially the same. Therefore, they are presented together here.

Sediment: Overall the cumulative impacts from sediment would be reduced over existing conditions if no wildfires occurred. There would be a slight potential increase in sediment in the short term (under 5 years) in some categories (harvesting, road use, and used stream crossings) and a potential decrease in sediment in the long term (more than 5 years) in other categories (CDAs) in the project area with this alternative. If a wildfire were to occur, there would definitely be cumulative impacts from sediment.

Ground Water: Alternatives two and three would cause similar cumulative effects to groundwater resources. Therefore, these alternatives will be discussed together in the following section. The increase in infiltration to area aquifers caused by reducing the density of trees in the project area has the potential to cause beneficial cumulative effects to ground water and resources. In addition, because of the extensive interactions between groundwater and surface water at major springs such as Spring Creek, this also has potential to cause beneficial cumulative effects to surface water resources. The cumulative effects are related to the current drought conditions in the Black Hills and associated reductions in stream flows and stored ground water. However, because of the time required for precipitation to infiltrate into deep bedrock aquifers, immediate short-term relief to current low-flow conditions in streams in the vicinity of the project area would not be expected.

Flow regime and Temperature/Oxygen: There would be positive cumulative effects as biomass was removed by this project and others. Flow regimes and Temperature/Oxygen levels would be maintained or improved.

Water Purity: There would be no cumulative effects because no direct or indirect effects would occur.

Soil Productivity: There would be no long-term, adverse effects on soil productivity as a result of these alternatives. The elements of soil productivity are discussed below.

- **Soil Erosion and Compaction:** There would no cumulative impacts from soil erosion or compaction in the project area from the proposed harvest units because no erosion or detrimentally compacted areas would be expected with the implementation of the Forest Plan Standards and Guidelines. If erosion or detrimental compaction were to occur it would be minimal and within the acceptable limits stated in Forest Plan Standard 1103. Residual areas of compaction or erosion resulting from past activities would improve while this project is implemented.

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

- **Soil Heating:** There would be no cumulative impacts from soil heating in the project area because no prescribed fire is planned.

- **Regeneration Hazard:** There would be no cumulative impacts from regeneration hazard in the project area with any of these alternatives because regeneration of ponderosa pine in the project area is not a concern.

Geologic Hazards: Past activities within the project area have not caused problems with landslides or soil failures. There would be no cumulative impacts to landslides because project design would avoid potential mass wasting areas. There would be no cumulative effect to soil failures because no direct or indirect effects would occur as a result of this project.

Riparian Ecosystems, Wetlands: No cumulative effects to riparian or wetlands are expected because no direct of indirect effects would occur as a result of this project.

Floodplains: There would be no cumulative effects to floodplains in this project because there would be no direct or indirect effects.

BMP (Best Management Practices) Effectiveness

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

"BMPs are developed by the State of South Dakota…to ensure compliance with federal and state water-quality standards," (USDA Forest Service, 1997). They provide good guidance but are fairly general. WCPs are practices to protect soil, aquatic, and riparian systems. USDA Forest Service, Region 2, developed them. They are more specific with design criteria. "If used properly, they meet or exceed State BMPs," (USDA Forest Service, 2005). BMPs and WCPs are incorporated into the FPS&G and provide more specific direction. Meeting the FPS&Gs when implementing a project, both the WCPs and BMPs are being met.

The question has been brought up, how do we know the BMPs are effective or work? The Black Hills National Forest completed a Forest Plan Best Management Practices Evaluation (USDA Forest Service, 2003). Chapter four cites two studies done on the Black Hills National Forest by the Black Hills Forest Resource Association, 2001 and Wyoming Timber Industry Association, 2001. The conclusion is "These results highlight

the consistent application and effectiveness of BMPs in the Black Hills and other National Forests" (USDA Forest Service, 2003). The evaluation goes on to review other studies or reports and comes to the conclusion that "These studies highlight the effectiveness of BMPs in forests throughout the United States" (USDA Forest Service, 2003). This evaluation shows that BMPs are effective.

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

The Bugtown Gulch Project will have Forest Plan Management Requirements, WCPs and BMPs prescribed and implemented. This will protect the water quality of the streams and creeks in the project area and the activities that are planned for in the project area will meet the requirements of the CWA.

TRANSPORTATION

Affected Environment

The Bugtown analysis area consists of a 23 square mile area located in the central portion of the Black Hills National Forest, approximately 5 miles northwest of Custer.
The main access into the analysis area is provided via US Highway 16/385, Custer County 297 (Medicine Mountain Road), and Custer County 284 (Custer-Limestone Road). Additional access can be gained from NSFR (National Forest System Road) 287 (North Pole Road) from the south, and NSFR 291 (Ditch Creek Road) from the north. Refer to Map 10 in Appendix A to view existing roads.

The road system in this area has always served a wide variety of uses including recreation, timber, range, and private property access. The existing road network consists of 116 individual roads. Total road mileage is 86.8 miles, including 60 miles of National Forest System roads and 26.8 miles of unclassified roads. There are currently 85.6 miles of open roads and 1.2 miles of closed roads in the project area. The road density is 3.7 miles per square mile for both open and total road density.

Currently, there are no highways in the project area. There are 23.2 miles of Maintenance Level 3 and 4 roads (collector roads maintained for passenger vehicle suitability) maintained annually through contracted maintenance work. There are also 36.8 miles of Maintenance Level 1 and 2 roads (local roads maintained to prevent resource damage, suitable for high clearance vehicles). These roads are minimally maintained every five years through Forest Service force account work.

Environmental Consequences

Direct and Indirect Effects

No change to the transportation network is proposed in the Bugtown Gulch project area under any alternative.

ALTERNATIVE 1 – NO ACTION

There would be no direct effects on roads within the project area. Indirect effects include a delay in implementing erosion control methods where needed.

ALTERNATIVES 2 AND 3

No new roads would be constructed and no roads would be closed as part of these alternatives. Pre-use maintenance would occur on existing roads to be utilized for hauling. Temporary roads may be used to access treatment areas, but would be obliterated following treatment.

Increased traffic can be expected on area roads during implementation. To minimize impacts to private landowners, dust abatement would be utilized near structures along private land.

Cumulative Effects

The cumulative effects analysis considered past, present and future activities summarized in Appendix E. There would be no significant cumulative effects as a result of any alternative.

CAVES AND MINERALS

Affected Environment

Rocks in the Bugtown project area have the potential to host both locatable and salable mineral deposits including gold, high purity quartz, pegmatite minerals, high calcium limestone, decorative stone, and landscape rock. However, the potential for exploration or development of these resources in the near future varies. Recent mineral production in the project area is restricted to high purity quartz vein. The last reported production is 600 tons of quartz from the Saginaw mine in 1992. The Saginaw mine is not active, although additional resources are available and the operator holds a valid Plan of Operations with the Forest Service. There are six unpatented mining claims within the project area. The Forest Service has no information regarding mineral exploration activities at these sites. Redden (1969) and Allsman (1940) describe anomalous gold mineralization within the project area, although the width, continuity, and metallurgical characteristics of this mineralization are unknown.

Six caves are reported in the project area. Four of these caves have been verified by Forest Service field personnel, and two caves have not yet been located. Cave survey and general location data were developed by the Pahasapa Grotto (the local section of the National Speleological Society). These caves are likely significant caves as set forth by

the federal Cave Resources Protection Act, which require protection under the act and the Forest Plan. The caves range from 20 to 80 feet in depth and are up to 130 feet long. They are potential habitat for cave dwelling animals and may host important paleontological resources.

Paleontological resources are present in the project area. Invertebrate fossils are common within the Englewood Formation and also occur within the Pahasapa Limestone (Redden, 1968). The caves described above have not been surveyed for the presence of fossils, but based on the geomorphology of the caves it is very possible that they host vertebrate fossils. The caves are all vertical shafts which open into additional cave passages at depth. The orientation of the vertical shaft provides a trap for animals that inadvertently fall into the cave. A similar cave in the southeastern part of the Hell Canyon District is currently being studied by paleontologists from Pennsylvania State University.

Portions of the Bugtown project area are on the preliminary list of special, exceptional, critical, or unique lands by the South Dakota Board of Minerals and Environment. The preliminary list does not formerly classify the area as special, exceptional, critical, or unique lands. A final determination regarding classification does not occur until an application for a state mining permit is filed which includes land on the preliminary list. In the event that land is ultimately classified as special, exceptional, critical, or unique and satisfactory mitigation is not possible, the South Dakota Board of Minerals and Environment may deny a state mine permit.

Environmental Consequences

Direct and Indirect Effects

Alternative 1- No Action
Under the no action alternative, the proposed work to reduce the risk of mountain pine beetle-caused tree mortality and wildfire risk would not be completed. The No Action Alternative would cause no beneficial or adverse effects to geological or mineral resources in the area.

Alternatives 2 and 3
Alternatives 2 and 3 would provide for extensive thinning to reduce the risk of mountain pine beetle-caused tree mortality, fuels treatments to reduce wildfire risk, and sanitation/salvage of beetle killed trees (see Maps 5 and 6 in Appendix A). These alternatives are very similar in terms of potential direct, indirect, and cumulative effects to geological and mineralogical resources.

Alternatives 2 and 3 would be very unlikely to cause adverse effects to geological and mineralogical resources. No changes would be made to the mineral status of lands open to mineral entry under the 1872 mining law. No changes would be made to the existing road system in the area, which provides access for mineral prospecting and development. No special designations for lands within the project area would be established that could hinder mineral exploration or development. There is a very low potential that construction activities within the direct vicinity of the caves could cause adverse effects to cave resources by causing changes to the local hydrogeologic systems. However, the

no-disturbance buffers around caves required by Guideline 1401 of the Forest Plan would provide mitigation for this potential adverse effect. Guideline 1401 would be treated as a standard as set forth by the Phase 1 amendment to the Forest Plan.

Cumulative Effects

The Bugtown project does not have the potential to cause cumulative effects to geology or mineral resources under either Alternatives 1, 2 or 3. The cumulative effects analysis considered past, present and future activities summarized in Appendix E.

ENTOMOLOGY

Affected Environment

The mountain pine beetle (*Dendroctonus ponderosae*) is the number one insect killer of pines throughout the western United States. The beetle is a native species whose hosts include most of the pine species in the West, including ponderosa pine. Mountain pine beetle is actively killing ponderosa pine in the Black Hills of South Dakota and Wyoming.

The mountain pine beetle has one generation per year in the Black Hills. Adult flight typically occurs between July and August, when adults leave previously infested trees and attack uninfested, green trees (i.e. trees having needles that are still green). Peak adult flight typically occurs around the first week of August in the Black Hills. The adults chew through the bark of green trees and construct galleries along which eggs are laid. Larvae emerge from the eggs and begin feeding on the phloem of the tree in late summer to early fall. Larvae, pupae, or callow adults can overwinter under the bark of the infested tree. In the spring, the beetle finishes its maturation process, producing the next generation of adults.

Populations of the mountain pine beetle are usually found at an endemic levels, killing and reproducing in stressed or weakened trees, such as lightning strikes or trees affected by root disease. An endemic level is considered to be less than one tree per acre per year killed in susceptible stands. For reasons not fully understood, beetle populations can increase dramatically. The beetles go through an increasing stage that is often termed an outbreak (more than 1 tree per acre per year killed, but less than 10 percent of the stand affected over a 3 year period) and finally into an outbreak stage where 10 percent or more of the stand is affected in a 3 year period (Lessard 1982). In the increasing and outbreak stages, healthy trees are attacked and killed in addition to stressed trees.

The beetle has always been a part of the Black Hills forest ecosystem, with epidemics occurring periodically. An epidemic is defined as when beetle caused tree mortality exceeds normal background mortality experienced at endemic or outbreak levels. The first recorded epidemic in the Hills occurred from the late 1890s through the early 1900s and killed an estimated 1 to 2 billion board feet of timber. Epidemics have also occurred in the 1930s, 1940s, 1960s and 1970s, each lasting 8 to 13 years with the 1970s epidemic

being larger and causing more mortality than any of the others (Thompson 1975). Epidemics of the beetle can cause significant changes in forested stands, including a reduction in average stand diameter and stand density (McCambridge et al. 1982). Mortality levels of 25 percent can be expected throughout the landscape surrounding epidemic areas and levels of up to 50 percent can occur in heavily attacked stands (McCambridge et al. 1982). Recent mountain beetle activity in the Beaver Park area of the Black Hills National Forest has experienced 100 percent tree mortality across landscapes. The levels of mortality caused in an epidemic and the associated change in stand structure and composition can be undesirable in that it reduces timber stocking levels, affects wildlife habitat, aesthetic, and recreation values.

Generally, when beetle populations reach epidemic proportions, natural enemies, such as birds and predaceous or parasitic insects, are not numerous enough to have a noticeable effect on the epidemic. Natural enemies are more important in limiting mountain pine beetle populations that are at endemic levels (Bellows et al. 1998). Likewise, environmental factors cannot be counted on for lessening the epidemic. For example, temperatures of -10° F can kill beetles in October but temperatures of -25° are needed by February (Schmid et al. 1993). These temperatures need to be reached under the bark, in the phloem, as opposed to air temperatures. Beetles survive low temperatures by removing water from within their cells and replacing it with glycoproteins, which act as a type of anti-freeze (Bentz and Mullins 1999). This is a process known as cold hardening. Beetles have supercooling points, the temperature at which ice crystals start to form in body tissues, as low as -32° F in January (Bentz and Mullins 1999). Phloem temperatures become equal to air temperatures only when they persist for 24 hours or more (Schmid et al. 1993). Generally, phloem temperatures are found to be 5 to 10° F warmer than air temperature.

Surveys

Aerial surveys of the Black Hills are conducted annually at the end of summer. These surveys are used to detect pines that have been killed in the last 1 to 2 years and whose crowns have faded. For the last few years, beetle mortality has been increasing throughout the Hills. One area that had concentrated pockets of mortality was the area around Deerfield Reservoir, and areas west and south, including the Bugtown Gulch area (see Map 3 in Appendix A).

Field surveys, in the form of strip cruises were conducted throughout the Bugtown Gulch areas in October 2004 and again in October 2005. Cruise lines varied in length between 0.25 and 1.5 miles and were approximately 1 chain wide, covering an area between 2 and 12 acres per line. Along each cruise line, recently attacked trees as well as 1 year old hits and 2 year old hits were counted.

On each cruise line, BAF 10 (variable radius prism) plots were measured every 1/4 mile, for a total of 4 per mile. DBH (diameter at breast height) was taken for all trees in each plot. These measurements were used to provide an estimate of BA (basal area)) in square feet per acre, DBH in inches, and trees per acre within the cruise lines. Beetle populations based on the number of dead trees have increased between 1 1/2-fold and 2

1/2-fold per year for the past 3 years. The populations in this area constitute epidemic levels.

There were some surveyed areas that had little or no beetle activity when surveyed and others where basically every tree had been killed. The numbers also indicate that the population is increasing as seen by the larger number of green, currently infested trees as opposed to 2003 and 2004 attacked trees. The average basal area of stands sampled in this area was 123 square feet per acre in 2004 and 107 square feet per acre in 2005. The average DBH in these stands was 11.3 inches. The average TPA (trees per acre) was calculated to be 191. The average percent of TPA killed across the area is 23 percent. The percent of trees per acre killed ranged from a low of 2 percent to a high of 100 percent. There are stands that have already been completely killed.

Brood sampling was carried out in November 2004 and May 2005 according to methods described by Knight (1960). A 6 inch by 6-inch piece of bark was removed from the north and south sides of currently infested trees. All live and dead mountain pine beetle brood in the pieces were counted. Trees were sampled at 4 sites in the Black Hills. One of these sampled sites is in the northern portion of the Bugtown Gulch project area. The numbers of brood found were totaled for each area. The cumulative number of brood is used in regression equations to classify whether beetle populations are decreasing, increasing, or static.

In all areas sampled, the data classify mountain pine beetle populations as increasing in both surveys. In November, the area with the most rapidly expanding population was in the Deerfield area, north of the Bugtown Gulch project area (see Map 3 in Appendix A). However, in the May 2005 survey, the area with the most rapidly expanding population is in the Bear Mountain area which is the northern portion of the Bugtown Gulch project area. Some of the brood numbers are equal or greater than what was seen in the Beaver Park area when that epidemic was at its highest intensity.

Hazard Ratings and Susceptibility

Pine stands in the Black Hills can be categorized in their susceptibility to beetle attack. In general, stands are considered to be most susceptible when 75 percent of the stand is in the 7 to 13 inch diameter range and the stand density is over 120 feet of basal area per acre (Stevens et al. 1980, Schmid and Mata 1992, Schmid et al 1994). These general hazard rating guidelines, and most stand inventory data, are based on stand averages; small pockets that have high stocking levels within a low density stand can be a focal point for beetle buildup. Stand hazard ratings give an indication of which stands are most probable to have the initial beetle infestations. Once an epidemic has started, any stands containing suitable host material can incur damage. These ratings also give no indication of local beetle pressure. However, hazard ratings can determine which stands should be given priority in treatment to minimize beetle susceptibility. They also point out that forest management strategies that decrease stocking densities is often the best approach to reduce long-term losses to the mountain pine beetle.

Ponderosa pine is the only mountain pine beetle host in the project area. Almost all of the pine stands are single storied and immature to mature in age. Average stand diameters

are in the 7 to 14 inch range. There are 10,465 acres of ponderosa pine stands at high risk for mountain pine beetle susceptibility on National Forest lands within the project area (see Map 7 in Appendix A).

The Bugtown Gulch area is experiencing an active mountain pine beetle epidemic that is occurring primarily in the high risk stands (see Map 2 in Appendix A). The population levels of the beetle are evidenced in the increasing tree mortality in the area due to beetles and the actual brood counts found under the bark of infested trees.

In the northwest portion of the area, where the outbreak is currently the heaviest, there has been a two-fold increase in tree mortality from 2003 to 2004. Brood counts taken in the area in November 2004 show brood counts as high, or higher than any seen in the worst outbreaks in the Black Hills. In a 2,800 acre area in the northwest portion of the analysis area, approximately 97,000 newly attacked trees were found in the Spring of 2004. Taken with the previous 2 years' infested trees, it was found that patches of trees 1 to 5 acres in size had only a handful of live trees. These patches of dead trees cover approximately 10 percent of the aforementioned 2,800 acre area. Scattered smaller groups of 1 to 25 infested trees are also in this area. The infestation in this area has reached the point where some low risk stands, including scattered pine trees in aspen stands, are also being attacked. Indications are that the beetles are moving toward the south and east which is towards more populated areas near Custer.

In the south and eastern areas of the project area, infestation is lighter, with patches of several to 25 dead trees being more common. An exception to this is a 250 acre area in the northwest portion of the Wabash timber sale, located in the south central part of the analysis area, where several mountain pine beetle-killed patches 1 to 2 acres in size have been found.

When beetle populations reach epidemic proportions, natural enemies, such as birds and predaceous and parasitic insects, are not numerous enough to have much effect on the epidemic. Likewise, environmental factors cannot be counted on for lessening the epidemic. The type of extreme cold temperatures needed to kill beetles while they are under the bark of trees are rarely seen in the Black Hills.

Environmental Consequences

Direct and Indirect Effects

ALTERNATIVE 1 – NO ACTION

If no action is taken in the project area, it is anticipated that the existing mountain pine beetle epidemic would increase in intensity and scale over the next 5 years. Vast changes to the forested landscape would be expected to occur. Losses to mountain pine beetle would be greatest in stands with a high susceptibility rating. The potential for any dense stands to escape beetle caused mortality would be very slim. With more than 75 percent of the project area in a high hazard condition, prominent changes to the landscape are expected.

The population of mountain pine beetles would increase at a greater rate because high risk stands would continue to exist and be available for infestation. As the beetle population continued to increase at an epidemic rate, more trees in low risk stands would also be attacked. Landscape scale changes in forest structure would occur with vast areas reduced to a just a few live trees per acre. These changes have been seen in previous outbreaks in the Black Hills, particularly in the Beaver Park area.

Table 3.5 illustrates the expected change in structural stages that would occur over the next 5 years if no action were taken.

Table 3.5: Current and Expected Structural Stages for Ponderosa Pine Within 5 Years, with the No Action Alternative

Structural Stage	Existing Acres (percentage)	Expected Acres in 5 years (percentage)
1	100 (<1%)	5126(40%)
2	14 (<1%)	14(<1%)
3A	61 (<1%)	960(8%)
3B	1428 (11%)	225(2%)
3C	370 (3%)	225(2%)
4A	2070 (16%)	6157(48%)
4B	7330 (57%)	0
4C	1403 (11%)	70(<1%)
5	0	0
Total	12,777	12,777

Nearly all acres of dense forest would suffer mortality and become structural stage 1. The percentage of high hazard stands would be reduced from 77 percent to less than 5 percent, but only because these stands would be dead. Beetle-caused tree mortality is likely to occur across entire hillsides as well as individual losses in low risk stands. Mortality would be expected to continue increasing over the next 5 years.

ALTERNATIVE 2 – PROPOSED ACTION

In this alternative, most of the ponderosa pine stands that are at a high-risk rating for mountain pine beetle susceptibility would be treated with commercial thinning as a prevention measure to reduce stand density and therefore, reduce hazard ratings to low. Refer to Map 8 in Appendix A to view expected post-implementation risk ratings in the project area. Thinning high-risk stands to a basal area of 40 square feet per acre would dramatically reduce the risk of mountain pine beetle-caused tree mortality. A basal area of 40 square feet per acre would make these stands highly unsuitable beetle habitat in the face of an epidemic level infestation. These stands would remain in a low hazard condition for a much longer time than if they were thinned to a higher basal area. The

percentage of acres at a high risk would be reduced from 77 percent under existing conditions, to 8 percent.

Sanitation treatment would be implemented in stands proposed for commercial thinning as well as in low risk ponderosa pine stands where feasible. Up to 2,655 acres of sanitation treatments may occur within low risk stands. Sanitation harvesting involves the removal of green trees that have live beetle brood in them. These green trees are already dead, however, the foliage will not change color until the following summer. Trees removed in a sanitation harvest would be treated by either moving them at least one mile from the nearest live host type or processed at a mill, prior to beetle emergence in mid-summer. Sanitation cuts would possibly be done for three years, if necessary, to remove newly infested trees.

Protective spraying was considered as an option and deferred. Application of insecticide to protect uninfested trees would be very costly and labor intensive. It would be applied from the ground, so machinery must be able to access the base of each tree where insecticide is applied directly on the bole. There are no campgrounds or other high value areas in the parts of the project area considered for protective spraying.

Up to 250 acres of Salvage harvest may occur. This would involve the removal of beetle-killed trees that no longer have live beetles in them. These trees' foliage has already changed color; their needles are either red or gone. Salvage does nothing to reduce the beetle population in the area, but would help recoup some timber value and reduce the potential for large-scale wildfire.

Precommercial treatments, including fuels treatments, would have no effect on mountain pine beetle hazard or expected tree mortality. However, these treatments may reduce a stand's susceptibility to mountain pine beetles in the future. The preventative thinning and suppression measures would be expected to be effective in maintaining live pine stands in the project area. Those more dense stands which would be deferred from treatment due to other resource concerns (goshawk nesting habitat or late succession designation) would be more likely to avoid beetle infestation in this alternative because of the surrounding prevention and suppression treatments.

This alternative would be the most aggressive toward treating stands to prevent and suppress mountain pine beetle. The expected result would be a low and decreasing level of mortality relative to the current epidemic. Expected structural stages in ponderosa pine stands within the project area are shown in below. The high hazard stands are reduced from 82 percent to 24 percent.

Table 3.6: Current and Expected Structural Stages for Ponderosa Pine under Alternative 2

Structural Stage	Existing Acres (percentage)	Alternative 2 (percentage)
1	100 (<1%)	100(<1%)
2	14 (<1%)	14(<1%)
3A	61 (<1%)	1604(13%)
3B	1428 (11%)	216(2%)
3C	370 (3%)	40(<1%)

Structural Stage	Existing Acres (percentage)	Alternative 2 (percentage)
4A	2070 (16%)	8046(63%)
4B	7330 (57%)	2433(19%)
4C	1403 (11%)	324(3%)
5	0	0
Total	12,777	12,777

ALTERNATIVE 3

This alternative would implement the same types of suppression and prevention treatments as Alternative 2, but to a lesser degree. All of the 3B and 3C stands in management area 5.1 and all stands within management area 5.4 would be deferred from commercial treatment. This objective is to provide more diversity on the landscape and meet all Forest Plan direction. The deferred stands would continue to be highly susceptible to mountain pine beetle infestation and the risk to the entire landscape would be greater than in Alternative 2 (see Map 9 in Appendix A). However, the thinning and sanitation treatments surrounding these deferred sites would increase the potential for these stands to persist, over no action. The percentage of ponderosa pine stands at a high hazard rating would be 21 percent. The expected result of the proposed treatments would be a decreasing level of mortality relative to the current epidemic. The expected level of tree mortality would be less than Alternative 1 but greater than Alternative 2. Expected post-treatment structural stages for ponderosa pine stands in the project area are shown in Table 3.7.

Table 3.7: Current and Expected Structural Stages for Ponderosa Pine Alternative 3

Structural Stage	Existing Acres (percentage)	Alternative 3 (percentage)
1	100 (<1%)	100(<1%)
2	14 (<1%)	14(<1%)
3A	61 (<1%)	61(<1%)
3B	1428 (11%)	1445(11%)
3C	370 (3%)	343(3%)
4A	2070 (16%)	7357(58%)
4B	7330 (57%)	3123(24%)
4C	1403 (11%)	324(3%)
5	0	0
Total	12,777	12,777

Cumulative Effects

The cumulative effects area is the project area and a 1 mile perimeter around the project area, including all private lands within (see Map 14 in Appendix A). The cumulative effects analysis considered past, present and future activities summarized in Appendix E. Activities which may have a cumulative effect have been considered from 1999 through

2015. High levels of insect activity were first detected by aerial reconnaissance in 2000. The latest post harvest noncommercial thinning for the Bugtown project may not be completed until 2009 and no further treatments are planned in this area. The Bear and Elliott timber sales, both designed to sanitize and thin for prevention, were finished by July, 2005. The Limestone II thinning of 2003 and 2004 (1,963 acres) were the first treatments that reduced stand densities to levels that would help prevent the infestation from spreading. The Wabash timber sale would also reduce stand densities resulting in more low risk acres. It is scheduled for completion by 2008. The epidemic would likely be stopped by the effect of the proposed treatments or have destroyed all available host material by 2015.

Under the treatment alternatives for Bugtown, the infestation should be largely confined to the project area. Beetles generally move less than one-tenth of a mile per year but might travel up to several miles on rare occasions. As populations build up the beetles are forced to travel farther to find suitable habitat not already infested by other beetles. Highly suitable habitat (high risk stands) would be available outside the project area on both public and private lands, particularly to the east. Tree mortality resulting from the beetle epidemic within the project area would be expected to occur up to approximately one mile outside the project area. This mortality should be very light under the treatment alternatives but heavy with no treatment. Activities, including mountain pine beetle populations and treatments, within 1 mile of the project area could have a cumulative effect.

The No Action Alternative would result in a significant adverse cumulative effect on mountain pine beetle caused mortality. Lack of active suppression or prevention treatments would encourage beetle populations to increase and mortality of pine stands would be heavy across the cumulative effects area.

There would be positive cumulative effects under the action alternatives, from all the listed projects throughout the cumulative effects area. Treatment of pine stands to lower stand density reduces the stands' susceptibility to mountain pine beetles. Mountain pine beetle-caused mortality would be expected to decrease within the cumulative effects area.

SILVICULTURE

Affected Environment

The Bugtown Gulch area, as with most forested areas of the Black Hills, has experienced harvest and other tree cutting activities going back to the early 1900s. Specific data is available for activities since 1980 (see Appendix E and map 4 in Appendix A). Seven timber sales have occurred in the analysis area since 1980. Ruby, Bellestar, Bull Spring, and Sourdough timber sales were active in the 1980s. These sales had some shelterwood seed cuts and overstory removals. Most of the activity was commercial and precommercial thinning associated with the Sourdough sale.
These sales contributed to the existing forest structure of dense and moderately dense mature, single storied stands. These stands are highly susceptible to mountain pine beetles.

The most significant activities since the 1980s has been commercial and precommercial thinning associated with the Limestone and Limestone 2 timber sales in the 1990s. The Bear and Elliott Timber Sales of 2005 are current sales designed for suppression and prevention of mountain pine beetle in the areas most heavily impacted by the beetles. Both Limestone sales and the Bear and Elliot sales have reduced the density in treated stands so they can be classified as low risk to mountain pine beetle attack.

Many of the large tracts of private land have been treated for mountain pine beetle sanitation and thinning, although no acre figures are available. Adjacent National Forest lands that are untreated are centers for beetle activity and are a threat to private property.

The vegetation in the Bugtown area is dominated by ponderosa pine (96 percent) along the ridges and slopes. Most of the ponderosa pine stands are even-aged and single storied. Less than 1 percent of the area is in the White spruce cover type. Aspen stands make up 2 percent of the area. Two percent of the area is in grass cover. Slopes in the project area range from 0 to 60 percent.

Shrubs, forbs, and grasses are plentiful in the forest understory. Common juniper *(Juniperus communis)* is found and frequently reaches a height of two feet. Oregon grape *(Berberis repens)* and kinnikinnik *(Arctostaphylos uva-ursi)* are common shrubs found in many sites along with a variety of forbs and grasses.

Table 3.8 shows existing cover types in the project area.

Table 3.8: Existing Cover Types.

Cover Type	Acreage/Percentage
Meadow	262 (2%)
Aspen	273 (2%)
Ponderosa Pine	12,777 (96%)
White Spruce	66 (<1%)

It is estimated that 2,184 acres (17 percent) of the forested portion of the analysis area is providing vertical diversity. This value is less than Forest Plan Objective 206 which states that 20 percent of the forested portion of a project area should provide vertical diversity. Timber stands with more than 1 canopy layer or a shrub component are providing vertical diversity. Increases in vertical diversity can be accomplished by regenerating stands, increasing aspen within pine stands or encouraging shrub growth.

Aspen and White Spruce

There are 273 acres of designated aspen stands in the project area. In addition to these stands, an estimated 150 to 200 acres of aspen clones exist within designated pine sites, mainly in the northern part of the analysis area. None of the designated aspen sites are considered to be in need of aspen regeneration treatments. Some aspen stands, approximately 160 acres, contain a few mature pine trees per acre and scattered seedlings

and saplings as well. Aspen release treatments have occurred in the project area over the past 20 years. Further conifer regeneration over time will inhibit the growth and viability of the aspen but the stands are remaining viable at this time.

There are only 2 stands typed as white spruce. These include a very small (8 acre) stand on a north facing slope in the northeast portion of the project area and a 58 acre stand which straddles French creek. Both stands contain some pine trees.

Ponderosa Pine

Ponderosa pine is the only mountain pine beetle host in the project area. Almost all of the existing pine stands are single storied and immature to mature in age (approximately 60-120 years old). Average stand diameters are in the 7 to 14 inch range. Individual trees 16"+ dbh occur in the landscape. Stand exam data show that up to 13, 16"+dbh trees occur within stands in the project area. However, this number is generally much less with many stands void of 16"+ dbh trees. Recent timber management has occurred in some portions of the project area, resulting in reduced stand densities. However, the vast majority of the ponderosa pine stands are in a dense to very dense condition. Table 3.9 displays acres and percentages of the various structural stages within pine stands only.

Table 3.9: Existing Structural Stages – Ponderosa Pine Only

Existing Structural Stage in **Ponderosa Pine** stands	Existing Acres (percentage)
1	100 (<1%)
2	14 (<1%)
3A	61 (<1%)
3B	1428 (11%)
3C	370 (3%)
4A	2070 (16%)
4B	7330 (57%)
4C	1403 (11%)
Total	12,777

There are 10,465 acres of ponderosa pine stands at high risk for mountain pine beetle susceptibility on National Forest lands within the project area (see Map 7 in Appendix A). Risk is calculated according to the risk rating system established by Forest Service entomologists and is based on stand density and average stand diameter. Stands with a structural stage condition of 3B, 3C, 4B and 4C are considered high risk for mountain pine beetle susceptibility.

The Bugtown Gulch analysis area is highly susceptible to vast changes in structural stages caused by mountain pine beetle infestation. There are 8,733 acres (68 percent) of

the pine stands in the area, in structural stage 4B and 4C. This condition is at the highest risk for beetle attack and mortality. These stands are made up of large diameter trees and are very dense which is very good habitat for beetles. There are also 1,798 acres (14 percent) of pine stands in a 3B and 3C structural stage. The 3B and 3C stands in this area generally have average stand diameters in the 7 to 9 inch diameter range which puts them in the high risk category for mountain pine beetle susceptibility, but would be considered somewhat less susceptible than 4B and 4C stands due to average stand diameters. With 82 percent of the pine stands in the area at high risk, there is an abundance of desirable host stands concentrated very closely together.

Environmental Consequences

Direct and Indirect Effects

ATERNATIVE 1 – NO ACTION

The No Action Alternative would forego any opportunity to reduce timber losses to mountain pine beetle-caused tree mortality. As discussed in the Entomology section of this chapter, vast changes to the ponderosa pine stands are expected to occur as a result. The effects discussed here are expected to occur within 5 years.

It is estimated that more than half of the mature ponderosa pine stands which currently have a dense to very dense canopy closure (4B and 4C) would be reduced to a stand initiation stage. The balance of these stands would most likely become open forest (4A) with very few dense stands remaining in a 4B or 4C condition. Similar changes would be expected to occur within the immature dense and very dense stands (3B and 3C). Under epidemic conditions the largest and healthiest trees would be attacked along with the weakest and smallest, causing a reduction in the quality of trees left. The expected structural stages that would be present on the landscape within 5 years are shown by cover type in Table 3.10.

Table 3.10: Expected Structural Stages of Bugtown Gulch Project Area by Cover Type within 5 years under No Action Alternative (in acres)

Structural Stage	Ponderosa Pine	Aspen	White Spruce	Total
1	5,126	37	0	5,163
2	14	41	0	55
3A	960	36	0	996
3B	225	88	0	313
3C	225	3	0	228
4A	6,157	55	8	6,220
4B	0	13	58	71
4C	70	0	0	70
5	0	0	0	0
Total	12,777	273	66	13,116

Regulated timber management investments in the project area would be lost and many areas would take decades to reforest. Much of the suitable lands within the project area would not contribute to the allowable sale quantity for the foreseeable future. Stands designated for goshawk and late successional habitat would likely be lost as tree mortality altered their structural stages and thus destroyed their designated characteristics.

Standing dead and fallen dead trees would create heavy concentrations of fuels, causing large areas to be at high risk to large scale, high intensity wildland fires. If they occurred, these fires would likely spread to stands that survived the beetle attack and destroy more resource values. Private forest lands mixed in the project area would be subject to the same destruction and loss of resource and habitat values.

Existing aspen clones would likely expand as the canopy in the ponderosa pine stands is opened. Other shade intolerant grasses, forbs, and shrubs would become more abundant as well. These changes would improve vertical diversity in those stands by developing understory structure.

ALTERNATIVE 2 – PROPOSED ACTION

Under this alternative, approximately 8,085 acres would be commercially thinned (see Map 5 in Appendix A). These same acres could also receive sanitation cutting where live trees are infested with mountain pine beetle brood. Up to an additional 2,655 acres may have sanitation treatments where beetle infestations occur. Salvage of trees killed by beetles may occur on up to 250 acres. Precommercial thinning is proposed on 3,026 acres. Fuels treatments are proposed in precommercial sized trees to reduce fuel loadings and the potential for large scale wildfire. Alternative 2 may harvest up to 24.9 mmbf (million board feet) of commercial timber. All treatments would occur within ponderosa pine stands or aspen stands with a pine component.

All commercial entries would be limited by operability and access limitations resulting in something less than the total acres planned being actually treated with commercial harvest. This will amount to less than 1 percent of the planned commercial treatment acres being deferred due to accessibility.

Thinning treatments would increase growth on remaining trees and improve the overall health of the stands because there would be more water, nutrients, and sunlight for each tree. Leaving 40 basal area would reduce the total amount of fiber produced in the stands in the future but would increase the sawtimber output over time because more tree diameter growth would be achieved. Aggressive thinning could put stands at risk to windthrow and breakage. There are no soils shallow enough to cause shallow rooting so no significant windthrow would be expected to occur. Thinning from below would minimize windthrow and breakage, by harvesting mostly the smaller, shorter trees and leaving the tallest trees that have had more wind exposure and developed more sturdiness.

Regulated healthy stands would maintain options for future forest management. Some advanced reproduction of seedlings could be expected. Overstory removals, regeneration

cuts, or uneven-aged treatments may be prescribed in the future to enhance or maintain the diversity in structure that was developed.

The landscape would be expected to encompass thinned stands, some very open stands, and some openings as a result of the varying levels and concentrations of infested trees. Aspen clones would increase in size and viability as conifers were removed in and around them. As the infestation slowed in the treated stands, areas left at higher densities for goshawk habitat and late succession would be more likely to avoid levels of mortality that would reduce their structural stage condition. Vertical diversity would be improved as understory vegetation is encouraged. Expected post-treatment structural stages by cover type are shown in Table 3.11 below.

Table 3.11: Alternative 2 Post Treatment Structural Stage Acreages by Cover Type

Structural Stage	Ponderosa Pine	Aspen	White Spruce	Total
1	100	37	0	137
2	14	41	0	55
3A	1604	36	0	1640
3B	216	88	0	304
3C	40	3	0	43
4A	8046	55	8	8109
4B	2433	13	58	2504
4C	324	0	0	324
5	0	0	0	0
Total	12,777	273	66	13,116

ALTERNATIVE 3

Alternative 3 defers approximately 2,233 acres from commercial thinning and 404 acres of potential sanitation (see Map 6 in Appendix A). This includes all acres (998 acres) within management area 5.4 as well as 1,639 acres of 3B and 3C within management area 5.1. All other features of Alternative 2 are included in Alternative 3. These 5.1 stands were deferred to provide some additional diversity by leaving more dense areas within the project area. While stands in a 3B or 3C structural stage are considered to be highly susceptible to mountain pine beetle, they are generally less susceptible than stands in a 4B or 4C condition due to having lower average stand diameters. The deferred stands would continue to be susceptible to mountain pine beetle infestation and the risk to the entire landscape would be increased as compared to Alternative 2. If the deferred stands sustained low enough mortality levels from infestation that their structural stages remained the same, there would be more density diversity among stands on the landscape. Vertical diversity would be improved as understory vegetation is encouraged.

Benefits of thinning and sanitation would be lost in the deferred stands. They would remain stagnant, resulting in less tree growth and delaying additional growth and future

sawtimber output. Deferring sanitation would increase the risk of more trees in the stands becoming infested. If the infestation reached a high level in these stands, the resulting mortality could reduce them to structural stage 1 and put adjacent stands at higher risk. Fuel build up from mortality in untreated stands would increase the risk of large scale, high intensity fires that spread to other stands and private land.

Approximately 16.7 mmbf of timber would be produced for the allowable sale quantity. Removing the dead trees would help reduce fire danger from standing snags burning and from fallen trees increasing fuel loading for surface and large scale, high intensity fires. Table 3.12 displays the expected structural stages by cover type.

Table 3.12: Alternative 3 Post Treatment Structural Stage Acreages by Cover Type

Structural Stage	Ponderosa Pine	Aspen	White Spruce	Total
1	100	37	0	137
2	14	41	0	55
3A	61	36	0	97
3B	1445	88	0	1543
3C	343	3	0	346
4A	7375	55	8	7420
4B	3123	13	58	3194
4C	324	0	0	324
5	0	0	0	0
Total	12,777	273	66	13,116

Cumulative Effects

The cumulative effects area is the project area. Activities occurring from 1990 through 2015 are included in the cumulative effects analysis. The cumulative effects analysis considered past, present and future activities summarized in Appendix E.

The stands treated in the Limestone, Limestone 2, Bear, and Elliott sales and the stands to be treated in the Warren Gulch and Wabash sale areas would have an effect on stocking levels and growth and yield until the stocking levels were next altered. This would not occur until the next analysis is done in approximately 10 years. Future treatments might be further thinning or regeneration cuts. Any treatments for growth and yield purposes would not occur until stands became overstocked again or regeneration cuts were prescribed at the culmination of mean annual increment or when uneven-aged treatments were desired.

Stands treated in the Limestone 2 project released hardwoods and would have an impact on vertical diversity as new seedlings become established and create a second canopy level. The Bugtown project and Wabash timber sale treatments would also have an effect in releasing hardwoods and creating a second canopy layer. Hardwood release would be

effective for 10 to 15 years when pine regeneration would begin to compete with hardwoods. The second canopy would add to vertical diversity until the overstory breaks down or natural events or future treatments eliminated one of the layers. Alternative 3 would leave the 3B and 3C stands untreated which would leave more density diversity if the stand structure received little mortality. The untreated stands would reproduce few seedlings and hardwoods would not be released

The action alternatives would have positive effects to growth and yield as well as diversity on the landscape. Currently overstocked stands would continue to have improved growth and yield for the next 10 years. Treatments creating vertical diversity and species diversity would remain effective through the time boundary. No adverse cumulative effects would be expected under the action alternatives.

The No Action Alternative would result in adverse cumulative effects to the timber resource. Beetle activity would reduce stand densities indiscriminately, leaving some trees more space than needed and others without enough space to grow efficiently. Large areas would have few to no trees and be unproductive well into the future. Under epidemic conditions the largest and healthiest trees would be attacked along with the weakest and smallest, causing a reduction in the quality of trees left. The epidemic would be expected to spread onto private lands as well as low and high risk stands outside the project area. Dense stands in the project area would likely attract beetles from outside the area. The fuel loadings would be compounded by standing dead and down trees over larger areas. The potential for large scale, high intensity wildfire would be elevated. If a wildfire were to occur under these conditions, it is likely that green trees, which had escaped beetle caused mortality, would be killed.

FIRE and FUELS

Affected Environment

Fire has historically been a major force in shaping and determining the structure and composition of ponderosa pine forests in the western United States, including the Black Hills. The current structure and composition of these forests has been influenced by human intervention in the form of aggressive fire suppression and active management. Other factors, such as weather and insect infestations, also contribute to shaping the forests.

About 190 million acres of federal forest and rangeland in the lower forty-eight states face high risk of large-scale insect or disease epidemics and large scale, high intensity fire due to deteriorating ecosystem health and drought. The Bugtown project area falls into this category. The severity of this problem has been recognized by many observers including the general public, the U.S. Congress, President Bush, the Western Governors Association, the National Association of State Foresters, the Intertribal Timber Council, and the National Association of Counties, as well as many others (Interim Field Guide, 2004).

Fire History

There have been 34 recorded fires in the project area since 1950. Ten of these fires were started on other ownership jurisdictions. Recorded causes of these fires include two campfires, five debris burnings, one equipment caused, four human caused, one land occupant caused, nineteen lightning caused, one smoking caused, and one unknown cause. No specific records are available for fires that occurred prior to 1950.

The majority of these fires have been less than ¼ acre in size. Only one recorded fire was larger than 1 acre in size. That fire was the 83,000+ acre Jasper fire of 2000. This arson caused wildfire burned under extreme conditions and is the largest wildfire ever recorded in Black Hills history. Only 358 acres of the Jasper fire entered the project area at the very northwestern boundary (see Map 3 in Appendix A).

Fire Regime Condition Class

A natural fire regime is defined as a general classification of the role fire would play across a landscape in the absence of modern human mechanical intervention, but includes the influence of aboriginal burning (Hann et al., 2003). FRCC (Fire Regime Condition Class) is a classification of the degree of departure from the natural fire regime, resulting in changes to one or more of the following ecological components: vegetation characteristics; fuel composition; fire frequency, severity, and pattern; and other associated disturbances (Hann et al., 2003). The Bugtown project area is classified as having a rating of Condition Class 3 based on outputs received from the computer generated FRCC score card located in the project file, and visual observations within the project area. In Condition Class 3, the risk of losing key ecosystems components is high. Fire regimes in the Bugtown project area have been significantly altered from their historical range and fire frequencies (return intervals) have also departed from historical frequencies. The score card shows a historical weighted mean fire return interval of 23 years. Due to past and present fire suppression activities multiple fires have been excluded, resulting in altered mean fire return intervals and dramatic changes to one or more the following: fire size, intensity, severity, and landscape patterns. Vegetation attributes such as species composition, structural stages, stand age, and tree densities have also been significantly altered from their historical characteristics.

The Bugtown area is classified in Fire Regime Group One, based on the Potential Natural Vegetation Group for the Black Hills and the computer generated Fire Regime Condition Class (FRCC) score card. In Fire Regime Group One, fires are characterized as low to mixed severity due to their frequent occurrence, entering the landscape every 1 to 35 years. Wildfire occurrence has played a dominant role in determining vegetative compositions and structure in many areas of the Black Hills National Forest. However, fire suppression efforts over the last one hundred years have altered fire return intervals several times, thus disrupting natural fire regimes and excluding fires that would have naturally occurred.

Fuel Models

Fire behavior fuel models are a means of classifying different vegetation types and their fuel properties. It is important to understand that FRCC and Fuel Models are different classification methods. Fuel Models are classified into four groups: grasses, brush, timber, and slash. The differences in fire behavior among these groups are basically related to the fuel load and its distribution among the fuel particle size classes (Anderson, 1982). Fuel models are used to help predict the fire behavior potential. Table 3.13 displays existing acres of varying fuel models on National forest lands within the project area.

Table 3.13: Existing Fuel Model Acres within the Project Area

Fuel Model	Current Acres
2	250
8	1,035
9	11,831
12	0

Fuel model 2 is timber with a grass understory. Fuel model 8 is represented by closed canopy pine and hardwood timber stands with little under growth or down woody fuels. Fuel model 9 is represented by closed canopy pine and hardwood timber stands with concentrations of dead down woody material. Fuel model 12 is represented by timber stands with heavy down woody materials, such as heavily thinned conifer stands or pine stands where 40 to 80 percent of existing trees are killed by beetles.

Over 90 percent of the project area is classified as Fuel Model 9 (Timber). Table 3.14 displays predicted fire behavior features in two representative stands within the project area, under a fuel model 9 condition. Analysis was completed utilizing Fuels Management Analyst-Crown Mass and PSExplorer, and Fire Family Plus.

Table 3.14: Predicted Fire Behavior in Representative Fuel model 9 stands, Existing Condition

STAND	WIND SPEED	RATE OF SPREAD	FIRELINE INTENSITY	FLAME LENGTH	AVERAGE MORTALITY	FIRE SIZE 1Hr.
#	MI/HR	CH/HR	BTU/FT/SEC	FT	%	ACRES
30607-10	3	8.5	91	3.6	26	3.64
30607-02	3	9.2	98	3.7	35	4.12

Modeling was based on stand exam data imported in the Fuels Management Analyst-Crown Mass computer modeling program. Data used was from the most current Stage II data available. The stands modeled were chosen because they are representative of the Bugtown project area.

Current areas of Fuel Model 2 will be maintained throughout the project area with or without treatment. However, due to its small acreage in relation to the rest of the Bugtown project area, it is not modeled for predicted fire behavior because it is expected to have little influence.

Fuel Model 8 (Timber) is most representative of the desired conditions for the Bugtown Project area. This represents an attainable condition with projected fire behavior that includes slow burning ground fires with low flame length. Fuel Model 9 is also representative of the desired conditions, meeting all the project requirements as well as the goals and objectives. This fuel model would include fire behavior of faster moving fire with longer flame length than Fuel Model 8 and is therefore not the preferred condition, but acceptable.

Values at Risk

There are both resource related and socio-economic values at risk within the project area. The community of Custer, South Dakota, is listed in the Federal Register as a 'Community at Risk" (CAR) (August, 2001) which is in the vicinity of Federal lands at high risk from wildfires. This designation means that these areas are identified as having a significant threat to human life or property as a result of a wildland fire disturbance event. Custer is located approximately 5 miles to the east of the project area.

Based on 2004 county assessor office records, there are 49 structures within the Bugtown project perimeters, and approximately another 35 within one mile of the project boundaries. These Structures are mostly single family homes with acreages of 5 to 200 acres, ranging between one hundred thousand to several hundred thousands of dollars in value.

Values in the Bugtown environment which would be threatened by wildfire include:

- Commercial timber stands
- Power lines
- Range improvements, such as fences and spring developments
- Private land - including various structures
- Investments in timber stand improvement and reforestation
- Wildlife habitat, including snags, forage, riparian areas, security cover, and mid to late stage ponderosa pine stands
- Dispersed camping sites
- Scenic vistas
- Water Quality

Environmental Consequences

Direct and Indirect Effects

The predicted fuel model and subsequent fuel profiles for harvest units in the project area have been analyzed for conformance to fire intensities and maximum fire sizes under 90th percentile weather conditions. The following weather conditions were used, as provided by remote automated weather stations (RAWS) utilizing average weather from 1975-

2003 in Custer, S.D. Weather was averaged through the computer model Fire Family Plus.

- 1 hour fuels- 3 percent
- 10 hour fuels-5 percent
- 100 hour fuels-7 percent
- Maximum air temperature-82
- Minimum relative humidity-20 percent
- Windspeed-11 mph (This translates to mid-flame wind speed of 3 mph)

In Fuel Model 8 or 9, there would be less fuel loading and decreased fire behavior as opposed to Fuel Model 12.

ALTERNATIVE 1 – NO ACTION

Major changes would be expected to occur across the landscape as a result of mountain pine beetle caused mortality within the next five years. Aerial fuels would be expected to fall to the ground and contribute to ladder fuels, thus increasing the potential for crown fire. Needles would remain on downed vegetation for three to five years, depending on moisture conditions. After that point, fire behavior would be expected to moderate some. However, in the next stage more fuels would continue to fall and create a build up of large fuels on the ground, which would greatly contribute to fire intensities over the next 5 to 10 years. Large openings with heavy fuel loads would be expected under the no action alternative. Roads would likely be blocked by fuel build up, which in turn would delay suppression efforts. Firefighters would be forced to depend more on aircraft for access and support, if these resources were available when a wildfire event occurred.

No action would continue the trend associated with increasing fire risks. No reduction of stocking levels would occur in dense stands with over-crowding. In the absence of vegetation treatments, tree densities would continue to increase, as would crown cover and ladder fuels, and increased mortality from insects and disease would occur. As a result, there would be a higher risk of losses to wildland fire. This trend would continue until interrupted by a natural disturbance such as a large scale, high intensity fire.

The impacts of the no action alternative on air quality in the surrounding area would mirror impacts on other elements of fuels management. In the short term, air quality would not be impacted. However, when a large scale, high intensity event occurred, there would be no control over the timing or amount of emissions released into adjacent airsheds, such as Wind Cave National Park, a Class 1 Airshed located approximately 10 miles to the southeast.

Under this alternative, the Bugtown project area would not contribute to the forest plan targets for fuels treatments nor meet the intent of the National Fire Plan, as well as many other national, regional, and local direction/policies.

Modeling of the existing situation in the Bugtown project area shows what impact the no action alternative would have on the fuels situation. Currently the majority (90 percent) of the Bugtown project area is in a Fuel Model 9. Within the next five years, if no treatment is implemented, it is projected that 9,622 acres of current Fuel Model 9 would move into Fuel Model 12, leaving only 2,537 acres remaining in Fuel Model 9. Canopy fuels would also have an impact on fire behavior. They would fall to ground and add to the surface fuels shifting existing conditions into a Fuel Model 12, which would contribute to increased fire behavior. These effects would cause access and control problems for firefighters as trees fell and blocked ingress/egress roads. Refer to Table 3.15, to see the acreages of each Fuel Model currently and how they shift with the effects of the mountain pine beetle epidemic.

Table 3.15: Current and projected acres in each Fuel Model under No Action within 5 years

Fuel Model	Current Acres	Post Mountain Pine Beetle
2	250	250
8	1,035	1,035
9	11,831	2,412
12	0	9,419

Table 3.14 in the Affected Environment discussion illustrates the predicted fire behavior for representative Fuel Model 9 stands based upon computer modeling. Predicted fire behavior in Fuel Model 9 allows for safe attack with ground crews and initial attack would likely be successful. However, predicted fire behavior under fuel model 12 would become more intense, further increasing the risk to residential areas, the general public, and firefighters. Using the Fuels Model Analyst Crown Mass model, results show that a fire starting in Fuel Model 12 timber stands would generate 500 to 600 BTUs per feet per second. These fireline intensity figures exceed Forest Plan Standards of 200 BTUs per feet per second and fire size. Flame lengths of a fire in this fuel type would exceed 7 feet in length with mid-flame wind speeds over 3 mph, which precludes suppression with handcrews that are not supported by air/heavy equipment suppression tactics. Table 3.16 illustrates predicted fire behavior for Fuel Model 12 for the same representative stands.

Table 3.16: Predicted Fire Behavior in Representative Fuel model 12 stands, Within 5 years under the No Action Alternative

STAND	WIND SPEED	RATE OF SPREAD	FIRELINE INTENSITY	FLAME LENGTH	AVERAGE MORTALITY	FIRE SIZE 1Hr.
#	MI/HR	CH/HR	BTU/FT/SEC	FT	%	ACRES
30607-10	3	12.7	500	7.8	98	8.1
30607-02	3	13.6	536	8.1	99	8.9

ALTERNATIVE 2 – PROPOSED ACTION

This alternative would affect the fuels resource in several ways. Forest direction for generated slash would be met and continuous crown closures/densities would be reduced. Losses to mountain pine beetle in overstocked stands would also be reduced as stocking levels were reduced to below threshold levels identified by silvicultural personnel, thus reducing fuel loadings in the short-term, as well as long-term. The existing FRCC of the project area would also improve across the landscape because stand density would be reduced and the vegetation attributes would be more similar to those that occurred naturally. The risk of losing key ecosystem components would also be reduced. Treatments outlined in Alternative 2 would decrease the risk for large scale, high intensity fires, allowing for characteristic low to mixed severity fires to occur. These results would all meet the Forest Plan Standards of the BTUs and acre suppression objectives.

Under the treatments proposed in Alternative 2, approximately 5,342 acres of Fuel Model 9 would be treated and either reduced to a Fuel Model 8 or maintained at a Fuel Model 9 for the foreseeable future. These acres would develop into Fuel Model 12 if not treated. Suppression objectives would be more readily attainable, leaving only 702 untreated acres to develop into Fuel Model 12. Refer to Table 3.17 below to see the acreages of the current Fuel Models, post mountain pine beetle (Alternative 1 within the next five years), and post treatment specified in Alternative 2. The planned treatments would result in few acres moving into fuel model 12 where suppression objectives are less attainable. Grass type fuel models are expected to maintain for several years, but may need treatment in future years for meadow restoration.

Table 3.17: Current and projected acres in each Fuel Model in 5 years within the Bugtown Project .

Fuel Model	Current Acres	Alternative 1 within 5 years	Post Treatment Acres Alternative 2
2	250	250	250
8	1,035	1,035	6,298
9	11,831	2,412	5,866
12	0	9,419	702

The treatments proposed in Alternative 2 would also have a significant affect on fire behavior. The chances for successful initial attack under this alternative would be much greater and the risk to residential areas, the general public, and firefighters would also be greatly reduced. As displayed in Table 3.18 and Table 3.19 below, in both Fuel Models 8 and 9 the fireline intensity would be well below the forest standard and the flame lengths would allow for safe attack with ground crews. The fire behavior predictions would be lower for Fuel Model 9 after treatment than they would be before treatment (See Table 3.14), due to reduced stand densities and fuel loadings from treatment occurrence.

Table 3.18: Fire Behavior after Treatment in a Fuel Model 8 in Alternative 2

STAND	WIND SPEED	RATE OF SPREAD	FIRELINE INTENSITY	FLAME LENGTH	AVERAGE MORT.	FIRE SIZE 1Hr.
#	MI/HR	CH/HR	BTU/FT/SEC	FT	%	ACRES
30607-10	3	1.2	3	.8	26	.07
30607-02	3	1.2	4	.8	31	.07

Table 3.19: Fire Behavior after treatment in a Fuel Model 9, Alternative 2

STAND	WIND SPEED	RATE OF SPREAD	FIRELINE INTENSITY	FLAME LENGTH	AVERAGE MORT.	FIRE SIZE 1Hr.
#	MI/HR	CH/HR	BTU/FT/SEC	FT	%	ACRES
30607-10	3	4.6	26	2.0	25	1.07
30607-02	3	5.0	28	2.1	32	1.22

Canopy fuels would also be reduced in this alternative, which would reduce the potential for a sustained crown fire. All treatments would greatly reduce canopy bulk densities but would not meet the minimum bulk density, which is 100 pounds per acre-foot which is 0.0023 pounds per cubic foot (FMA User's Guide to Crown Mass, 1999-2002). Natural and activity surface fuels would also be treated to reduce the tons per acre to meet Forest Plan Standards of potential fireline intensity no greater than 200 BTUs per second per foot. Treatment of created fuels by piling and burning would have the effect of lowering existing fuel levels. In general, treatment of activity fuels would result in the treatment of natural slash. Fire intensities would drop with increases in fuel treatments.

Some areas may receive smoke impacts from pile burning; however, it is unlikely because pile burning would be done under controlled events. In certain cases, burning operations would be halted if smoke impacts were undesirable. Ignition of piles would occur only during the daytime, which would have less impact to the local area because of improved smoke dispersal and mixing heights.

In Alternative 2, 112 acres of POL thinning is also proposed in addition to the fuels treatment areas. Activity fuels generated would be monitored and prescribed for treatment, if needed to meet Forest Plan Standards and Guidelines (see Appendix C). Fuels treatment prescriptions that could be implemented area described below. A map of likely fuels /slash treatments can be found in Appendix A, map 17.

Lop and scatter: Fuels would be lopped into smaller pieces and left scattered on the ground with a maximum height of 18 inches.

Machine piling: Machine piling would be used where a localized heavy concentration of fuel is undesirable, such as a major travel route or next to structures.

Hand piling: On inoperable slopes and erosive soils, hand piling would occur.

Whole tree yarding: The whole tree would be yarded to the landing. Once at the landing, the top would be severed from the merchantable bole and pushed aside for subsequent piling, burning, and rehabilitation.

Pile burning: Piled slash would be burned after drying out for one year. Snow cover needs to be present for pile burning implementation to occur.

Mastication: Fuels would be mechanically "ground" to reduce fuel densities. One benefit of this treatment is that very little if any pile burning would occur thus saving money and time.

Thinning: Generally prescriptions of understory thinning are 18 feet by 18 feet to 24feet by 24feet spacing and up to 9 inches DBH (diameter at breast height) and follow commercial harvest.

ALTERNATIVE 3

The difference in this alternative is that 2,637 acres would be deferred from commercial treatment. Fewer acres of pre-commercial POL thinning (677 acres less) would also occur. Alternative 3 would meet Forest Plan Direction and the existing FRCC would improve for the same reasons described in Alternative 2, but the effects would occur to a lesser degree across the landscape. Because fewer acres would be treated, more acres would move into a Fuel Model 12 as shown in Table 3.20 below. This would have an impact on the forest within the Bugtown project area from increased mortality related to the mountain pine beetle epidemic, as well as impacting the expected fire behavior. As the amount of acreage proposed for treatment decreases, the risk of a large scale, high intensity fire escaping from the project area would increase. This would increase the risk to the general public, residential areas, and firefighters. The risk of surface fires transitioning into crown fires would also increase as a result of fewer acres treated.

Table 3.20: Current and projected acres in each Fuel Model in 5 years in the Bugtown Project, Alternative 3

Fuel Model	Current Acres	Alternative 1 within 5 years	Post Treatment Acres Alternative 3
2	250	250	250
8	1,035	1,035	5,239
9	11,831	2,412	5,709
12	0	9,419	1,918

Silvicultural treatments and fuels treatments under this alternative would result in changes in fuel model occurrences with stands being less susceptible to large scale, high

intensity fire as well as burning at lower intensities. Table 3.18 and Table 3.19 under the Alternative 2 discussion show the predicted fire behavior for Fuel Models 8 and 9 after the proposed treatment under Alternative 3 would be implemented. The fireline intensity would be well below the forest standard and the flame lengths would allow for safe attack from ground crews, allowing for more successful initial attack.

Activity fuels would be treated in the same manner as in Alternative 2, to reduce the tons per acre to meet Forest Plan Standards of potential fireline intensity no greater than 200 BTUs per second per foot.

Cumulative Effects

In the Bugtown project area past, present, and reasonably foreseeable future actions are applicable to interpreting changes in fuel conditions. Past timber management activities have had impacts that have created situations that have both increased and decreased the risk of large scale, high intensity fire. Wildfire suppression leads to a buildup in down woody material, increased stocking, and increased ladder fuels, which all increase risks. The previous lack of thinning in dense stands has also contributed to an increase in wildland fire behavior, tree densities, the presence of ladder fuels, and dense crown closures, again all contributing to higher risks. The cumulative effects analysis considered past, present and future activities summarized in Appendix E.

If fires had been allowed to burn instead of pursuing an aggressive fire suppression program over the last 75 to100 years, a significant increase in the amount acreage in stands would have burned at a more frequent interval and a lower intensity. However, today conditions favor wildfires of increased fire intensity at longer fire return intervals.

The cumulative effects area for the Bugtown project includes all land ownerships within the project boundary and approximately 1 mile outside the project boundary (see Map 14 in Appendix A). One mile outside the project boundary is defined by the spotting distance that is likely to occur based on fuel characteristics, topographic features, and 90th percentile weather conditions within the project area, as well as professional experience. Activities occurring from 1999 through 2020 are also being considered in the cumulative effects analysis for the risk of large scale, high intensity fire. This timeframe represents the beginning of the current mountain pine beetle epidemic and the estimated time into the future that the effects of this project may occur.

In the No Action Alternative, adverse cumulative effects to the risk of large scale, high intensity fire would be expected to occur over the next 15 years due to the current mountain pine beetle infestation and the overly dense forest and heavy fuel loadings which would continue to compound upon each other. Tree mortality from mountain pine beetle provides for dead and dry flashy aerial fuels within the first 3 to 5 years, dramatically increasing the risk of large scale, high intensity fires. The potential for sustained crown fires would greatly increase as well as the fireline intensity. As dead needles and small branches fell to the ground, the hazard would decrease. However, within the next 5 to10 years the dead trees would start to fall, creating heavy jackpot fuels for several years. This again would substantially increase risks by creating more intense

and difficult fire behavior conditions for firefighters, especially ground crews, as flame lengths exceeded the ground crews' ability for direct attack. With this type of fire behavior, forest suppression objectives would not be met.

Under the No Action Alternative, the FRCC would not improve and would most likely continue to deteriorate, creating conditions conducive to extreme fire. Defensible space would also be minimized, resulting in dangerous conditions for the firefighters and the general public in the event of a fire. Current access into the Bugtown project area may also be blocked as dead trees begin to fall to the ground. Since there is no proposed action to change access, this could create a major issue for firefighters by blocking ingress/egress routes for initial attack activities, as well as blocking evacuation routes, increasing the time required to perform these duties.

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

Both action alternatives are expected to have positive long-term cumulative effects. The proposed treatment to reduce mountain pine beetle mortality combined with fuel treatments would decrease the risk of large scale, high intensity fires as well as decrease fuel loading and continue to keep the forest in desirable conditions. Areas susceptible to beetle kill would also be minimized. Other projects that reduce canopy densities within the cumulative effects area would have similar positive impacts. These projects combined with the treatments proposed in Bugtown would decrease the hazardous fuels much more efficiently for longer periods of time. Fuel treatments would also be far more effective if collaboration occurred between landowners and other cooperators. Several landowners in the area have inquired about State and Private Forestry assistance. Some are implementing or have completed thinning treatments on their land.

With the fuel treatments proposed, fire behavior would be much more manageable, with lower intensity surface fires easily managed by ground crews, thus meeting forest suppression objectives and significantly decreasing the potential for sustained crown fires. The FRCC would improve as fuel composition and vegetation characteristics were returned to more historical type conditions and the risk of losing key ecosystem components decreased. Defensible space would also be increased, providing increased protection for firefighters and the general public and allowing firefighters to work where

they otherwise may not have been able to if no treatment was implemented. The risk of access routes being blocked by fallen trees would also be reduced as a result of decreased beetle caused mortality.

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

WILDLIFE

Wildlife Habitat

The topography in the project area ranges from gently rolling hills to moderately steep slopes and supports mostly contiguous ponderosa pine stands broken by narrow meadows in drainage bottoms. The project area consists primarily of the habitat type, ponderosa pine (*Pinus ponderosa*)/common juniper (*Juniperus communis)*. Very little white spruce (*Picea glauca*)/twinflower (*Linnaea borealis*) woodland habitat type is present, and is confined to more mesic, north aspects. In the southeastern portion of the project area, the habitat type tends to approach ponderosa pine (*Pinus ponderosa*)/western wheatgrass *(Pascopyrum smithii)* as there is more developed grass understory.

There are three small, spring-fed perennial streams, French Creek, Vanderlehr Creek, and a small section of Middle Fork Creek. There are also a few developed springs, primarily for livestock watering . Private land consists of both dry meadow bottomland and pine forest. While they likely provide some value as wildlife habitat, their condition and use is unpredictable and depends on landowner objectives which vary greatly. Subdivided lots (residential-ranchette homes) are increasing.

Grasslands:

There are approximately 262 acres (2 percent) of the Bugtown Project Area classified as meadow, generally located in draw bottoms. Opportunities are limited to expand these meadow sites since the area is primarily ponderosa pine forest. Over the past two decades, approximately 47 acres of meadow restoration have occurred within the Bugtown area. No additional acres are planned with this project. Livestock grazing is permitted on these meadows. Wildlife utilization of meadow habitat is not expected to change and no increase in total meadow acres is likely as a result of any alternative proposed with this project. Between 1995 and 2002 there has been a +7.5 percent change in forest-wide grassland acres reported (USDA Forest Service, 2004).

Aspen

There are 28 RIS sites (273 acres) typed as aspen in the project area. The condition of these aspen clones range from habitat structural stage (SS) 1 to SS4B. This acreage does not include the small aspen clones (less than 2 acres) that are not large enough to be

managed as separate sites, but instead are managed as aspen inclusions within the larger ponderosa pine sites. There are an estimated 150 to 200 acres of small aspen clones within pine sites, primarily in the northern half of the project area.

Over the past two decades, aspen clones within the Bugtown project area have received treatment to release and regenerate aspen. No additional aspen treatments are proposed or are believed necessary for the foreseeable future. Between 1995 and 2002 there has been a +5.5 percent change in RMRIS *hardwood* acres reported, forest-wide (USDA Forest Service, 2004).

Wildlife that utilize aspen would benefit from any alternative because each alternative is expected to reduce ponderosa pine stems which would improve growing conditions for aspen. Alternative 1 would achieve this through mountain pine beetle caused mortality. The potential for increases in aspen acreage would be greatest under this alternative, although openings in the pine canopy would be random. The potential for large-scale wildfire is also highest under Alternative 1. Stand replacing wildfire could increase aspen in the project area. The action alternatives would reduce ponderosa pine mainly through commercial thinning treatments. Residual pines would be more evenly spaced with the action alternatives. No specific aspen release or regeneration projects are proposed. Alternative 2 proposes the most acres of thinning and therefore, would have a greater potential to increase aspen acreages than Alternative 3.

White Spruce

The White Spruce forest type is limited to 66 acres within the project area. The larger site (58 acres) is located along French creek in the southeastern portion of the project area. A second site (8 acres) occurs in the northeast portion of the project area. Spruce is not susceptible to mountain pine beetles. No treatment is proposed within spruce stands. Therefore, none of the alternatives would impact spruce habitat within the project area.

Ponderosa Pine

Ponderosa pine is the dominant cover type in the project area, covering approximately 12,777 acres (96 percent). Pine stands contain various age structures and canopy densities but are for the most part considered mature (greater than 9 inches dbh) with moderate to dense canopy closure (greater than 40 percent). Ponderosa pine is the only mountain pine beetle host in the project area. Proposed alternative treatments occur within pine stands or to pine trees within aspen stands. Therefore, the analysis presented in this section pertains to impacts resulting from changes in ponderosa pine habitat whether by mountain pine beetle or active management.

Existing Habitat Structural Stage Conditions

Habitat structural stage codes are used to describe the size class, diameter range, and crown cover percentage of timber stands. Table 3.21 displays definitions for each habitat structural stage.

Table 3.21: Habitat Structural Stage Definitions

Code	Structure	Tree Size	Diameter Range	Crown Cover %
1	grass-forb	nonstocked		0-10
2	shrub/seedling	established	less than 1 inch	11-100
3A	sapling-pole	small, medium	trees mostly 1-9	11-40
3B	sapling-pole	small, medium	trees mostly 1-9	41-70
3C	sapling-pole	small, medium	trees mostly 1-9	71-100
4A	mature	large, very large	trees mostly 9 inches and larger	11-40
4B	mature	large, very large	trees mostly 9 inches and larger	41-70
4C	mature	large, very large	trees mostly 9 inches and larger	71-100
5	old growth	large, very large	varies	

Habitat Structural stage information for the project area was determined using stand exam information which was field verified and revised based on field review. The acreages shown pertain to whole sites only. Inclusions of the various types may occur within other stands. Table 3.22 displays the existing structural stage condition for each cover type.

Table 3.22: Existing Structural Stages by Cover Type

Structural Stage	Ponderosa Pine	Spruce	Aspen	SS Totals
1	100		37	137
2	14		41	55
3A	61		36	97
3B	1428		88	1516
3C	370		3	373
4A	2070	8	55	2134
4B	7330	58	13	7401
4C	1403			1403
5	0	0	0	0
Total	12,777	66	273	13,116

ALTERNATIVE 1 – NO ACTION

Under this alternative, no vegetative management activities would occur at this time. Often the No Action Alternative assumes a static condition which remains unchanged. However, in this case, the No Action Alternative is expected to result in substantial changes to the existing forest condition within 5 years. Mountain pine beetle is expected to cause widespread pine tree mortality. The project entomologist has developed guidelines for predicting habitat structural stage changes in the Bugtown Gulch area over the next 5 years if no action is taken to reduce the mountain pine beetle threat.

It is predicted that mountain pine beetle populations will continue to increase dramatically resulting in larger areas of dead pine trees. Tree mortality is expected to be slow in some areas, rapid in others, creating a 'patchy' stand structure. The more dense stands would be likely to suffer the most in mortality. Table 3.23 displays expected structural stages by cover type that may occur within the project area within 5 years.

Table 3.23: Predicted Structural Stages – Alternative 1

Structural Stage	Ponderosa Pine	Spruce	Aspen	SS Totals
1	5126	0	37	5163
2	14	0	41	55
3A	960	0	36	996
3B	225	0	88	313
3C	225	0	3	228
4A	6157	8	55	6220
4B	0	58	13	71
4C	70	0		70
5	0	0		0
Total	12,777	66	273	13,116

ALTERNATIVE 2 – PROPOSED ACTION

This alternative was designed to reduce the potential for widespread beetle caused mortality and the potential for large scale, high intensity wildfire. The project focuses on removing beetle-infested trees (sanitation), and aggressive thinning to reduce the chances of a major insect infestation and reducing risk of high intensity wildfire in the foreseeable future. Fuel treatments adjacent to private land and salvage of dead timber would also be prescribed to reduce ground fuel loading. The expected habitat structural stages resulting from this alternative are shown in Table 3.24.

Table 3.24: Predicted Structural Stages – Alternative 2

Structural Stage	Ponderosa Pine	Spruce	Aspen	SS Totals
1	100		37	137
2	14		41	55
3A	1604		36	1640
3B	216		88	304
3C	40		3	43
4A	8046	8	55	8109
4B	2433	58	13	2504
4C	324			324
5	0			0
Total	12,777	66	273	13,116

ALTERNATIVE 3

This alternative would defer action in selected stands within MA (management area) 5.1 and all stands within MA 5.4. The objective is to provide more vegetative structural diversity within MA 5.1 and to avoid changes to big game habitat effectiveness as a result of treatments in MA 5.4. Deferred stands within MA 5.1 are those with a habitat structural stage 3B or 3C because these young, smaller diameter stands are considered less susceptible to mountain pine beetle. These stands would be available as dense areas and provide that habitat component. However, they would continue to be at a high risk for mountain pine beetle susceptibility. The mature class SS4 sites would be treated as in Alternative 2 and fuel reduction treatments would not change. Table 3.25 displays expected structural stages.

Table 3.25: Predicted Structural Stages – Alternative 3

Structural Stage	Ponderosa Pine	Spruce	Aspen	SS Totals
1	100		37	137
2	14		41	55
3A	61		36	97
3B	1445		88	1,543
3C	343		3	346
4A	7357	8	55	7420
4B	3123	58	13	3194
4C	324			324
5	0			0
Total	12,777	66	273	13,116

Late Succession

Direct and Indirect Effects

There is currently no late succession habitat (SS5) within the Bugtown Gulch project area. The 1997 Forest Plan designated 486 acres of the forested land-base located within the Bugtown project area to be managed for late succession habitat. The designated sites are in several pieces scattered within the project area. These acres are experiencing various levels of mountain pine beetle related tree mortality at this time and none are in a late succession condition. The more dense stands have experienced heavy beetle caused mortality. In the winter and spring of 2004/2005, approximately 251 acres (51 percent) of these stands designated for late succession management were thinned and sanitized (Bear and Elliot timber sales) in an effort to suppress heavy beetle infestations. Table 3.26 displays current structural stages of stands designated for late succession management. Refer to Map 15 in Appendix A to view existing and proposed stands for late succession management.

Table 3.26: Structural Stages within Stands Currently Designated for Late Succession Management

Structural Stage	Acres
4A	251
4C	235

The HFRA (Healthy Forest Restoration Act) contains provisions related to old growth stands when implementing covered projects in Section 102 (e)(2). This project is an "Authorized project" under section 102 (a)(4) of the HFRA. Section 102(e)(1)(B) of HFRA defines 'covered project' for subsections (e) and (f). It excludes authorized projects under section 102 (a)(4). Therefore, this provision does not apply to this project. Furthermore, there are no stands in the project area which are in an old growth (structural stage 5) condition.

ALTERNATIVE 1 – NO ACTION

The No Action Alternative would not exchange stands currently designated for late succession management with better quality stands. It is predicted that within 5 years much of the dense stands designated for late succession management would experience heavy mortality and dramatically changed conditions. There would likely be an abundance of large diameter snags and large down woody material. The lack of prevention and suppression activity in areas surrounding the designated stands, would contribute to the potential for a very high level of mortality to occur. There may be some patches of pine SS4B and SS4C that escape from heavy beetle caused mortality. However, the potential for large scale, high intensity wildfire would be the highest of all alternatives and could impact these stands.

ALTERNATIVE 2 – PROPOSED ACTION

This alternative would exchange the recently treated 251 acres of stands designated for late succession management with 259 acres located in the French Creek area Refer to Map 15 in Appendix A. As a result, the total acres managed for late succession habitat would be increased by 8 acres and would occur in a more contiguous management block. A total of 494 acres would be designated for late succession habitat management. These particular acres are experiencing a relatively low level of mortality as compared with other dense stands in the project area.

Table 3.27: Structural Stages of Stands Proposed for Late Succession Management

Structural Stage	Acres
3B	25
4A	49
4B	185
4C	235

Sanitation of trees infested with mountain pine beetles would occur in stands designated for late succession management which are not part of the protected goshawk nest habitat. No thinning of non-infested trees or salvage of dead trees would occur. The intent of sanitation is to remove beetles from the area, thereby reducing the potential for heavy mortality in these stands. No snags over 18 inches dbh would be cut (see design criteria in Appendix B).

Sanitation and thinning done as suppression and prevention measures in the surrounding area would result in the greatest potential for these designated stands to survive the current beetle epidemic in the project area. Individual dead trees would likely increase, but not to the extent expected in Alternative 1. Wildlife that prefer large diameter green trees, larger diameter snags, and large down woody material (e.g. brown creeper, fringed myotis, goshawk) would benefit more from the proposed actions that suppress extensive beetle mortality in this area and the work to retain large diameter green trees.

ALTERNATIVE 3

Alternative 3 proposes the same exchange of stands designated for late succession management as in Alternative 2. Management activities would also be the same as in Alternative 2. The difference between these alternatives in respect to stands designated for late succession management is that there would be less preventative thinning occurring in the surrounding area under Alternative 3. This lack of treatment would result in a slightly elevated risk of loss in the designated stands, as compared to Alternative 2.

Cumulative Effects

The cumulative effects area considered includes the project area and activities which have occurred in the last 10 years and 10 years into the future. Impacts to stands designated for late succession management generally occur as a direct result of management activity, wildfire or insect infestations, and disease. Stands were designated for late successional management in the 1997 Forest Plan. The current mountain pine beetle epidemic in the Bugtown Gulch area will likely run its course within 10 years. The cumulative effects analysis considered past, present and future activities summarized in Appendix E.

There would be no direct or indirect to late succession habitat. Therefore, no cumulative effects to late succession habitat would occur with implementation of any alternative. A portion of the stands currently designated for late succession management have been impacted by beetle infestation and management activities to address that infestation. Large trees within these stands have been killed and stand density has been reduced. The potential late successional quality of these stands has been diminished. Under the No Action Alternative, there would be impacts to stands with potential late succession characteristics as beetle population's increase within these stands and within the project area. The resulting mortality is expected to be of a magnitude that would delay development of late successional structure for decades.

The action alternatives would designate better quality stands for late succession management. In addition, action alternatives would implement actions to suppress existing infestations and prevent further infestations within the project area. Therefore, the potential for stands to develop late successional character would be improved.

Grass/Forb Structural Stage

Direct and Indirect Effects

The Forest Plan directs that at least 5 percent of timber harvest project areas should be in a SS1 condition. Currently, 100 acres of ponderosa pine stands in the project area are classified in a grass/forb condition (SS1). In addition, there are an estimated 600 acres of small forest openings within timber stands. In total there are approximately 700 acres (5.5 percent) of SS 1 in the project area. Most of these openings were created from log landings, slash disposal sites, and temporary road corridors from past timber harvesting. In addition, recent bug killed trees have also created small forest openings. These small forest openings provide important habitat for wildlife.

All alternatives would increase the amount of grass/forb structural stages within the project area. The No Action Alternative would be expected to result in the biggest increase as a consequence of increasing beetle populations. Alternatives 2 and 3 would be expected to have some openings created by beetles as well as small openings created for log landings. All alternatives would meet Forest Plan direction.

Cumulative Effects

No adverse cumulative effects to grass/forb habitat would occur under any alternative.

Snags

Forestwide snag densities have been monitored. The 2002 Forest Monitoring Report stated that the Forest-wide snag density goals were met, but that distribution across watersheds was uncertain (USDA Forest Service, 2004). The 2004 Forest Monitoring Report displays data from the *Snag Study II* (Spiering and Knight, 2004). In that study, data from the Hell Canyon Ranger District showed an average snag density of 3.3 per acre for trees between 9 inches to19 inches dbh, but for snags greater than 19 inches, the density was only 0.2 per acre. It was also noted in the monitoring report that there had been some additional tree mortality caused by insect infestation (Forestwide), and the 18,000 acre Red Point Fire incident (Hell Canyon Ranger District) since the *Snag Study II* data was collected (USDA Forest Service, 2005).

Forest Plan direction for snags is contained in Objective 211, Standard 2301, and Standard 2302. This direction identifies particular snag density by watershed. There are eight- 7th order watersheds that are within the Bugtown project area, however three of these together make up less than 1 percent of the project area. These three watershed acres were lumped into the other five watersheds for convenience. One of these five

watersheds (07050101) in primarily located within the Jasper burn area. This large wildfire (+80,000 acres) burned in 2000 and created a snag density that continues to exceed Forest Plan Standard 2301.

Field transect data collected by the Project entomologist in 2004 reports trees killed per acre by mountain pine beetle for the current year and the 2 previous years in various locations throughout the project area. The 2004 field survey revealed approximately 44 trees per acre that had been killed by beetles since 2002. Indications are that beetle populations, and therefore pine mortality, is increasing (refer to Entomology section of this Chapter).

Aerial detection surveys were also completed in 2004. These surveys identified locations of active beetle infestation and estimate numbers of brown-needled trees which had been killed by beetles the previous year (2003). These values range from an average of 1 to 2 trees per acre up to 8 to 25 trees per acre killed in 2003 alone. Map 11 in Appendix A displays the results of the 2004 aerial survey in the Bugtown project area.

Field surveys completed by the project biologist determined that the vast majority of trees killed by beetles are in the 10 to 12 inches diameter range. These areas of beetle caused mortality are in patches on the landscape and vary in size and intensity. There are relatively few snags previous to the beetle infestation and very few snags above 20 inches exist. Where terrain has limited past harvest activity, large diameter snags are more abundant.

The current and increasing mortality caused by this mountain pine beetle epidemic across the project area has contributed greatly to snag density. Based on field survey information, all watersheds within the Bugtown project Area meet or exceed the minimum snag densities as directed by the Forest Plan.

Direct and Indirect Effects

ALTERNATIVE 1 – NO ACTION

Snag density would continue to increase in the short term. Snag densities of 50 to100 trees per acre could be common as the beetle epidemic continues to gain strength. The number of large diameter snags would likely be improved. Snags over 20 inches dbh would continue to be rare as few green trees over 20 inches currently exist. Long term, as these beetle killed trees rot and fall, the lack of live mature trees in these areas will limit future snag recruitment for many decades.

The potential for large scale, high intensity wildfire would continue to increase. Wildfire risk is highest with this alternative. A large wildfire could contribute to increased snag densities in the short term, but would be detrimental to long term snag recruitment potential.

Wildlife that benefit from a high density of snags (woodpeckers, bats), forage on wood borer insects (woodpeckers), or utilize down woody material (small mammals, reptiles, deer fawning cover) would be favored in the short term under this alternative.

ALTERNATIVE 2 – PROPOSED ACTION

This alternative would directly affect the most acres Therefore, the potential for removal of existing snags is the greatest of the alternatives. Sanitation would remove actively infested green trees thereby removing developing snags and salvage treatments up to 250 acres would remove dead trees. No snags over 18 inches would be cut. Salvage harvest s would be required to retain at least 4 of the largest snags per acre. Timber harvest operations remove snags which present a safety hazard to forest workers. Preventative thinning would decrease the potential for new snag creation by mountain pine beetles or wildfire in the short term, as compared to the No Action Alternative. Residual trees following thinning are less likely to be infested and will grow into larger diameter trees. Providing for large diameter snag recruitment in the future. Fuels treatments will reduce the potential for large scale high intensity wildfire.

It is expected that the post-treatment snag density would continue to meet Forest Plan direction across the watersheds. Habitat for snag dependant wildlife (woodpeckers, bats, small mammals, etc.) would continue to be provided. Longevity of the current crop of bark beetle killed trees is expected to be 5 to 10 years as these insect killed trees rot and fall. This alternative is most likely to retain green trees which will grow larger in diameter over time and provide for replacement snags, into the future by reducing the potential for widespread beetle mortality and large scale, high intensity wildfire.

ALTERNATIVE 3

This alternative commercially thins approximately 2,233 less acres than Alternative 2. This would result in less potential for existing snag loss in these areas due to hazard tree removal, as compared to Alternative 2. In addition, there would be 404 acres less of sanitation treatments. As in Alternative 2, no snags over 18 inches would be cut. The potential for beetle caused mortality and large-scale wildfire is higher in this alternative than alternative 2. Therefore, short term snag density would likely be greater than alternative 2 and less than alternative 1. However, the potential for green trees to persist and become snags in the future is somewhat less than alternative 2 and much greater than alternative 1. It is expected that the post-treatment snag density would continue to meet Forest Plan direction, short term, across the watersheds.

Cumulative Effects

The cumulative effects area analyzed for snags is the 7th order watersheds and includes private lands (see Map 13 in Appendix A). The cumulative effects analysis considered past, present and future activities summarized in Appendix E. Activities from the previous 20 years to 10 years into the future have been considered. Current activities that reduce snags include a District policy that allows snags to be cut for firewood in the northern portion of the project area. This firewood policy has been in place since January 3, 2005 and is due to expire December 31, 2005. Past activities that affected snag density included timber harvest, fire/fuels reduction projects, and firewood cutting. These activities had a negative effect on snag density. Also, timbered Private lands in and around the project area have been harvested or thinned and ocular estimates found that

these areas could not be counted on to supply snag habitat, even though some snags were usually observed and did provide some snag habitat opportunities.

Snag density has changed dramatically in these watersheds with the recent beetle mortality. Areas with snag densities exceeding 10 snags per acre are not uncommon in areas with active beetle mortality. Forest Plan Standard 2301 is now expected to be met or exceeded for the foreseeable future, at the watershed scale. Therefore, adverse cumulative effects to snag dependant wildlife are not anticipated. Long term snag density and snag replacement trees are addressed in Action Alternatives 2 and 3 by project design (see Appendix B). As long as mature green trees are available across the watershed, the potential is there for future snags that are available to the wildlife species that depend on them. Fire, insects, lightening, and other causes would continue to provide standing dead trees. There are expected to be many areas within the watersheds associated with the Bugtown project that will provide a per acre snag density that far exceeds FP Standard 2301, addressing concerns for wildlife species which depend on snags.

Downed Woody Material

Down woody material provides both cover habitat (nesting/denning/loafing sites) and foraging habitat for a variety of wildlife species. Down woody material in the project area was evaluated by ocular estimates. Pockets of blowdown trees were common where there had been past insect mortality, and these are scattered throughout the project area. Slash from past logging activities is still present in some areas. Frequent storms that cause trees to blow-down or break-off also provide down woody material. Fuel treatments in some areas have removed basically all large ground fuels. The project area currently meets Forest Plan Guideline 2307 and Standard 2308.

Direct and Indirect Effects

ALTERNATIVE 1 - NO ACTION

This alternative would provide the largest amount of down woody material per acre. As beetle killed trees rotted and fell, they would contribute down woody debris to the forest floor. This alternative would be the most beneficial for wildlife species that have a particular association with the attributes provided by down woody material. Wildfire risk would also increase with this alternative and this could affect snags and down woody material if fire were to consume them. The project area currently meets Forest Plan Guideline 2307 and Standard 2308.

ALTERNATIVE 2 – PROPOSED ACTION

Depending on method and equipment used to treat pine vegetation and the follow-up fuels projects, the treatment areas could see a reduction in existing amounts of down woody material, and a loss of future opportunity to provide for this component, post treatment. The project design is proposed to ensure continued down woody material on

treated acres (see Appendix B). The project area is expected to continue to meet Forest Plan Guideline 2307 and Standard 2308.

ALTERNATIVE 3
This Alternative would have less impact to any existing down woody material and would be expected to also increase recruitment of down woody material. The project design is included with this alternative as well. The project area would continue to meet Forest Plan Guideline 2307 and Standard 2308.

Cumulative Effects

Past forest practices have generally maintained sufficient down wood to meet Forest Plan Objective 212. The cumulative effects analysis considered past, present and future activities from 10 years past to 10 year into the future as summarized in Appendix E. Current direction to reduce fuel loadings in order to reduce risk of wildfire may limit meeting this objective in areas adjacent to private land. The project design is expected to provide sufficient material (post activities) to meet Standard 2308 on acres treated for mountain pine beetle risk, and follow the intent of Objective 212. This would provide for wildlife needs for this rotation and the foreseeable future. Therefore, no adverse cumulative effects are expected.

Riparian/Instream Fisheries Habitat

There are three perennial streams within or adjacent to the Bugtown Project Area. They are: upper French Creek, Middle Fork of French Creek, and Vanderlehr Creek (see map 18 in Appendix A). Upper French Creek has approximately 2.5 miles flow through the project area. Private lands are both upstream and down stream of this section. Fish species found by SDGF&P (South Dakota Game Fish & Parks) surveys in 1994 (site #12) along upper French Creek within the Bugtown project area were creek chub, fathead minnow, and white sucker. Middle Fork has approximately 0.4 mile flows through the project area. Private lands are both upstream and down stream of this section. This section lacks a distinct and defined stream channel and does not provide fish habitat. The willows in this section are in poor condition; some are protected from browsing/grazing by fencing. Vanderlehr Creek has approximately 1.5 miles flow through the project area. Private lands are both upstream and down stream of this section. Spruce trees line this shallow, narrow creek section.

Direct and Indirect Effects

ALTERNATIVE 1 – NO ACTION

This alternative would defer all proposed treatments. It is possible that loss of trees to beetle caused mortality for large areas could provide additional water flow to springs and creeks. However, with large areas of beetle killed trees comes an increased risk of wildfire. If a large wildfire did occur, it would create large amounts of ash that would likely wash into the streams which could then take years to flush through the system.

ALTERNATIVES 2 AND 3

These alternatives are presented together because their effects are expected to be essentially they same. Forest Plan standards and guidelines limit activity within riparian areas and address concerns regarding sedimentation and stream bank disturbance. Both alternatives would reduce the potential for large-scale high intensity wildfire and therefore the potential for large amounts of ash to be deposited. No activities are proposed that are likely to adversely affect riparian habitats.

Additional analysis of the environmental consequences to riparian and instream fisheries habitat is disclosed in the Watershed, Geology and Soils section of the Chapter.

Cumulative Effects

All three of these riparian areas are grazed seasonally by livestock. All areas are shallow, slow moving streams. No project impacts are expected on riparian/fisheries habitat as a result of proposed activities. Therefore the project would not contribute a cumulative negative effect to these habitats. The reduction of ponderosa pine density from beetles or vegetation treatment may produce additional water that could increase stream flow. Private lands are not expected to be managed differently for the foreseeable future. Some additional residential development could occur on the private land in-holdings. These actions are not expected to produce adverse cumulative effects that would significantly change the existing condition for riparian associated species.

Forest Fragmentation and Edge Habitat

There is a concern that fragmentation of wildlife habitat will result in species becoming imperiled through isolation of individuals of the same species or result in increased susceptibility to predation. This has occurred in some parts of the United States where large areas of natural habitat have been converted to agricultural lands or urban areas. The forests of the Black Hills have evolved under a heavy influence of fire, insect, and disease activity (Parrish, et al. 1996). That evolution, combined with the variation in terrain, aspect, and geology has resulted in forests with a wide variety of vegetative structure and composition, varying densities, and an abundant forest/meadow edge.

While vegetation treatment (timber harvest) changes patch size and vegetation structure, this is not the type nor degree of fragmentation that is likely to result in a loss of species viability. This type of fragmentation more closely resembles the pattern of natural variability found in many western forests. There have been no species identified in the Black Hills for which there is agreement that habitat fragmentation is considered a threat. The FEIS for the Black Hills National Forest, Forest Plan discusses fragmentation and Edge on pages III-247 through III-275.

Federally Listed Threatened, Endangered, Proposed (T&E) and Rocky Mountain Region (R2) Sensitive Species

A Biological Assessment/Biological Evaluation (BA/BE) has been completed for the Bugtown Gulch Mountain Pine Beetle and Fuels project. The complete (BA/BE) is available in the project file. A summary of the BA/BE is contained in Appendix D.

According to the U.S. Fish and Wildlife Service website (southdakotafieldoffice.fws.gov), the bald eagle (threatened) and the black-footed ferret (endangered) are federally listed species for which potentially suitable habitat may occur in the Bugtown Gulch project area. There is no suitable habitat for the black-footed ferret, but the bald eagle occurs as a winter migrant. A determination of "No Effect" was made for the bald eagle and black-footed ferret for all alternatives in the Bugtown Gulch project area.

Region 2 sensitive wildlife species which may occur in the project area include fringed myotis, Townsend's big-eared bat, northern goshawk, American marten, flammulated owl, Lewis' woodpecker, black-backed woodpecker, American three-toed woodpecker, northern leopard frog, Black Hills red-bellied snake, Cooper's Mountain snail, and Regal Fritillary butterfly.

All alternatives would have a 'No Impact' determination for the three fish species (mountain sucker, lake chub, and finescale dace). The determination for all other Region 2 sensitive wildlife species is "May impact individuals, but is not likely to result in a loss of viability in the planning area, nor cause a trend toward Federal listing." All locations of Region 2 sensitive species will be protected through implementation of Forest Plan standards and guidelines and project design (see Appendix B).

Several of these TES species are also management indicator species under the Black Hills National Forest, Forest Plan, as amended. These dual category species are Bald eagle, fringed myotis, Townsend's big eared bat, American marten, northern goshawk, black-backed woodpecker, American three-toed woodpecker, Cooper's Mountain snail, and Regal Fritillary butterfly. These species are discussed in the Management Indicator Species section which follows. Additional information on these species can be found in the BA/BE.

Management Indicator Species

Management Indicator Species (MIS) or their habitats are representative of a variety of habitats and can indicate overall changes in the forest ecosystem. MIS identified in the Forest Plan (pages II-41 to II-42) include threatened, endangered, or sensitive species, all of which have been addressed in the BA/BE, as well as species of special interest. A listing of MIS species, their habitat description, whether or not they were analyzed in detail and rationale supporting that is presented in Table 3.28 below. The table also notes whether these species are TES or species of special interest.

Table 3.28: MIS list and rationale for project-level analysis.

Species	Analyzed in Detail	Rationale	Habitat Description
Bald eagle=T (*Haliaeetus leucocephalus*)	YES	This species is a winter resident in the Black Hills; there is no critical habitat in the Black Hills or in the Bugtown Project Area. All alternatives would continue to provide perching habitat.	Winter resident in the Black Hills and spring/fall migrant. Usually found near unfrozen water or carrion in winter (Tallman et al. 2002).
Fringed myotis=S (*Myotis thysanodes*)	YES	Species will roost in snags and snag habitat is present in the project area.	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 2003a).
Townsend's big-eared bat=S (*Corynorhinus townsendii)*	YES	This particular bat species needs caves, mines or significant rocky outcrops for roosting	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 2003b).
American marten=S (*Martes americana*)	YES	Spruce is present in two stands. Habitat limited and isolated. Track surveys failed to detect marten.	Spruce forests with complex near-ground structure, extending into adjacent ponderosa pine stands (Buskirk 2002).
Northern goshawk=S (*Accipiter gentilis)*	YES	Historic nest, visual sightings in project area. Areas of suitable nesting habitat likely.	Forages in a variety of forested areas and small openings; nests primarily in dense mature conifer forests (Erickson 1987).
Black-backed woodpecker=S (*Picoides arcticus*)	YES	Suitable habitat is present due to increases in bark beetle population and snags. Species observed during surveys.	Burned areas with a high density of pre-burn snags; dense and/or mature forests with a high snag density (Anderson 2002, Panjabi 2003).
American three-toed woodpecker=S (*Picoides dorsalis*)	YES	There are a limited number of mature spruce stands present. This species was not observed during project surveys.	Mature spruce forests, burned areas (Panjabi 2003).
Lake chub=S (*Couesius plumbeus*)	NO	Species not present (SDGFP surveys). Habitat not available. Limited perennial streams, no lakes or rivers in the project area. Project would have no affect on species or habitat.	Streams or lakes with clear, cool water and clean cobble/gravel substrate , only found in Deerfield reservoir. (Isaak et al. 2003).
Finescale dace=S (*Phoxinus neogaeus*)	NO	Species not present (SDGFP surveys). Habitat not available. Limited perennial streams, no lakes or rivers in the project area. Project would have no affect on species or habitat.	Small lakes and cool, boggy environments associated with springs or beaver dams (Isaak et al. 2003). Limited to the Redwater drainage and no occurrence are documented on the SD portion of the forest.

Species	Analyzed in Detail	Rationale	Habitat Description
Mountain sucker=S (*Catostomus platyrhynchus*)	NO	Species not present (SDGFP surveys). Habitat not available due to impassible barriers on French Creek (Stockade Lake dam, West dam). Limited perennial streams, no lakes or rivers in the project area. Project would have no affect on species or habitat.	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).
Osprey (*Pandion haliatus*)	NO	There are no lakes, or rivers within the project area. Species or habitat not affected by project.	Usually located near water, especially close to lakes and rivers with good supplies of fish (DeGraaf et al. 1991).
Mule deer=SI (*Odocoileus hemionus*)	NO	The project area is considered annual range for white-tailed deer. The Bugtown area is not considered mule deer habitat. No mule deer were observed in or adjacent to the project area and the proposed project would not reduce mule deer habitat.	Widely distributed species that uses a number of different habitat types: grasslands, semiarid deserts, mountain foothills, shrublands and forested areas (Higgens et al. 2000).
White-tailed deer=SI (*Odocoileus virginianus*)	YES	The project area is considered summer and winter range. The species was observed numerous times during winter fieldwork.	Very adaptable species that can live in almost any habitat. In South Dakota, this includes grasslands, wetlands and woodlands (Higgens et al. 2000).
Elk=SI (*Cervus elaphus*)	YES	The area is considered annual range. Elk were observed in small groups during winter surveys.	Found in a variety of habitats such as coniferous forests, meadows, and forest edge (Higgens et al. 2000).
Mountain goat=SI (*Oreamnos americanus*)	NO	Species not present within project area. The project area lacks preferred habitat. The proposed project would not impact this species or preferred habitat.	Inhabits rugged terrain such as steep cliffs and rocky outcrops (Higgens et al. 2000). In the Black Hills, primary range basically consists of the rugged terrain around Harney Peak, the Needles and Mount Rushmore (Richardson 1971).
Cougar=SI (mountain lion) (*Felis concolor*)	YES	Cougars are likely present in the project area.	Prefer remote, undisturbed areas with good cover and prey (Higgens et al. 2000).
Merriam's turkey=SI (*Meleagris gallepavo merriami*)	YES	Desirable habitat is located throughout the project area. Turkeys were observed during winter fieldwork.	In the Black Hills, turkeys use a variety of habitats. Winter habitat consists primarily of ponderosa pine with >70% canopy cover, while open stands of ponderosa pine with sufficient ground vegetation provide good summer habitat (Rumble and Anderson 1993).

Species	Analyzed in Detail	Rationale	Habitat Description
Pygmy nuthatch=SI (*Sitta pygmaea*)	YES	Marginal habitat is present throughout the project area.	This primary cavity nester is generally associated with large snags and prefers open, park-like forest, especially among ponderosa pines in the lower coniferous zone (i.e., ≤5,500 ft, Tallman et al. 2002).
Brown creeper=SI (*Certhia americana*)	YES	Dense mature pine stands are available. Observations were made during project level surveys.	In the Black Hills, white spruce and late successional pine appears to be the most important habitat type for this species (Panjabi 2001, 2003).
Brook trout=SI (*Salvelinus fontinalis*)	NO	Species not present (SDGFP surveys). Limited perennial streams, no lakes or rivers in the project area. Project would have no affect on species or habitat.	Clear cool well-oxygenated creeks, small to medium rivers, and lakes. May move from streams into lakes or sea to avoid high temperatures in summer (NatureServe 2003).
Brown trout=SI (*Salmo trutta*)	NO	Species not present (SDGFP surveys). Limited perennial streams, no lakes or rivers in the project area. Project would have no affect on species or habitat.	Mostly in cold, medium to high gradient streams, but lake and sea-run populations also exist (NatureServe 2003).
Cooper's mountain snail=S (*Oreohelix strigosa cooperi*)	NO	Frest (2002) snail survey sites within project area did not detect species. Additional surveys in limestone areas also failed to detect any *Oreohelix* species. Species presence not suspected, therefore project would have no affect on species or habitat.	Lowland wooded or riparian areas on limestone soils (Frest and Johannes 2002).
Cockerell's striate disc= SI (*Discuss shimeki*)	NO	Frest (2002) snail survey sites within project area did not detect species. Limited habitat potential in project area and species presence not suspected, therefore project would have no affect on species or habitat.	Generally associated with shaded north-facing slopes along stream floodplains. Can be locally abundant in spruce sites (Frest and Johannes 2002).
Regal fritillary butterfly=S (*Speyeria idalia*)	NO	The meadow habitat is dry and more typical of montane grassland; it lacks the structure and moisture gradient desired by this species. Species not suspected to be present. No records document this species in this vicinity. Project would not affect species or habitat.	Tallgrass prairie and extensive grasslands with violets (Royer and Marrone 1992).

T=Threatened, S=Sensitive, SI=Special Interest

MIS selection for the Bugtown Project followed direction outlined in 36 CFR 219.19 (a)(1)- "their population changes are believed to indicate the effects of management activities." The role of MIS in project level analysis is established in FSM 2634.1. Monitoring population changes of MIS is accomplished through coordinated efforts involving US Forest Service biologists, research, contracted monitoring surveys and State agencies. Forest monitoring of land bird species is accomplished currently by contract with the Rocky Mountain Bird Observatory (RMBO). Game species (e.g., white-tailed

deer, turkey, elk, brook and brown trout) are monitored by a SDGFP biologists and harvest data. The Black Hills National Forest Monitoring Reports (2001-2004) summarizes the best available population/habitat information from available sources.

Bald eagle (Threatened, MIS)

The bald eagle is monitored annually across the Black Hills National Forest following an established protocol (i.e., road transects) and coordinated with USFWS efforts. The population trend nationally for bald eagles is upward as evidenced by the proposal (64 FR 36453) to remove the species from the Endangered Species List. South Dakota trends are based on mid-winter surveys (SDGFP 2004b). The 2004 BHNF Monitoring and Evaluation Report states that bald eagle observations in 2004 were 25 percent higher when compared to the five year average (USDA, Forest Service, 2005). South Dakota trends are based on mid-winter surveys (SDGFP 2004b). The Bugtown project would have a neutral effect on the bald eagle population and habitat trends as all alternatives would continue to provide perch sites, and prey availability (carrion) would be independent of all alternatives.

No influence to Forest-wide population or habitat trends or attainment of Objective 221 would occur as a result of this project.

Fringed Myotis (MIS, R2SS)

This species is known to occur during some period of the year within the vicinity of the Bugtown Project Area. This bat will utilize caves and abandoned mines as hibernation roost sites. Individuals may also roost in crevices of rock outcrops. All of these features are present in the project area; however, they have not been surveyed for bat use. The fringed myotis is also known to use cavities in snags as maternity or daytime roost sites. Occasionally, man-made structures have also been used for day/night roosting needs. Keinath (2004) considers late succession forest stands to be preferred habitat for this species as these areas generally contain old trees, higher snag densities, large diameter trees, and some stand structure/composition variability to promote prey abundance. There are no stands in a late succession condition in the project area. These species feed mainly on small moths high in the forest canopy and on or near the ground near thick vegetation.

The Bugtown project area is approximately 1% of the total Forest and the fringed myotis is detected during summer mist-net surveys at many locations across the planning area (Tigner and Stukel, 2003). Protection efforts (gating caves and mines) of known winter roost sites in the planning area have occurred and will continue (USDA, Forest Service 2005). The Phase I Amendment to the BHNF Management Plan has evaluated this species and concluded that proposed project level effects are not expected to affect population viability on the planning area when Standards and Guidelines are followed (BHNF, Phase I Amendment, 2001).

ALTERNATIVE 1 – NO ACTION

Mature tree mortality would likely increase, expanding open forest conditions (SS1) and providing many additional snags. No direct impact to existing caves would be expected.

Some changes to micro-site condition around existing roosts could occur as a result of green pine tree vegetation loss due to bark beetle mortality. This stand structure change would be expected to affect the stands designated for late succession management as well. The risk of large wildfires would increase with this alternative, the effect of which is largely unknown but suspected to be neutral to somewhat negative as there would be less habitat structural diversity. Development of late successional conditions in the project area would be delayed for many decades.

ALTERNATIVES 2 AND 3

The potential effects of the two action alternatives would be expected to be very similar and therefore are presented together for this species. Negative effects of the action alternatives could be loss of snags from vegetative and fuels management activities. Project design and the amount of beetle killed trees would ensure that ample snags would be provided across the project area, now and into the future (see Appendix B). The proposed thinning will increase the potential for large diameter green trees to develop and become large diameter snags in the future. While thinning will remove some mature trees, the largest trees available in each site would be retained. These alternatives are expected to improve chances of maintaining a green pine canopy over most of the project area (SS4A), for the foreseeable future. The project design would protect known caves and snags that may provide roost habitat. Proposed treatments would not likely adversely affect roosting bats in these caves. The open forest condition is expected to improve conditions for aspen, grasses/forbs, and shrubs which would increase understory diversity and could improve the habitat for insects (prey). Since foraging behavior of this species in the Black Hills is dependant on insect availability, it is unclear if the proposed actions would help or hinder foraging strategy of this species.

Monitoring protocol has been developed for bats, including the fringed myotis (USDA Forest Service 2003b, 2004c). Forest-wide monitoring indicates population trend of the fringed myotis cannot be determined due to lack of quantitative data (USDA Forest Service 2004c). The substantial protection of known hibernacula provided in 2003 reflects an upward trend in known bat habitat (USDA Forest Service, 2004d). Project design conserves habitat for this species. The recent efforts to protect known roost sites Forest-wide appear to reflect an upward trend in habitat and demonstrate active management to successfully accomplish the intent of *Objective 221*. There is no evidence to suggest that the Bugtown project as designed would affect population viability, nor contribute to a downward trend in the Forest-wide fringed Myotis population or habitat for the foreseeable future.

Townsend's big-eared bat (MIS, R2SS)

This species is known to occur during some period of the year within the vicinity of the Bugtown Project Area. Townsend's big-eared bat feeds mainly on small moths high in the forest canopy. This species mainly utilizes caves for roost habitat. Several caves are known to occur in the project area, however they have not been surveyed for bat use. This

species will also occasionally use manmade structures that are free from disturbance as day/night, or maternity roosts.

Monitoring for this species occurs at selected caves and mines (hibernacula) and report generally stable populations for Townsend's big-eared bat (USDA Forest Service, 2004). The *Phase I Amendment* to the BHNF Management Plan has evaluated this species and concluded that proposed project level effects are not expected to affect population viability on the planning area when Standards and Guidelines are followed (BHNF, Phase I Amendment, 2001). There are continuing efforts to protect these species through additional cave/mine entrance gating (USDA, Forest Service 2005). Recent efforts to protect known roost sites Forest-wide appear to reflect an upward trend in habitat.

ALTERNATIVE 1 – NO ACTION

No direct impact to existing caves would be expected. Some changes to micro-site condition around existing roosts could occur as a result of green pine tree vegetation loss.

ALTERNATIVES 2 AND 3

Potential effects of the two action alternatives are combined in this effect analysis since the areas deferred from treatment in Alternative 3 are not in proximity to the small cave locations. Effects therefore would be expected to be very similar. No direct adverse effects to this species would be expected following Guideline 1401(a) using the 500 foot buffer around known caves. These alternatives would be expected to improve chances of maintaining a green pine canopy over most of the project area (SS4A). The resulting open forest condition would be expected to indirectly improve conditions for aspen, grasses/forbs, and shrubs which would increase understory diversity and in turn improve the habitat for some insects (prey).

Project design conserves habitat for this species. Recent efforts to protect known roost sites Forest-wide appear to reflect an upward trend in habitat and demonstrate active management to successfully accomplish the intent of *Objective 221*.

These alternatives would not negatively influence the Forest-wide population or habitat trends or influence the attainment of Forest Plan Objective 221 for Townsend's big-eared bat.

American Marten - (MIS, R2SS)

The few spruce sites within the Bugtown project area currently have sufficient down woody material to meet Forest Plan guidelines. These stands have small pockets of "blowdown" in addition to individual trees that have fallen or broken. RIS sites: 030902-20, 030601-26, and portions of site 030905-03 are considered the most suitable marten habitat, (Rank 7 to 9 in the Habitat Relation Model; Fecske, 2003). However, these sites are isolated and relatively small (66 acres are typed as white spruce in RIS). At best these areas might serve marten as connectivity (travel corridor) habitat rather than actually providing suitable (year-round) habitat. This is still unlikely due to the remote location of this habitat in relation to the existing populations of central (Norbeck/Black

Elk Wilderness) and the Northern Hills. Marten surveys were conducted in the limited habitat available in the project area. Track plate boxes were set along French Creek in spruce in late November 2004. They were checked and re-baited weekly until mid-February 2005 when they were retrieved. No marten tracks were recorded. The project area has not been identified as an important connectivity corridor for marten.

Recent research on the Black Hills National Forest indicates that high quality marten habitat consists of mature spruce stands with canopy cover over 50 percent near streams and at elevations higher than 5,200 feet. (Fecske, 2003). Spruce stands that are too small, have little canopy cover, or are located long distances from perennial streams provide low-quality habitat. There appears to be a threshold percentage of high-quality habitat required for American marten presence within a given 10.2 square kilometer area (2,520 acres). Where there is a minimum of 6 percent high quality habitat, there is a 92 percent chance of detection (Fecske and Jenks 2002). The Bugtown project area contains 66 acres of mature spruce and riparian habitat along French Creek and Vanderlehr Creek. If the associated pine/spruce mix along the two creeks were also included, liberal estimates might place total acreage of moderate to high quality marten habitat (Rank 7 to 9) at 50 acres for Vanderlehr Creek and approximately 200 acres for French Creek. This total still places the estimate of potential higher quality marten habitat at less than 1 percent for the 10.2 square kilometer area associated with each creek. In others words, it would be very unlikely that marten are present within the Bugtown project area with anything approaching a regular frequency.

Habitat and population trend for the marten appears stable at this time (USDA Forest Service, 2004). SDGF&P Department biologists will trap a limited number of marten to gain additional information regarding various population parameters.

ALTERNATIVE 1 – NO ACTION

Because this species is not believed to be present in the project area and the fact that a very limited amount of potential habitat is available, very minimal affects to marten would be possible. The mountain pine beetle does not infest spruce trees, the preferred marten habitat. Therefore, as the epidemic progresses, spruce would remain untouched. However, pine trees within spruce stands may be killed and create snags. In pine stands surrounding spruce stands, the resulting large volume of down woody material might benefit marten, but the ‘open’ forest conditions that would be created by wide-spread bark beetle caused tree mortality are typically avoided by marten as they increase chances for predation. A reduction in habitat more favorable to marten migration could occur with this alternative.

ALTERNATIVES 2 AND 3

These alternatives are presented together because they would have similar effects on marten habitat. Habitat capability was determined using the HABCAP model. The results by alternatives are presented in Table 3.29. The values did not change by alternative because no treatments are proposed in spruce habitat type and beetles do not infest spruce.

Table 3.29: Habitat Capability (HCP) for American Marten by Alternative.

Species	Existing Condition HCP	Alt. 1 HCP	Alts. 2 and 3 HCP
American (pine) marten	.005	.005	.005

The lack of high-quality habitat and no confirmed presence suggests that any effects from the action alternatives would be minimal. The action alternatives propose vegetation treatments (pine thinning, sanitation) in areas adjacent to the small spruce sites. Any potential for adverse effects would come from anticipated habitat changes in pine stands and how that may affect marten if one was attempting to travel along the potential connectivity corridor habitat provided by French Creek or Vanderlehr Creek.
This project would not contribute to a loss of occupied marten habitat. White spruce would not be affected. Therefore, this project is not expected to affect the existing Forest-wide marten population or marten habitat trend. While habitat for this species would not be enhanced, existing habitat would be conserved, therefore this project as designed would not be expected to negatively influence the attainment of *FP Objective 221*.

Northern Goshawk (MIS,R2SS)

The Bugtown project area has one known active goshawk nest, in the Sourdough territory. This nest was discovered in 1993 and presumed active that year. It was inactive in 1994. No records were found of survey visits for years 1995 through 2001. This nest has been monitored annually since 2002. It was reported inactive in 2002, active in 2003 and 2004. In 2005, a goshawk has been observed in the nest stand and an alternate nest was discovered within the same stand. District monitoring efforts in the summer of 2005 observed one juvenile goshawk in the nest stand. It is speculated that at least one young fledged from this pair. Goshawk surveys in the remainder of the project area did not detect any additional birds or nests.

Mountain pine beetle activity and subsequent tree mortality in the nest stand was first reported during the 2003 survey and it has been increasing steadily. Recently, firewood cutting of beetle killed trees has occurred within the nest stand, and off-highway vehicle traffic has increased along the snowmobile trail that goes through the nest stand. Both of these activities were occurring during nesting season and created disturbance to this pair.

Forest-wide, in 2003- 74 known territories were monitored with 34% reported as ‘occupied’ the highest occupancy rate since 1999 (58% occupied). The 2003 Monitoring and Evaluation Report states that the goshawk population trend on the planning area appears relatively stable or decreasing due to loss of nests to fire, and the HABCAP (Forest-wide) model indicates goshawk habitat is relatively stable over the five-year reporting period (USDA-Forest Service, 2004).

The Forest Plan provides specific guidance for management of goshawk nesting and post-fledging areas (Standards 3108, 3109 and 3111 and Guidelines 3110 and 3112-3114, all of which are to be treated as standards under the Phase I Forest Plan Amendment). In

addition to the known Sourdough territory in the Bugtown Gulch project area, an additional potential nest and PFA (Post Fledging Areas) area was identified and included in the analysis. The location of this potential territory (French Creek) was based on the availability of suitable nesting habitat and distance from other known territories. In addition, goshawk fly-by observations have been noted in this area. Forest Plan standard 3108 which specifies protective measures for the goshawk regarding pre-project nest surveys and identification and exclusion of nest stands is met by all alternatives.

All action alternatives meet Standard 3109 by maintaining at least 180 acres best suited for nesting habitat in the known Sourdough territory (197 acres) and the potential French Creek territory (190 acres). No treatments are proposed within this nesting habitat in any alternative. The existing structural stages within these protected nest areas are shown in Table 3.30.

Table 3.30: Acres of Habitat Structural Stages in Sourdough and French Creek Protected Nest Habitat

Habitat Structural Stage	Sourdough acres	French Creek acres
4B	107	23
4C	90	167

Forest Plan Guideline 3110 specifies that activities should not reduce the structural and compositional integrity of active and alternative nest stands. Forest Plan Guideline 3112 states that management at goshawk nest sites should be designed to conserve or enhance site conditions. There would be no activities in any nest stand under any alternative. Therefore, both of these Guidelines are met for all alternatives.

Forest Plan Standards 3111 and 3113 relate to minimizing human caused disturbances within nest stands and PFAs during the Spring and Summer months. Project design criteria in Appendix B is included which will address these Standards. Therefore, all alternatives will meet Forest Plan standards 3111 and 3113.

Forest Plan Guideline 3114 directs that silvicultural prescriptions and management activity maintain or strive for a balance of Vegetative Structural Stages (VSS) within PFA's around nesting habitat. PFAs for both the Sourdough (412 acres) and the French Creek (417 acres) nesting habitat have been identified.

Vegetative Structural Stages (VSS) differ from Habitat Structural Stages (SS) which are used for all other wildlife analysis for this project. Acres of VSS in each PFA were determined based on predominant tree diameters and canopy closures in each stand. A single VSS was assigned to each stand. Existing acres of VSS in each PFA is shown in Table 3.31. Currently, these PFAs do not meet the ranges of VSS in Guideline 3114.

There are no stands within the PFAs or nest habitat that qualify as VSS5 or VSS6. However, an estimated 50 acres of VSS5 occurs as inclusions within stands in the protected nest acreage for each. These nest stand areas are closely associated with the PFA's but are not included in the PFA table. The bark beetle mortality that is actively occurring is changing the structure of these stands and pockets of dead trees 1 to 5 acres

in size exist within stands. RIS Sites within the PFA varied between 13 acres to100 acres in size.

Guideline 3114 is based on goshawk research conducted by Reynolds (GTR-RM-217, 1992) and has been supported by Forest Planning efforts as best available science. Guideline 3114 strives for this 'balance of structural stages' to provide 40 to 50 percent of the PFA to be in a mature (14 to 20 inches dbh) to old-forest (20 inches and greater dbh) condition with minimum canopy closure of 50 percent. Recent information (Greenwald, et.al. 2005) has suggested that goshawks selected more habitats in the home range with structural characteristics of mature to old-growth forests, such as large trees and high canopy closure. The review recommended protecting existing mature and old-forest characteristics.

Table 3.31: VSS Table of PFA's by Alternative

PFA #1 (Sourdough)	**Habitat Str. Stages included in VSS class**	**Range % by VSS in Forest Plan Guideline 3114**	**Existing Condition**	**Alt. 1**	**Alts. 2&3**
VSS1 (grass/forb)	SS1, SS4A	10 (7-13)	22%	100%	22%
VSS2 (seed/sap)	SS2	10 (7-13)	0%	0%	0%
VSS3 (young, poles)	SS3A,3B&3C	20 (15-25)	7%	0%	7%
VSS4 (mid-aged)	SS4B,SS4C	20 (10-30)	71%	0%	71%
VSS5 (mature)	Potentially SS4B,SS4C	20 (15-25)	0%	0%	0%
VSS6 (old forest)	Potentially SS5	20 (15-25)	0%	0%	0%
PFA#2 (French Creek)	**Habitat Str. Stages included in VSS class**	**Range % by VSS in Forest Plan Guideline 3114**	**Existing Condition**	**Alt. 1**	**Alts. 2&3**
VSS1 (grass/forb)	SS1, SS4A	10 (7-13)	15%	94%	15%
VSS2 (seed/sap)	SS2	10 (7-13)	0%	0%	0%
VSS3 (young,poles)	SS3A,3B&3C	20 (15-25)	6%	6%	6%
VSS4 (mid-aged)	SS4B,SS4C	20 (10-30)	79%	0%	79%
VSS5 (mature)	Potentially SS4B,SS4C	20 (15-25)	0%	0%	0%
VSS6 (old forest)	Potentially SS5	20 (15-25)	0%	0%	0%

ALTERNATIVE 1 – NO ACTION

The Sourdough nest stand could remain viable for another year or two (2006/2007), depending on bark beetle spread and tree mortality in this area. However, the nests are likely to be abandoned in the near future as a result of the current beetle caused tree mortality that is moving through the nest stand and surrounding area. Bark beetle populations already established in this area are expected to kill the majority of mature forest (vss5) and mid-aged forest (vss4) trees within the nest stands and PFA stands. VSS1 (grass/forb) would increase dramatically. Stands that retain some live mature over story would be expected to have canopy densities under 50 percent and are therefore classified as VSS1. Within five years VSS2 would be expected to increase as seedlings are released. The Sourdough PFA would remain outside the suggested balance of VSS (Standard 3114). Achievement of this balance would be delayed for many decades as the forest re-grows.

The French creek territory is currently experiencing a much lighter degree of infestation than the Sourdough territory. However, within 5 years, it is estimated that similar VSS changes would occur in these stands as well. The balance of VSS in this PFA would move further away from the recommended balance in Standard 3114. Recovery and achievement of the VSS balance would be delayed for decades.

The risk of large scale, high intensity wildfire is the greatest with this alternative. Widespread, high intensity wildfire has the potential to destroy active and inactive nests and to vastly change habitat conditions. A stand replacing wildfire would delay development of suitable goshawk habitat for many decades.

ALTERNATIVE 2 – PROPOSED ACTION

The goshawk nesting habitat areas in the Sourdough (197 acres) and French Creek (190) territories would be deferred from treatment. The risk of beetle susceptibility and wildfire would still remain high in these deferred stands. It would be expected that the prevention and suppression treatments that are proposed across the landscape with this alternative would provide some protection to these stands and increase the potential for them to persist. The nest stand and surrounding protected nest acres in the Sourdough territory would still be expected to move toward the vegetative structural condition predicted with Alternative 1 within 2 to 5 years. When this happens, that nest area would be expected to be abandoned and no longer suitable as goshawk nesting habitat. The protected nest habitat in French Creek is more likely to benefit from treatments in surrounding areas. No change to the habitat structural stages would be expected within 5 years in the French Creek nest habitat.

The PFA habitat associated with each nesting area is proposed for active management. Sanitation is a suppression method that would remove infested trees with live beetle brood in them and is proposed in all PFA stands. Variable density commercial thinning is proposed as a prevention measure, to maintain as many healthy green trees as possible into the foreseeable future. These management activities would not be expected to change the current VSS balance in either PFA, in the short term. There would not be active movement toward the suggested VSS balance, in the short term These actions would retain an average stand canopy closure of 50 percent and therefore would retain the VSS4 designation. In addition, the largest trees available on these sites would be targeted for retention. These actions would be expected to reduce the time required for VSS4 stands

to move to a VSS5 or VSS6 vegetative structural condition, when compared to Alternative 1.

The management recommendations proposed in a recent publication by Greenwald, et al. (2005) did not specifically address situations where mountain pine beetle mortality was actively threatening goshawk nesting habitat. They recommended generally deferring vegetative treatments in late-succession habitat but made no allowances for large scale, high intensity events that affect specific goshawk territories. There is no late succession habitat within the project area.

Fuels treatments proposed are not expected to further alter PFA vegetative stand structure (VSS) but they would likely reduce understory vegetation and down woody material where stands occur adjacent to private land.

ALTERNATIVE 3

Nest stand protection and PFA activities are the same as with Alternative 2. Proposed treatments in the PFAs would retain an average stand canopy closure of 50 percent and therefore would retain the VSS4 designation. Proposed fuel treatments are the same as Alternative 2, as well.

The difference in these alternatives which may impact goshawk habitat is the number of acres proposed for prevention and suppression treatments outside the goshawk nest and PFA areas. A total of 2,637 less acres would be treated in this alternative, most of which remain in a high risk condition for mountain pine beetle susceptibility. Therefore, the potential for beetle caused mortality is higher under Alternative 3, but less than Alternative 1. The potential for large wildfires is also higher than Alternative 2, but less than Alternative 1.

Summary Alternative Discussion

Bugtown Project Area is providing protection to the known goshawk territory (PFA#1) as outlined in *FP Standard and Guidelines 3108-3114*. Silvicultural prescriptions proposed in the action alternatives are designed to enhance PFA characteristics for goshawk habitat, long term, by improving site conditions to continue the progression of VSS classes towards those having larger diameter trees. An additional PFA (#2), with protected nest stands, was established in the Bugtown project area. This is located in an adjacent 6th order watershed (upper French Creek) in order to better provide for goshawk habitat across the planning area and to meet direction provided in *FSM, BHNF – Policy 2672.103.*

The Forest Plan *Phase I Biological Evaluation* (2001) stated that with changes to the FP *Standards and Guidelines*, and using the assumption of presence where suitable habitat exists (i.e. *Policy 2672.103)* and establishing additional PFA's in suitable habitat, by watershed, thus insuring measures that are believe sufficient to provide an adequate interim strategy for minimizing cumulative effects and maintaining population viability on the planning area.

These measures meet the intent of *FP Objective 221* for this project since the no action alternative increases the risk of greater loss of habitat for this species. This project is also

not expected to affect the existing Forest-wide goshawk population or goshawk habitat trend. The Bugtown project area makes up approximately 1% of the planning area.

Black-backed Woodpecker-(MIS, R2SS)

The Jasper burn (2000) area is directly west of the Bugtown Gulch area. Black-backed woodpeckers are most prevalent in burned areas and to a lesser extent, late succession stands of ponderosa pine. Rumble (2002) also confirms that beetle-killed areas are important. Observations from RMBO monitoring data resulted in nearly an eight-fold increase in black-backed woodpeckers using burned areas from 2001 to 2002 (Panjabi 2001, 2003; USDA, Forest Service 2004). Black-backed woodpeckers were also observed foraging in the Bugtown project area during winter (2004/2005) field surveys. The 2003 Monitoring and Evaluation Report states that due to the amount of new habitat created and the number of birds observed, both population trend and habitat trend appear to have been increasing for the black-backed woodpecker over the past several years (USDA Forest Service, 2004). RMBO has recorded increases in this species starting in 2001, but data suggests that for the Jasper burn (2000) area the population may have peeked and is beginning to decline (Panjabi, 2005). Large fires and bark beetle caused tree mortality is continuing to occur throughout the Black Hills suitable black-backed woodpecker habitat is being created throughout the forest.

Research conducted by Mohren (2002) indicated that this species prefers dense stands of mature ponderosa pine (SS 4C) and may avoid the more open nature of SS 4A and 4B stands. Because of these findings, Mohren (2002) suggested a change to the HABCAP model. Currently, the model considers SS 4A, 4B, 4C and SS5 the same value (1.0-optimum) for both feeding and cover. The model also assumes that snags are not a limiting factor.

This species is a primary cavity nester and snags are critical for areas to be considered suitable cover habitat. Another assumption by the model is that SS1 does not provide suitable forage and cover habitat. It does not make the distinction that SS1 with snags (insects/fire) is different than a SS1 resulting from a patch clear-cut.

ALTERNATIVE 1 – NO ACTION

This alternative would be expected to provide for the greatest short-term increase in black-backed woodpecker habitat because of the predicted spread of mountain pine beetles. Insects provide food for woodpeckers and trees killed by insects provide snags for nest sites. Dead and dying trees would increase the risk of large wildfires in this area and thereby further increase habitat for this species. Black-backed woodpecker populations may increase for a few years taking advantage of the current insect infestation occurring within the Bugtown project area. However this population increase would ‘top-out’ and gradually recede to pre-disturbance event levels, usually within 5 years.

ALTERNATIVE 2 – PROPOSED ACTION

The proposed vegetation and fuels treatments would not be expected to remove existing

habitat, but would reduce the potential for additional black-back woodpecker habitat to be created in the short-term. Treated stands would remove infested trees and thin stands to 40 BA. These open forest stands (SS4A) are less susceptible to attack by insects. Thinned stands would retain large diameter healthy trees (from largest size class available) to retain stand structure diversity and address wildlife concerns like future large diameter snag replacement. Some accessible areas managed for late succession would be sanitized and infested trees removed. The risk of wildfire is also reduced substantially when compared to Alternative 1 (no action). This alternative would remove exiting feeding habitat and cover (nesting) habitat for this species. There is the possible loss of individual birds if harvest operations occur during the breeding season. However, suitable nesting and foraging habitat is expected to remain throughout the Bugtown project area under this alternative.

ALTERNATIVE 3

By deferring treatment on approximately 2,637 acres, this alternative would be expected to provide some additional foraging habitat, and nesting habitat for this species, now and into the future. Some of the deferred stands would primarily be of small diameter (less than 9 inches dbh) and would not provide trees large enough to be used as nest trees. The risk of wildfire would be slightly increased when compared to Alternative 2. Other effects for the proposed vegetation and fuels activities would be similar to Alternative 2, and there would still be the possible loss of individual birds if harvest operations occurring during the breeding season.

Summary Alternative Discussion

Habitat for this species would be enhanced under all alternatives. Naturally, the no action alternative would contribute the most habitat, at least for the next 5 years or so. Under this alternative it is also expected that large areas would become a grass/forb structural stage with few green trees remaining. Alternative 2 would be expected to contribute the least habitat for this species, short term, since it would treat the most acres and remove the most potential foraging habitat. Alternative 3 would treat fewer acres and would be expected to provide more short term habitat for this species.

There have been thousands of trees 'hit' by beetles in the past 2 years which has created additional habitat that would remain with both action alternatives. The trees that have been hit by the summer, 2005 beetle flight will create even more habitat. These events (i.e. fire, insects) that provide the largest influx of new habitat for this species are expected to continue as various scales across the planning area for the foreseeable future. There is the possible loss of individual birds if harvest operations occurring during the breeding season, however the potential for this is low and it would not be expected to influence forest population trends. Nor would there be a reduction in the current upward trend in habitat for this species. Habitat for this species would be provided in the project area for the foreseeable future. Additionally, the project would retain green healthy trees of various diameters across the project area which would maintain existing mature forested stands for future black-backed woodpecker habitat needs. The project also limits salvage harvesting to 250 acres (2% of the total area proposed for treatment in Alternative 2) to ensure that sufficient standing dead trees are left within the project area. The project would conserve habitat for this species and is not expected to adversely influence *FP Objective 221*.

None of these alternatives would influence the Forest-wide population or habitat trends or influence the attainment of Forest Plan Objective 221 for black-backed woodpecker.

American Three-toed Woodpecker (MIS, R2SS)

This species occurs almost exclusively within mature stands of white spruce and utilizes snags within these stands. There are 66 acres of spruce forest type in the project area. No three-toed woodpeckers were observed in the Bugtown project area during field surveys

Forest-level monitoring data from 2002 identified 22 three-toed woodpeckers in white spruce habitat and only four in late succession ponderosa pine, although these stands also contained some spruce trees (Panjabi 2003). Since the MBBH (Monitoring Birds of the Black Hills) monitoring program began in 2001, observations of the three-toed woodpecker population trend is increasing. In 2003, all but one observation occurred in white spruce habitat (USDA Forest Service, 2004). HABCAP modeling of the planning area (forest) suggests habitat is relatively stable or slightly decreasing, (USDA Forest Service, 2004). Research conducted by Mohren (2002) suggested that this species prefers areas where spruce, aspen, and/or ponderosa pine occurred in close proximity to each other. There is some of this multi-species forest condition within the area designated for late-succession management in the French Creek area.

Little information regarding American three-toed woodpecker territory size is available. Wiggins (2004) reported that a Norway study found three-toed woodpeckers having breeding territories of 11 hectares (27 acres), 17 hectares (42 acres), and 19 hectares (47 acres). Anderson (2003) reported on a study with a breeding territory of 2.3 hectares (6 acres). She also cited a study that said three-toed woodpeckers need 42.9 hectares (106 acres) per pair. In any event, the Bugtown project area at best could only be expected to support between one and ten breeding pairs of three-toed woodpeckers, at most. However, since no records of three-toed woodpecker sightings within the Bugtown project area are known, and field surveys (2004/2005) in the project area also failed to detect this species (despite the additional forging opportunities created by the mountain pine beetle) it is very unlikely that that upper number of potential breeding territories could be achieved.

ALTERNATIVE 1 – NO ACTION

Preferred spruce habitat is not susceptible to the mountain pine beetle. However, since the risk of wildfire is greatest in this alternative, the potential to lose this habitat and individual birds would be greater than in the action alternatives. No late succession habitat, pine or spruce, occurs in the project area. American three-toed woodpecker may utilize pine snags within spruce stands or in stands which contain spruce. Bark beetles would provide food for woodpeckers and trees killed by insects would provide snags for nest sites.

This alternative would be expected to provide some increased habitat for the American three-toed woodpecker in the short term as pine trees within spruce sites are killed. But since this area contains very little preferred habitat to begin with, any potential habitat increase for this species would likely be marginal. The majority of the spruce habitat type in the Bugtown project area would be located within the designated late-succession area and this is the area most likely to actually provide some three-toed woodpecker habitat.

Over time (5 to 10 years) as beetle populations recede and the dead trees rot and fall, these potential foraging and nesting habitat would also decline within the project area. There would also be the expectation that there would be fewer green (pine) trees remaining to speed pine forest regeneration.

ALTERNATIVES 2 AND 3

The proposed vegetation and fuels treatments would not impact existing spruce habitat. There are no late succession pine stands and therefore, no impact to that potential habitat would occur either. However, the potential for late succession to develop is greatest under this alternative because retention of a green forest canopy is greatest. The active management proposed in these alternatives would reduce density in mature stands, short term.

There would be the possible loss of individual birds if harvest operations occurred during the breeding season. Suitable nesting and foraging habitat would be expected to remain throughout the Bugtown project area under this alternative.

None of these alternatives would influence the Forest-wide population or habitat trends or influence the attainment of Forest Plan Objective 221 for American three-toed woodpecker.

Elk and White-tailed deer (MIS)

The Bugtown Gulch project area provides both summer and winter range for white-tailed deer (DePerno et al. 2002). It is also both winter and annual range for elk (Wyoming – South Dakota Black Hills Elk Range Map, Rocky Mountain Elk Foundation, Black Hills Conservation Initiative, 2002). Depending on snow depth, white-tailed deer may move to the southern portion of the project area. During field surveys in the fall of 2004, white-tailed deer were commonly observed. Elk were also occasionally observed in the Bugtown project area.

Black Hills deer population trends forest-wide have fluctuated in recent years, but have increased over 1998 numbers (USDA Forest Service, 2004). The main reason attributed to higher deer numbers is the increase in forage and ground cover as a result of recent large-scale fires (e.g., Jasper Burn, 2000) (T. Benzon, big game biologist, SDGF&P, personal communication). Habitat trend for white-tailed deer at the Forest-level suggests that summer habitat has increased while winter habitat has remained relatively stable to slightly decreasing. Likewise elk populations have been steadily increasing throughout the Black Hills (USDA Forest Service, 2004) and have become an issue in regards to private land depredation problems. Habitat trend at the Forest-level suggests that elk summer habitat has increased while winter habitat has remained relatively stable to

slightly decreasing. The SDGF&P has responded to the increase in elk numbers by issuing more hunting licenses (USDA Forest Service, 2004).

The project area currently has some limiting factors to consider the area optimum deer and elk habitat. Large areas of preferred browse species (i.e., chokecherry [*Prunus virginiana*], serviceberry [*Amelanchier* spp.], aspen [*Populus tremuloides*], etc.) do not exist. Where browse is available, it can receive heavy utilization by deer. Herbaceous forage is allocated for livestock grazing as well as elk, deer, and other wildlife. The area has a high road density and private land in-holds that increase conflicts and fragment habitat. SDGF&P advocates for long-term habitat management to improve, enhance, maintain, and protect quality (deer) habitat, particularly shrub and forb component (SAIC, 2003).

Areas of cover habitat currently exist throughout the project area, but these dense timbered stands reduce opportunities for increasing browse forage. Insects are opening these dense pine stands, but this is also gradually decreasing cover habitat.
The South Dakota Game, Fish& Parks Dept. (SDGFP) advocates for long-term habitat management to improve, enhance, maintain and protect quality (deer) habitat, particularly shrub and forb forage (SAIC, 2003). This report reiterates the long standing concern by the SDGF&P that poor browse and shrub conditions adversely affect herd condition and carrying capacity. While the importance of maintaining adequate cover which shelters animals from weather and predators is stated, the SAIC (2003) also recommends that to enhance foraging opportunities for both deer and elk in pine stands the basal area factor (BA) should be 40 or lower.

Big Game Screening

Forest plan guideline 3203 requires that big game screening cover be provided along at least 20 percent of the edges of arterial and collector roads. Big game screening cover can be provided by slope and landform features as well as from vegetation. There are 27.5 miles of arterial and collector roads which are on National Forest and travel through forested habitat. Field reconnaissance and photo interpretation determined that big game screening cover currently exists along approximately 22.5 percent of these roads. In the Bugtown project area, dense pine stands, pine regeneration, and topography provide this screening cover.

ALTERNATIVE 1 – NO ACTION

Screening cover along arterial/collector roads would likely be reduced below *Standard 3203* as beetle mortality would kill trees that are providing this cover. Cover being provided by pine regeneration, landscape features, and down woody material would continue. Future screening cover in the form of pine regeneration might be slower to become established in areas of heavy tree mortality.

ALTERNATIVE 2 AND 3

Screening cover which is currently being provided by vegetation would be deferred from all vegetative treatments in these alternatives. The potential for screening cover to be lost

to mountain pine beetles or wildfire would be lower than in Alternative 1. Long term, cover habitat provided by pine regeneration would be expected to increase as thinning operations release understory vegetation.

Habitat Effectiveness

The (GIS) HABCAP model was used to calculate and compare habitat effectiveness (HE) by alternative and by Management Area. Vegetation structural stage data for the model was derived from stand exam information with field verification. The model evaluates the spatial arrangement of cover and forage habitat (habitat distribution). Open road density was based on existing road inventory information. Roads are considered to adversely impact habitat quality within 60 to 180 meters (ineffective area due to roads).

The vast majority of the Bugtown project area is in management area 5.1 (90 percent) and the remaining 10 percent is located within management area 5.4. These Management Areas have specific HE values in Guidelines 5.1-3201 and 5.4-3203. These guidelines are to be treated as standards under the Phase I amendment to the Forest Plan. Both of these guidelines state: "Deer and elk habitat effectiveness values in a planning unit should at least meet the following values. Vegetative management projects in planning units currently below these values should result in increased habitat effectiveness."

Open road density in the project area is considered high (3.7 miles per square mile). The model acknowledges that open roads adversely affect big game and incorporates buffers to calculate ineffective habitat along open roads. This ineffective habitat due to roads averages 25 percent (0.247) for the entire Bugtown project area (both MAs). No change to open road density is proposed in any alternative.

<u>Management Area 5.1 Habitat Effectiveness</u>

ALTERNATIVE 1 – NO ACTION

Extensive beetle-caused mortality would be expected under this alternative within 5 years. Habitat conditions would change dramatically with increases in forage habitat values and a corresponding decrease in cover habitat values with poor cover/forage distribution. Winter and summer cover indices fall dramatically because for forage habitat to be effective, it needs to be in close proximity to cover habitat. With the predicted large areas of SS1 due to pine beetle mortality, little cover habitat would be expected to remain. Large forage areas with little to no cover habitat could also cause a reduction in habitat distribution values. This and the loss of cover habitat are the primary causes for the large drop in HE under the No Action Alternative, and why all that additional forage still displays a lower HE value for elk in summer. It is projected that within 5 years, the project area would not meet any HE values displayed in Forest Plan Guideline 5.1-3201 except for Deer-summer, in this alternative. Refer to Table 3.32 to view HE values.

In reality, events like the Jasper burn show that Black Hills elk do not necessarily avoid areas that lack cover habitat. White-tailed deer on the other hand seem to follow this cover/forage-habitat distribution scenario more. Good deer habitat must have quality

forage in adequate quantities and cover which shelters from weather and predators (SAIC, 2003). Consequently, elk would be most likely to continue to use this area, while deer would be less likely to if the predicted mortality occurs.

This alternative would be expected to improve conditions for aspen as pine mortality increases. The reduction in pine canopy would also help increase shrubs and grass/forb production. Herbaceous ground cover is an important component for fawn survival. Research in the Black Hills has shown that white-tailed deer fawns prefer bed-down sites in relatively tall, dense grassy vegetation within open stands of ponderosa pine (Uresk et al. 1999). The No Action Alternative would be expected to have large areas of grass/forb with few live trees. Therefore, the establishment of future cover habitat would take more time than under the action alternatives which would retain more green trees.

ALTERNATIVE 2 – NO ACTION

The changes in HE are a result of changes in vegetative condition. The proposed vegetation treatments would reduce cover values and increase forage values, but to a much lesser degree than projected with no action. The proposed treatments would reduce the potential for large scale beetle mortality or wildfire to occur. Therefore, while cover values would be reduced in treated stands, these stands would retain some marginal cover value (SS4A) rather than be converted completely to forage (SS1). This altered habitat proportion would cause summer HE to increase and winter HE to decrease over the existing condition. This alternative would be most likely to retain live mature trees into the future and therefore, would be most likely to establish future cover habitat. Under Alternative 2, all HE values of Forest Plan guideline 5.1-3201 would be met. Refer to Table 3.32 to view HE values by alternative.

Alternative 2 would be expected to improve conditions for aspen as pine mortality increases. The reduction in pine canopy would also help increase shrubs and grass/forb production. Dense grassy vegetation, preferred as fawn bed-down sites, would likely increase as the pine canopy is opened.

ALTERNATIVE 3

This alternative defers treatments on 1,639 acres of SS3B and SS3C in management area 5.1. Therefore, more cover habitat would be retained than in Alternative 2. The differences in HE values in MA 5.1, as compared to those in Alternative 2, are strictly related to this retention of cover. All HE values of Forest Plan guideline 5.1-3201 would be met with this alternative (see Table 3.32).

This alternative would be expected to improve conditions for aspen as pine mortality increases. The reduction in pine canopy would also help increase shrubs and grass/forb production. Dense grassy vegetation, preferred as fawn bed-down sites, would likely increase as the pine canopy is opened. These changes would be expected to be slightly less than with Alternative 2 due to less acres being treated and opened.

Table 3.32: Habitat Effectiveness by Alternative in Management Area 5.1

Species	MA 5.1 Guideline	Exisiting Condition	Alt. 1	Alt. 2	Alt. 3
Elk (Summer)	**43%**	50% (.496)	42% (.417)	51% (.511)	49%(.492)
Elk (Winter)	**34%**	49% (.488)	19% (.185)	35% (.349)	41%(.414)
Deer (Summer)	**40%**	45% (.448)	42% (.416)	48% (.475)	48%(.477)
Deer (Winter)	**35%**	47% (.470)	17% (.171)	35% (.345)	41%(.411)

Management Area 5.4 Habitat Effectiveness and Thermal Cover

Management area 5.4 acres make up a small portion of the Bugtown Project Area (10 percent-see Map 12 in Appendix A). Big game do not confine their movements to such small areas. Accuracy and applicability of the HABCAP model is lessened when used on small areas (less than 5,000 acres) or very large areas (more than 20,000 acres). The section of National Forest land in MA 5.4 in the Bugtown project is 1,024 acres and therefore, of a much smaller size than the model is intended for. To address this concern and displays effects, HE values were calculated for both the project area and a larger area (9,064 acres) which includes 3 HUC7 watersheds. The results of this watershed scale analysis is found in Table 3.34.

The HABCAP model was not intended to be used on project areas less than 10,000 acres (T. Mills, personal communication), especially for big game since many move significant distances over the course of a year, depending on snow conditions and other factors. The BHNF LRMP, Phase I Amendment failed to take this into consideration. It is generally difficult and meaningless to expect small analysis areas to meet current big game Habitat Effectiveness guidelines (treated as Standards). The MA 5.4 area within the Bugtown project area (1,024 acres) does not provide a realistic 'home range' area for elk or deer. Habitat Effectiveness values should be evaluated in a larger context.

Habitat Effectiveness values for the existing condition are below those stated in Forest Plan guideline 5.4-3201, except for deer-summer. In the watershed scale analysis, none of the HE values are met (see Table 3.34). This is mainly because these watersheds include the Jasper fire area (2000) which significantly reduced cover in the area and few of the timbered portions of the area are in a SS4C and SS3C stand condition, primarily due to past vegetation management activities. Since only these two structural stages can provide optimal winter cover (according to the HABCAP model), this area lacks these stand conditions. In addition, this area has many roads that also decrease habitat effectiveness. The only method for increasing HE value would be to reduce open road density by closing roads. Road closures or construction are not part of this project and therefore, this value cannot be improved with this project.

Table 3.33: Habitat Effectiveness by Alternative in Management Area 5.4

Species	MA 5.4 Guideline	Existing Condition	Alternative 1	Alternative 2	Alternative 3
Elk (summer)	**54%**	.469 (47%)	.396(40%)	.469 (47%)	.396(40%)
Elk (winter)	**47%**	.455 (46%)	.000(0%)	.000 (0%)	.000(0%)
Deer (summer)	**45%**	.467 (47%)	.430(43%)	.469 (47%)	.430(43%)
Deer (winter)	**46%**	.453 (45%)	.000 (0%)	.000 (0%)	.000 (0%)

ALTERNATIVE 1 – NO ACTION

As described under 5.1, No Action, previously, extensive beetle-caused mortality would be expected to occur within 5 years. Dramatic increases in forage and decreases in cover values would be expected. The distribution of these habitats would be nil as the stands would be of the same SS and condition lack cover values. Calculated HE values for this alternative are displayed in Table 3.33 for the project area. All HE values are reduced significantly and winter HE values are zero.

ALTERNATIVE 2 – PROPOSED ACTION

This alternative does not meet HE values for Elk and Deer winter or Elk summer habitat (see Table 3.33). While the elk summer HE values do not change from the existing condition, they do not improve as is required under Guideline 5.4-3203 for vegetation projects where the existing HE is below the stated value. The only method for increasing this value would be to reduce open road density by closing roads. Road closures or construction are not part of this project and therefore, this value cannot be improved with this project.

HE values for summer exceed those expected with Alternatives 1 or 3. Winter HE is currently below the guideline values and is reduced to zero with this alternative. The reason for the reduction is a result of reducing the density of pine stands with a 4B structural stage to a 4A condition. This lowers the cover value of these stands, but does not eliminate their value. However, the HABCAP model also incorporates a distribution value which measures the juxtaposition of cover and forage on the landscape. In this case, because all pine would have the same structural stage (4A) the distribution value is zero. Consequently, calculated HE values are zero.

In reality, it is not possible to have this area provide zero effective (winter) habitat for either elk or deer regardless of Alternative and this situation demonstrates the limitations of this model. The area will provide winter foraging habitat, until snow depths exceed 1-2 feet (deer) or greater (elk), and topography and understory vegetation would allow this area to provide some winter cover habitat.

For these reasons, a project specific Forest Plan amendment would be necessary to implement Alternative 2. The proposed amendment would be for Alternative 2 only and would allow for elk and deer winter HE to be reduced from 47 percent and 46 percent, respectively, to 0 percent, and elk summer HE to be reduced from 54 percent to 47 percent.

The watershed scale HABCAP run continues to show Elk and Deer winter, and Deer summer HE values below Forest Plan Guideline 5.4-3203. However, the degree of change from the existing condition on this scale is much less than at the project level (less than 2 percent). Refer to Table 3.34 to view HE values calculated at the watershed scale.

Table 3.34: HE Values in MA 5.4 on a Watershed Scale

Species	MA 5.4 Guideline	Existing Condition	Alternative 1	Alternative 2
Elk (summer)	**54%**	.414 (41%)	N/A	.414 (41%)
Elk (winter)	**47%**	.361 (36%)	N/A	.343 (34%) (-2%)
Deer (summer)	**45%**	.435 (44%)	N/A	.431 (43%) (-1%)
Deer (winter)	**46%**	.324 (32%)	N/A	.309 (31%) (-1%)

ALTERNATIVE 3

Part of the project design for this alternative is to meet all Forest Plan direction and therefore, avoid the need to amend the Plan for this project. As previously stated, it is not possible to implement activities in this management area and improve conditions, without closing roads. No road closures are proposed in any alternative and therefore, only deferring vegetative treatment in this management area would meet Forest Plan direction. Therefore, Alternative 3 would defer all commercial treatments in MA 5.4 and results in the same HE values as in Alternative 1 due to expected beetle caused mortality.

Summary Alternative Discussion

All alternatives are expected to further improve (forage) conditions of grasses/forbs, aspen and shrubs by removing pine. Recent increases in deer and elk populations have corresponded to increases in forage and ground cover from recent large scale fires. The Jasper fire area has produced a large area of primarily forage habitat and the elk have responded positively. Herbaceous ground cover is also an important component for fawn survival. Research in the Black Hills has shown that white-tailed deer fawns prefer bed-down sites in relatively tall, dense grassy vegetation within open stands of ponderosa pine (Uresk et al. 1999).
Population statistics form SDGF&P report an increasing population in white-tailed deer compared to 1998 (USDA Forest Service, 2004). Elk numbers have also been increasing to the point where SDGF&P increased hunting licenses last year (2004) in the south-central Black Hills to address private land depredation.
Some Private land in-holdings in Bugtown area are used for summer livestock grazing. They also provide foraging habitat for big game. Much of the forested portions of these

lands have already been logged to reduce bark beetle risk potential. Structural stages of these areas are SS3A or SS4A. Subdivision (agricultural to residential) appears to be the biggest threat to loss of big game habitat on private land in the project area. Roads and human traffic into these parcels and onto adjacent public lands also contributes to big game disturbance.

This project is not expected to affect the existing Forest-wide deer or elk population or habitat trend. Since deer and elk populations are increasing, the intent of *Objective 221* will be achieved.

Thermal cover

Forest Plan Objective 5.4-205 states that at least 20 percent of the forested portion of the management area should provide thermal cover for elk, deer, winter turkey habitat. There currently is no thermal cover in the 5.4 areas of the Bugtown project area. Structural stages 3C and 4C qualify as thermal cover. Therefore, none of the alternatives would impact existing thermal cover in the project area. Alternative 2 would provide the greatest opportunity to develop thermal cover in the future.

Mountain Lion (Cougar) (MIS):

The cougar is considered a big game species in South Dakota and Wyoming and now can be hunted in both states. Recently the SDGF&P commission approved a limited hunting season for the SD Black Hills cougar population.

Home range size can vary but males typically have a home range between 25 and 35 square miles while females range between 15 and 30 square miles (Higgens et al. 2000). Cougar habitat in the Black Hills is basically anywhere there is cover, prey, and nearby sources of water (SDGFP 2004a). For example, dense stands of spruce have been identified as a good cover since it provides stalking cover, habitat for prey (i.e., white-tailed deer), and some thermoregulation benefits as well. Cougar prey species consist of mule deer, white-tailed deer, elk, bighorn sheep, mountain goat, beaver, and porcupine (Higgens et al. 2000; SDGFP 2004a). There have been no HABCAP indices established for this species. Cougar numbers are known to be increasing in the Black Hills. The SDGFP now estimates the Black Hills population at approximately 150+ animals (Ted Benzon, big game biologist, SDGFP, personal communication). Since cougars have large home ranges the Bugtown project area is thought to be part of the territory for at least one male animal. Cougar tracks were observed along Upper French Creek in January 2004 during marten surveys. Exact numbers that may utilize portions of the Bugtown project area is unknown.

The open road density and the amount of private land development within the Bugtown project area may affect cougar use and movement through this area, although many of these roads receive little traffic except during big game hunting season. Cougar observation reports show that they will come close to human habitation in search of food.

ALTERNATIVE 1 – NO ACTION

There would be no changes in road density. Spruce habitat would be expected to remain largely unaffected by mountain pine beetle. Predicted changes in pine habitat condition would not be expected to affect the cougar however they could affect the animals' primary prey (deer, elk). While the loss of cover habitat may affect how big game

utilizes the Bugtown project area, there would be no reason to suspect that deer and elk would not continue to remain throughout the project area. The cougar would be expected to adapt and move with prey availability.

ALTERNATIVE 2 – PROPOSED ACTION

This alternative treats the most acres of ponderosa pine habitat type. No spruce would be treated, and steep rocky pine areas would likely be deferred due to limited access. The reduction of big game cover habitat as a result of vegetation management may affect how they utilize the Bugtown area. Herbaceous and shrub production would be expected to increase and big game would adapt, taking advantage of the additional forage. Any cougars using portions of the project area would also adapt to any changes in big game movements. Long term, this alternative would be expected to maintain additional green trees across the project area. Additional green, mature trees would encourage natural regeneration and the development of seedling/sapling stands that develop into cover habitat. This cover habitat would benefit big game as well as cougars. No change to open road density would occur.

ALTERNATIVE 3

While similar to Alternative 2 in effects, it would defer treatment on approximately 2,637 acres to provide additional structural diversity and meet forest plan direction for big game in management area 5.4. Providing the mountain pine beetle infestation does not heavily attack these deferred stands, they would be expected to provide some additional cover habitat for big game and may also allow the cougar additional foraging opportunities. As with Alternative 2, no change to open road density would occur.

These alternatives would not influence the Forest-wide population or habitat trends or influence the attainment of Forest Plan Objective 221 for Cougar.

Merriam's Turkey (MIS):

Turkeys are common in and around the project area. In the Black Hills, the Merriam's turkey will use a variety of habitats. Winter habitat consists primarily of ponderosa pine with greater than 70 percent canopy cover, while open stands of ponderosa pine with sufficient ground vegetation provide good summer habitat (Rumble and Anderson 1993). Roost sites are typically on top of slopes or ridges in trees at least 9 inches dbh with layered horizontal branches (Rumble 1992). Winter diets consist mainly of ponderosa pine seeds and summer diets are of grass seed and foliage (Rumble and Anderson 1996). There appears to be a preference for rock or rock outcrops for first-time nesting attempts. Subsequent attempts usually result in a shift to shrubs located in meadows (Rumble and Anderson 1989). Primary nest predators consist of mammals and the American crow (Rumble and Hodorff, 1993).

Turkey populations have been on a steady increase since 1998. The population has gone from approximately 9,000 birds in 1998 to 18,500 birds in 2002 (2003 FP Monitoring

Report, 2004). However, population levels can fluctuate considerably due to adverse weather conditions during the spring nesting and brood rearing season. SDGF&P regulates hunting pressure to compensate for population declines due to adverse weather conditions. Habitat trend has remained relatively stable at the Forest-level (USDA Forest Service, 2004).

The Bugtown area provides summer and wintering habitat for turkeys. Preferred roost trees are more common in SS 4B and 4C sites since there are large diameter overstory trees scattered throughout these areas. There are areas (at least 0.25 acre) with pockets of mature trees scattered throughout the project area, however some of these are being attacked by bark beetles. Habitat capability, as calculated with the HABCAP model is displayed for all alternatives in Table 3.35.

Table 3.35: Habitat Capability (HCP) for Merriam's Turkey by Alternative.

Time of Year	Existing Condition	Alt. 1	Alt. 2	Alt. 3
Summer	.662	.616	.879	.838
Winter	.805	.422	.680	.716

ALTERNATIVE 1 – NO ACTION

No mature trees would be harvested, but beetle caused mortality would remove many potential roost trees. Habitat capability (winter) would be reduced because of expected losses of winter cover habitat. Future pine seed cone crop would be severely restricted and winter habitat would decline sharply.

ALTERNATIVE 2 – PROPOSED ACTION

This alternative would also decrease winter habitat, but since SS 4A is expected to remain after treatment, this cover habitat reduction would be less severe. The loss of winter cover could move birds to seek areas with higher basal areas and canopy density outside of the Bugtown project area. Alternative 2 would improve summer and winter habitat when compared to the No Action Alternative, as forage was improved and roost trees remained. Guideline 3205 (turkey roost trees) would be met by project design (see Appendix B).

ALTERNATIVE 3

This alternative would be expected to provide slightly more winter habitat than Alternative 2 since it would defer commercial thinning in approximately 2,233 acres of SS3B and SS3C stands. Guideline 3205 (turkey roost trees) would be met by project design.

Summary Alternative Discussion

Action alternatives (2&3) would retain an average green tree stand density of SS4A (BA 40) in treated areas and incorporate roost tree group selection design into stand prescriptions *(Guideline 3205).* These alternatives would reduce insect mortality as well as risk of wildfire. Large areas of SS1 do not make high quality Merriam turkey habitat.

Turkeys have expanded in population size quite significantly over the last five years while habitat capability at the Forest-level has remained relatively stable (USDA Forest Service, 2004). The action alternatives may result in a short term reduction of winter cover habitat for the foreseeable future, but are not expected to enhance cover habitat, long term. Project design will continue to provide large diameter roost tree groups. Understory vegetation diversity is expected to increase and this will improve foraging habitat and brood cover. The continuation of other activities in this area such as livestock grazing and recreation (including turkey hunting) have not and would not seriously affect the turkey population- which is primarily a function of weather dependant events, predation and winter foraging habitat. This project is not expected to adversely influence the attainment of *Objective 221* since project design conserves habitat for this species.

Pygmy Nuthatch- (MIS)

Historical and current accounts list the pygmy nuthatch as a rare bird in the Black Hills (Pettingill & Whitney, 1965, Tallman et al. 2002, Panjabi, 2003). This primary cavity nester is generally associated with large snags and prefers open, park-like forest, especially among ponderosa pines in the lower coniferous zone (i.e., less than 5,500 feet). The town of Custer, SD is 5,300 feet in elevation and pygmy nuthatches have been observed at backyard bird feeders in winter in the town of Custer, SD. The Bugtown project area could be considered just outside of the reported preferred elevation range of this species in the Black Hills. The highest elevation of the Bugtown project area is Bear Mountain Lookout at 7,166 feet in elevation and the lowest elevation in the project area is 5,600 feet on French Creek. For this analysis, the Bugtown project area is being presumed to provide suitable habitat for this species due to the proximity of reported observations at 5,300 feet. This nuthatch feeds on insects and conifer seeds and preferring larger diameter snags (19 inches and greater dbh) for excavation of nest sites. It gleans insects (arthropods) off pine foliage in summer, and feeds on pine seeds in winter. Wide population fluctuations are reported (Ghalambor, 2003) presumably due to cold winter temperatures and/or poor cone crops. This species sometimes is communal in nature, especially in winter. Since the start of RMBO monitoring in 2001, this species has only been observed six times, two of these observations in pine-juniper shrublands (Panjabi, 2005). No pygmy nuthatches were observed in the Bugtown project area during field surveys. The 2003 Monitoring and Evaluation Report finds that despite a strong Forest bird-monitoring program, the data collected is insufficient to discern population trends at this time due to the rarity of this bird. Forestwide habitat capability trend appears to be stable or slightly decreasing (USDA Forest Service, 2004).

ALTERNATIVE 1 – NO ACTION

This alternative would be expected to reduce available habitat for this species. HABCAP lists pine structural stages SS4A, SS4B, & SS4C (and SS5-late succession) as optimal winter habitat, and in summer, SS4A and 4B are listed as optimal habitat. These SS4s (mature timber) structural stages would be expected to be largely lost to beetle mortality. With this comes the increased risk of wildfire which would also result in habitat loss for this species. While mature stands of green pine with pockets of insect-killed trees would likely continue to provide 'islands' of habitat for this species, the overall effects of this alternative are predicted to reduce habitat for the pygmy nuthatch. The only expected benefit of this alternative would be that snags (nesting habitat) would not be a limiting factor. There would be no potential for adverse effects to nesting birds resulting from mechanized disturbance during vegetation treatments. Pine SS1 (grass/forb) and SS2 (seedling/sapling/shrub) do not provide habitat for this species. Long term (10 to 50 years) snags and large diameter green trees could be absent from large portions of this project area.

ALTERNATIVE 2 – PROPOSED ACTION

This alternative would provide an abundance of SS4A which is considered suitable feeding and cover habitat in both summer and winter. Since SS4A and 4B are valued more as feeding and cover habitat than is SS4C, HCP would actually increase slightly in summer. This alternative would improve habitat opportunities for this species when compared to no action (Alternative 1), especially long term.

This species prefers large diameter trees and all that is required to meet SS4A is a 9 inches or larger dbh. This alternative would be most likely to retain and develop large diameter green trees into the future. The proposed treatments would lessen the potential for beetle caused mortality and large scale, high intensity wildfire to occur. Thinning prescriptions will generally retain the largest trees on site and design criteria is included which would require that a minimum of five to eight green trees per acre in the largest diameter classes available be retained (see Appendix B). This design criteria is targeted toward existing large trees which differ from the general size and age class of the overall stand because thinning treatments generally leave the largest trees in a stand.

Summer/winter-cover habitat would depend on adequate snag (nesting) opportunities. This habitat would be expected to increase as areas with pine beetles continue to kill trees, including large diameter trees. The alternative may directly affect individuals if active nests were disturbed during breeding season.

ALTERNATIVE 3

This alternative would defer treatment in some SS4B, SS3B and SS3C stands and this would provide some better quality feeding habitat for this species, when compared to thinning these stands as proposed in Alternative 2. As with Alternative 2, the project design would retain five to eight green trees per acre in the largest diameter classes available. Additional large diameter snags would be expected as trees die from mountain pine beetle attack. Action alternatives may directly affect individuals if active nests were disturbed during breeding season.

Summary Habitat Discussion

Project design for both action alternatives includes retaining healthy larger diameter green trees in all treatment areas, as well as protection of snags, and this is expected to conserve suitable habitat for this species across the project area, for the foreseeable future. Ghalambor (2003) reported that the breeding territory of the pygmy nuthatch is generally 1-3 hectares. Areas this size (and larger) that contain large diameter green trees and snags are expected to be provided in areas managed for late-succession, goshawk PFA, steep or inoperable areas that are scattered throughout the Bugtown project area, as well as managed forested acres. With the habitat trend of the planning area being reported in 2003 Monitoring Report as relatively stable, and the proposed actions within the Bugtown project area continuing to provide habitat for this species for the foreseeable future (USDA, Forest Service, 2004). Habitat for this species is expected to improve within the Bugtown project area over time.

This project is not expected to affect the existing Forest-wide pygmy nuthatch population or adversely affect habitat trend for this species. Other activities such as recreation and livestock grazing would not be expected to influence this species, but activities such as firewood gathering could reduce potential nesting habitat. The Bugtown project represents approximately 1% of the Forest and would continue to provide habitat for this species, if present.

Since Alternatives 2 or 3 work to maintain live large diameter trees across the project area by reducing the risk of widespread insect mortality and wildfire they conserve habitat for this species and meet the intent of *FP Objective 221*.

These alternatives would not influence the Forest-wide population or habitat trends or influence the attainment of Forest Plan Objective 221 for pygmy nuthatch.

Brown Creeper- (MIS)

This small forest bird occurs in low abundance throughout the Black Hills and is associated with mature and late succession forest conditions. Brown creepers are known to have relatively strict breeding habitat requirements; they prefer to nest in areas with an abundance of mature and old-growth trees and high canopy cover (Wiggins, 2005).

Results from RMBO (Rocky Mountain Bird Observatory) monitoring data identify late succession pine (SS5) and white spruce as the most important habitat type for this species (Panjabi 2001-2004). Monitoring data also suggests the brown creeper is well distributed in low abundance throughout the Black Hills and that it is mainly found in SS4C and SS5

habitat. Winter field surveys of the Bugtown project area produced sightings of this species on various occasions in ponderosa pine (SS4B and SS4C) stands. The species was also observed on one occasion in the dense stands habitat along French Creek. There is no late succession habitat in the project area and only 66 acres of spruce stands. The brown creeper primarily gleans insects from live trees so patchy areas with large diameter green trees and large diameter snags (i.e. late succession) is considered preferred habitat.

In the 2003 Monitoring and Evaluation Report, a 1 percent decline in habitat capability (HCP) was reported. The HABCAP model considers ponderosa pine SS4A, 4B, and 4C all the same habitat value (0.50) to the brown creeper. Three years of RMBO observation data suggest a relatively stable population at this time, forest-wide (USDA Forest Service, 2004). Brown creepers were observed most often in late succession ponderosa pine, but were also recorded in white spruce, and both northern and southern hills pine type.

Anderson and Crompton (2002) found that *shelter-wood logging* creates open forest conditions that are less favorable for the brown creeper as they observed that this species was "conspicuously less abundant in treated areas than in untreated stands. However the paper was not specific regarding before and after treatment basal areas, only that the shelter-wood timber harvest resulted in a 53% reduction in total tree basal area and a 58% reduction in canopy cover. While the Bugtown project does not propose shelter wood harvesting, treated stands could result in near similar reductions of basal area and canopy cover and could be expected to have a similar effect on this species. Based on literature it can reasonably be assumed that habitat for this species will decline within the Bugtown project area, regardless of Alternative selected.

ALTERNATIVE 1 – NO ACTION

This alternative would be expected to eliminate the majority of preferred brown creeper habitat in the project area (4C) by beetle-caused tree mortality within 5 years, according to the Project Entomologist. The potential to develop additional 4C or SS 5 habitat would be delayed for decades as large areas of mortality are expected. There would also be an increased risk of wildfire with this alternative. Large burned timber areas (like Jasper burn) do not support brown creepers.

ALTERNATIVE 2 – PROPOSED ACTION

Based on the current literature (Anderson and Crompton 2002, Wiggins 2005) , it is expected that the proposed vegetation and fuels treatments will reduce brown creeper habitat when compared to present conditions. Structural stages SS4C and SS4B would be thinned and moved to a SS4A condition. While open canopy forest conditions (SS4A) likely provide some habitat value it cannot be considered high quality brown creeper habitat. To continue providing brown creeper habitat within the Bugtown project area project design would retain green trees of the largest diameter classes available (not infected with pine beetles) in all treatment areas. In any event, preferred habitat is expected to remain primarily in the area managed for late succession habitat, the goshawk PFA's, and in areas where the conditions are steep, inoperable areas not affected by mountain pine beetle tree mortality. Sanitation treatment of areas managed for late

succession habitat and goshawk PFA's is expected to increase the potential for this denser, older forest habitat to persist. Reducing green tree loss to bark beetles in the stands managed for late succession habitat would benefit the brown creeper habitat situation, long term.

Vegetation and fuels treatments proposed with action alternatives to contain and reduce widespread pine tree losses to mountain pine beetle would also be expected to contribute to a decrease in brown creeper habitat quality but not as severe as what is expected with the no-action alternative. Reducing the threat of wide-scale insect caused tree mortality and wildfire is preferred as a preventative action to limit the more substantial habitat changes predicted within the next 5 years. Action alternatives may disturb brown creeper nests if activities occur during the nesting season. Although the local density of large snags and mature (green) trees will affect brown creeper habitat more than any other single factor (Wiggins, 2005). Areas with large diameter trees (>20"dbh) are primarily limited to *areas managed for* late succession, inoperable ground and around the goshawk nest stand. These would not be thinned in either action alternative. Wiggins (2005) reported on two studies regarding brown creeper breeding territories. In these studies it varied from .01-6.4 hectares (1/4 acre -16 acres). It was suggested in these studies that food source availability was the likely reason for this territory size variability. The Bugtown project would incorporate design to retain large diameter trees where available in all commercial treatment areas. Using this information there is no evidence to suspect that the Bugtown project area would not continue providing habitat sufficient to maintain brown creeper breeding territories.

ALTERNATIVE 3

This alternative would defer treatment in approximately 690 acres of SS4B and approximately 1,532 acres of SS3B and SS3C stands. These areas may provide additional structural diversity and a variety in foraging habitat for this species when compared to Alternative 2. Some larger diameter trees are usually mixed in these 3B and 3C stands so some cover habitat may be present. Short term, the expectation is that Alternative 3 would provide some additional foraging and perhaps some cover habitat for the brown creeper when compared to Alternative 2. Thinning and sanitation treatments around these areas would lower the potential for loss to beetles, when compared to Alternative 1. However, these stands would continue to be at a high risk for mountain pine beetle infestation and therefore, these stands would be less likely to retain the current structural conditions into the future or to develop into preferred habitat of SS4C or SS5.

The risk of large scale, high intensity wildfire would be less than Alternative 1, but greater than in Alternative 2. Therefore, the potential loss of habitat to wildfire would also be of the same measure.

Summary Alternative Discussion

Both Action Alternatives would maintain and encourage development of large diameter green trees within the project area. In addition, the largest trees available on site will be targeted for retention. These alternatives are expected to put the Bugtown project area in a better position to continue providing habitat for this species, long term, especially when compared to the habitat losses expected from mountain pine beetle mortality, as well as

the increased wildfire risk associated with no-action.

Pockets of brown creeper habitat would remain within the Bugtown Project Area for the foreseeable future. The Bugtown project area is approximately 1% of the planning area where brown creeper habitat would also be available. This project is not expected to affect the existing Forest-wide brown creeper population or habitat trend. Other activities such as recreation and livestock grazing are not expected to affect this species. Project design is expected to be sufficient to conserve habitat and not adversely influence the attainment of *FP Objective 221*.

Cumulative Effects on MIS Species

The cumulative effects area for MIS is the project area.. The cumulative effects analysis considered past, present and future activities summarized in Appendix E. Activities considered in the cumulative effects analysis are those occurring in the past 10 years through 10 years into the future. The beetle epidemic will likely have waned within ten years.

The alternatives would have no adverse cumulative effects on the bald eagle, fringed myotis, Townsend's big eared bat, American marten, Northern goshawk, black backed woodpecker, American three-toed woodpecker, elk, white-tailed deer, cougar, Merriam's turkey, pygmy nuthatch, or Brown creeper.

Bald Eagle

The bald eagle is a winter resident/migrant which feeds mainly on carrion. The alternatives are expected to maintain ample eagle perch sites and have little effect on eagles. Therefore no cumulative effects are expected.

Fringed Myotis and Townsend's Big eared Bat

The direct and indirect impacts discussed previously for the fringed myotis and Townsend's big eared bat are expected to be minor. Some loss of individual snags may occur, but increases in snag availability on the project area as a whole is expected. Other activities such as livestock grazing and recreational pursuits are not expected to affect this species. The exception is recreational caving which could adversely affect individuals if disturbed. However, this a potential disturbance is suspected to be a rare occurrence as these caves are small, narrow vertical cracks that cannot be easily entered by people. No cumulative effects are expected.

Marten

There is little quality marten habitat (spruce) in the project area and it is an extensive distance to quality marten habitat. There would be no direct effect to spruce habitat and the potential for indirect effects is limited to potential wildfire effects. The spruce is located on moist sites and less likely to be impacted by fire. Recreational activities, livestock grazing and other uses are also not expected to present conflicts with this species. Therefore, no cumulative effects are expected.

Northern Goshawk

The 2003 Monitoring and Evaluation Report states that the goshawk population trend on the Forest appears relatively stable or decreasing due to loss of nests to fire (USDA-

Forest Service, 2004). The Jasper fire area, directly west of the project area, experienced a direct loss 5 goshawk nests and impacted 4 additional nests. The Forest Plan Phase I Biological Evaluation (2001) stated that with changes to the Forest Plan Standards and Guidelines and using the assumption of presence where suitable habitat exists, that these measures provide an adequate interim strategy for minimizing cumulative effects and maintaining population viability on the planning area. The Bugtown project area makes up approximately 1 percent of the planning area. Therefore, since the Bugtown project design follows these guidelines, no adverse cumulative effects to goshawks are anticipated. Therefore, no cumulative effects are expected.

Black Backed Woodpecker

The black backed woodpecker has seen an increase in habitat over the past five years due to wildfire and insect infestations. Monitoring of the Jasper burn area (adjacent to the Bugtown project area to the west) showed an increase in black-backed woodpeckers over the period of 2001 to 2003. In 2002, RMBO reported densities up to 6.9 birds per square kilometer, and Vierling (2004) in her study showed similar results. The Forest estimates that over 188,000 acres burned between the years 1998 through 2003. In addition, nearly 200,000 acres were infested with mountain pine beetles or pine engravers by 2003 (USDA, Forest Service 2004). The Bugtown project area would add habitat for this species under all alternatives. Habitat for this species would be provided in the project area for the foreseeable future, other activities like livestock grazing and recreational pursutes are not expected to influence this species presence. Firewood gathering would contribute to a loss of potential nesting and foraging habitat.
No adverse cumulative effects are expected.

American three-toed Woodpecker

The American three-toed woodpecker is mainly found in spruce and less frequently in dense mature and late succession pine. No cumulative effects are expected since habitat is conserved and other activities such as livestock grazing and recreation is not expected to influence this species.

Deer and Elk

Recent increases in deer and elk populations have corresponded to increases in forage and ground cover from recent large scale fires. The Jasper fire area has produced a large area of primarily forage habitat and the elk have responded positively. Herbaceous ground cover is also an important component for fawn survival. Research in the Black Hills has shown that white-tailed deer fawns prefer bed-down sites in relatively tall, dense grassy vegetation within open stands of ponderosa pine (Uresk et al. 1999).

Some Private land in-holdings in Bugtown area are used for summer livestock grazing. They also provide foraging habitat for big game. Much of the forested portions of these lands have already been logged to reduce bark beetle risk potential. Structural stages of these areas are SS3A or SS4A. Subdivision (agricultural to residential) appears to be the biggest threat to loss of big game habitat on private land in the project area. Roads and human traffic into these parcels and onto adjacent public lands also contributes to big game disturbance.

All Deer and Elk habitat effectiveness guidelines are met in management area 5.1 under the action alternatives. The No Action Alternative does not. In management area 5.4, none of the alternatives meet the direction of Guideline 5.4-3203 (see the Big Game section earlier in this Chapter). All alternatives in both management areas would increase forage (early successional habitat) and decrease cover.

The Black Hills National Forest has amended the 1997 Forest Plan Revision five times. The first was the Phase I Amendment in 2001. Four project level amendments (Canyon/Nest 03/10/2003, Prairie 10/31/03, Coulsen 07/07/04 and Deerfield 10/20/05) regarding big game habitat effectiveness, thermal cover and MA 3.7. The Project level amendments were all non-significant amendments and allowed each Project a one-time deviation from management direction for big game habitat effectiveness values and/or thermal cover to better achieve the objectives for each Project.

The Canyon /Nest project allowed a reduction in elk winter habitat effectiveness in management area 5.1 of the Nest portion of that project only. The rationale for this amendment is partially based on that particular area being higher elevation and not winter range.

The Prairie Project allowed for vegetation treatments to occur within thermal cover in Management Area 3.7 and adjusted a travel restriction boundary in MA 3.7 and regulates off-road motorized use in that area pending further Forest travel management planning.

The Coulsen project amendment included reductions in winter habitat effectiveness for deer and elk in management area 5.1. This area is higher elevation and not considered winter range for big game.

The Deerfield decision amendment would allow for reduced winter habitat effectiveness for deer and elk in management area 8.2. In addition, the Deerfield project will allow for removal of MPB infested trees in management area 8.2.

The Dean Project, on the Bearlodge Ranger District, proposed a non-significant amendment a one-time deviation for thermal cover and a durable change to Forest Plan direction by designating a part of the Dean Project Area from MA 5.4 to MA 5.6 to reflect actual use of the Project Area by deer and elk. While the decision for Dean was signed (05/24/05) it was remanded on appeal and awaiting a new decision. This area is approximately 45 miles from the Bugtown project area (see Map 16 in Appendix A).

Other proposed Forest Plan amendments are the Phase II Amendment (significant Forest Plan Amendment addressing research natural areas, management indicator species, northern goshawk, and forest health posed by mountain pine beetle and increased fuel hazard) This decision has been made, although implementation has not yet occurred pending publication of the Notice of Availability in the Federal Register.

These amendments were considered in the analysis for this project.

Only Alternative 2 proposes active management within management area 5.4, which would result in a decline in winter HE. No other project analysis on the Forest has

resulted in a decline in winter HE values in management area 5.4 under the 1997 Forest Plan, as amended. Based on a review of recent Forest plan amendments, population and habitat trend monitoring and field review of the area, no adverse cumulative effects are expected to big game.

Cougar
The cougar has very large home ranges with areas the size of Bugtown Gulch providing only a portion of a home range of perhaps a few cougars. Prey species are expected to remain abundant. Rock outcrops and spruce slopes would not be impacted and road densities would not change. The increasing residential development on private lands and recreational use on NFS lands could limit habitat availability in some areas. Therefore, no cumulative effects are expected.

Merriam's Turkey
Understory vegetation diversity is expected to increase and this will improve foraging habitat and brood cover. The continuation of other activities in this area such as livestock grazing and recreation (including turkey hunting) have not and would not seriously affect the turkey population- which is primarily a function of weather dependant events, predation and winter foraging habitat. No cumulative effects are expected.

Pygmy Nuthatch
This project is not expected to affect the existing Forest-wide pygmy nuthatch population or adversely affect habitat trend for this species. Other activities such as recreation and livestock grazing would not be expected to influence this species, but activities such as firewood gathering could reduce potential nesting habitat. The Bugtown project represents approximately 1% of the Forest and would continue to provide habitat for this species, if present. No cumulative effects are expected.

Brown Creeper
This project is not expected to affect the existing Forest-wide brown creeper population or habitat trend. Other activities such as recreation and livestock grazing are not expected to affect this species. No cumulative effects are expected.

Other Species of Interest

Other Raptor Species

The forest plan states in Guideline 3204, that known and historic raptor nests (other than goshawks) should be protected. Based on current vegetative structural stage data, the Bugtown project area may provide habitat for a variety of forest raptors including red-tailed hawk, Cooper's hawk, sharp-shin hawk, great-horned owl, saw-whet owl. All of these species have been observed within or adjacent to the project area at some time within the past decade. The presence of stick nests or defensive behavior on the part of the nesting female is generally how these raptor nests are located. Pre-sale crews found an active red-tailed hawk nest in June 2005. An active great-horn owl nest was located in 2003 in spruce trees along Vanderlehr Creek. American kestrels have been observed west of the project area in the Jasper burn area.

ALTERNATIVE 1 – NO ACTION

Since no commercial timber harvesting would occur, the potential for active raptor nest disturbance by this mechanized equipment is removed. But as previously discussed in the section on Goshawks, the No Action Alternative would be expected to suffer significant tree mortality from mountain pine beetles. The risk of wildfire would also be increased. Raptor species that prefer green forested landscapes for nesting would not be expected to benefit from this alternative. Nest trees and the associated stand could be altered by beetle-caused tree mortality. Raptors that prefer a more open habitat condition might be expected to maintain or improve habitat conditions under this alternative. For example, the American kestrel is limited to open country areas and would use large snags (existing cavities) for nesting (Tallman et al. 2002). While the RMBO Report stated that kestrels were not detected in sufficient numbers in the Black Hills to estimate population density (Panjabi, 2003) and that the majority of kestrel sightings are from the southern Hills, this species is now regularly observed in the Jasper burn area. The Jasper burn opened up over 80,000 acres of previously forested lands, created many snags and increased habitat for the kestrel. A wide-spread beetle infestation or subsequent large fire in the Bugtown project vicinity could also improve habitat potential for the kestrel.

The recently located red-tailed hawk nest tree and surrounding area could also be affected by beetle-caused tree mortality.

ALTERNATIVES 2 AND 3

The recently discovered red-tailed hawk nest tree and any other discovered raptor nests would be avoided by project design. Vegetative management operations could be restricted depending on nest activity and season. Despite precautions, these alternatives could directly adversely affect some raptors during timber harvest operations if active nest trees are accidentally felled. These alternative would be expected to maintain more live green trees in all treated areas when compared to the tree loss potential resulting from the predicted bark beetle tree mortality (No Action Alternative 1).

Migratory Birds

In 2002 the US Fish and Wildlife Service published Birds of Conservation Concern. The purpose of that document was to identify migratory and non-migratory birds of the United States and its territories that are of conservation concern so as to stimulate coordinated and proactive conservation actions among Federal, State and private partners. The concerns may be the result of population declines, naturally small ranges or population sizes, threats to habitat, or other factors.

Bird monitoring is conducted at the Forest-level to determine species distribution, abundance, and trend (Panjabi 2001-2004). The monitoring is designed and conducted by the RMBO to provide statistically rigorous population trend data for at least 61 species

that breed in the Black Hills. Trend data will assist the Forest in determining whether additional conservation measures are necessary.

Species of concern applicable to project-level conservation are identified by many sources, including the Endangered Species Act, the Regional Forester's sensitive species list, the Black Hills National Forest MIS list, internal and public scoping efforts, and the BCC (USFWS Birds of Conservation Concern (USFWS 2002). All of these sources and their respective species of concern except the BCC have been examined elsewhere in this document

The BCC 2002 publication partitions North America into 37 BCRs (Bird Conservation Regions). The Black Hills is included in BCR 17 – Badlands and Prairies. Of the 24 bird species found in BCR 17, eleven are duplicated on the Regional Forester's sensitive species list and were evaluated in the BA/BE if they have potential to occur in the Bugtown project area. A summary account of these species can be found in the BCR Table. There are six remaining species that could potentially occur in the Black Hills National Forest (planning area) but only two, the golden eagle and the red-naped sapsucker, have potential to be found within the Bugtown project area or affected by the proposed actions.

All of the alternatives would result reduced stand densities across the project area. This may result in a change in bird species composition in those areas. However, sufficient foraging habitat, hiding cover, and nesting habitat exists within and adjacent to the project area for migratory birds and other landbirds. Although species composition may change, nesting attempts may fail, or individuals may be displaced to other areas as a result of project activities, overall numbers of migratory birds and other landbirds would likely not change.

RANGE, NOXIOUS WEEDS and BOTANY

Affected Environment

The project has a diverse topography, ranging from broad plateaus with limestone rock outcrops in the north to deeply incised canyons in the south. White spruce is found along the major drainages, and on the north-facing slopes above the drainages, however ponderosa pine Woodland community types (Marriot and Faber-Langendoen 2000) dominate the majority of the area. Pockets of quaking aspen and paper birch are minor components throughout the analysis area.

There are two main ponderosa pine woodland community types present, Ponderosa pine/Common juniper (*Pinus ponderosa/Juniperus communis*) and Ponderosa pine/Western wheatgrass (*Pinus ponderosa/Pascopyrum smithii*) (Marriot and Faber-Langendoen 2000). Many of the Ponderosa pine/Common juniper communities have a very strong graminoid component, which according to Marriot and Faber-Langendoen (2000) is not typical for this community type. One South Dakota state-listed species (*Ceanothus fendleri* – Fendler's ceanothus, SDS2, ranking from NatureServe 2005) was found in a ponderosa pine community type.

The majority of the meadows in the analysis area are dominated by an introduced graminoid component, often Kentucky bluegrass (*Poa pratensis*) and/or Timothy (*Phleum pratense*). Recent studies have indicated that in general, the upland rangeland vegetation is in satisfactory range condition (USDA Forest Service 1997).

White spruce Alluvial Black Hills Forest (Marriot and Faber-Langendoen 2000) is present along portions of Vanderlehr and French Creeks. The well-shaded, northern slopes above these drainages commonly contain white spruce communities with intermingled paper birch. These alluvial bottoms and the north facing white spruce slopes have the potential of providing habitat for the Region 2 sensitive species, leathery grapefern. These areas were not surveyed intensively due to the seasonality of the survey and the lack of treatments proposed in the areas.

Range

There are portions of four grazing allotments in the project area as follows: French Creek Allotment, portions of North Pole and Pope Spring Units; Junction Allotment, portions of North, North Mile High, and South units; Limestone Allotment, portions of Windmill and Bear Springs units; and Tenderfoot Allotment, portions of Camp Custer, South Mile High and Vestal units. There are currently a total of 11 grazing permits, (two private land permits and nine term permits) within the analysis area.

Range condition, trend and inventory for the analysis area were measured on the various allotments in 1967, 1970, 1979, 1983, 1985, 1986, 1990, 1994 and 1995 (USDA Forest Service 1997a). Recent studies have indicated that in general, the upland rangeland vegetation is in satisfactory range condition (USDA Forest Service 1997).

There are numerous structural range improvements on federal land within the analysis area, including allotment boundary fences, unit division fences, and water developments. These developments will need to be protected during any timber treatment.

Noxious Weeds

The Crawford, Limestone II, and Limestone areas of the project area were surveyed for noxious weeds during treatment in 2004. It is known that there are at least 640 acres of noxious weed infestations in the project area. Previous disturbances within the project area and current infestations put this area at high risk for continued invasion. The infestations can be expected to spread at least 30 percent per year when there is disturbance. Treatment will be required to achieve the desired condition as described in the Forest Plan. Currently there are no suitable biocontrol sites known in the analysis area. However, if such sites are discovered, biocontrol will be incorporated into the treatment of noxious weeds in this area. Timely treatment and constant monitoring (and re-treatment as needed) can reduce infestations of noxious weeds by 20 percent per year. Areas in the project area that are disturbed will need to be revegetated (as called for in Standard 1110) to meet Objectives 230 and 231.

Documented noxious weed species found in the area include:

- Canada thistle (*Cirsium arvense*)
- Hound's tongue (*Cynoglossum officinale*)
- Musk thistle (*Carduus nutans*)
- Common tansy (*Tanacetum vulgare*)
- Common mullein (*Verbascum thapsus*)
- Black henbane (*Hyoscyamus niger*)

Botany

A botanical survey was conducted during October, November, and December 2004. Due to the seasonality of the survey, the survey focused on identifying possible Region 2 (R2) sensitive species habitat, collecting information related to plant communities, and identifying locations of target plant species (i.e. R2 sensitive species, state-listed species, and species of local concern). Topographic maps, aerial photos, and Hillshade, a GIS model which estimates high probability sensitive plant habitat based on the amount of shade, and therefore moisture, were used to determine survey areas within the analysis area. There were areas identified during the survey that may be suitable habitat for R2 sensitive species. No R2 sensitive species were found to occur in the project area. A review of existing data indicated there has not been that no R2 sensitive plant species have been found in the area in the past.

In the Bugtown project area, many of the north facing slopes that support white spruce (*Picea glauca*) and the drainage bottoms with running water may be habitat for leathery grapefern (*Botrychium multifidum)*, a R2 sensitive species. Forest Plan direction can be met by avoiding disturbance of those white spruce stands and areas of running water, and meadows located on limestone-derived soils therefore conserving the sensitive species habitat. See Appendix D for a summary of the Biological Evaluation completed for Botany.

Environmental Consequences

Impacts to range resources are mainly centered around changes in forage amount and quality resulting from timber removal and the introduction and spread of noxious weed species. The total amount of herbaceous and shrub production in the area varies as a result of the basal area and overstory density changes after timber and fuels management treatments are applied. Management activities that reduce the tree density of the forested stand would increase the amount of available forage. When there is an increase in forage in an area, there may be a reduction of impacts from grazing in other areas as grazing pressure would be reduced on those areas. However, the disturbance created by timber removal would create a seedbed for noxious weeds that could outcompete native vegetation.

Impacts to the sensitive plant species may be direct impacts, for example trampling, exposure to grazing, and mechanical damage. The impacts may be more indirect such as a change in the microclimate as a result in loss of habitat.

Direct and Indirect Effects

ALTERNATIVE 1 – NO ACTION

No treatment in the ponderosa pine stands may increase the potential for large scale, high intensity fire in the area as the number of dead and stressed trees increased due to mountain pine beetle infestation. large scale, high intensity fire would be a threat to the sensitive plant species habitat and structural range improvements in the area.

The predicted loss of pine cover resulting from lack of treatment may lead to an increase in forage production which aids in maintaining or improving the desired condition.

Noxious weed populations would be limited to current infestations unless disturbance occurred from natural events or large scale, high intensity fire. Noxious weed infestations are known to increase with large fire events.

ALTERNATIVE 2 – PROPOSED ACTION

If implemented, alternative 2 would increase the amount of available forage by decreasing the ponderosa pine density. Increasing the amount of forage available would lessen the pressure on primary range, which would aid in maintaining or improving the desired condition. There may be some short-term loss of grazing access during the timber harvest and/or thinning activities, but in the long term grazing distribution would improve as more areas became accessible.

The known Fendler's ceanothus (*Ceanothus fendleri*) occurrence is located within a site identified for Sanitation. The removal of individual pine trees that have live beetle brood in them should not have a detrimental effect impact on the ceanothus habitat, as the plant is located in a fairly open woodland. Direct impacts to the plant by equipment would be avoided by flagging the area to be avoided.

Reducing the risk of wildfire will help protect sensitive plant species habitat and structural range improvements. Although specific data is lacking on the Black Hills National Forest, the earlier successional conditions that occur with opening the overstory canopy could produce conditions that would be beneficial to site colonization by wind-dispersed, spore-producing *Botrychium* species, if the associated mycorrhizal species and other microsite conditions are present (Farrar 2004).

There are no beetle or fuel treatments proposed for areas that might be probable R2 sensitive species habitat such as the spruce sites, the drainages with running water, and the meadows formed over limestone-derived soils.

The post harvest activities (kv) proposed in both action alternatives may enhance and/or protect sensitive species habitat.

Under Alternative 2, 10,740 acres may be disturbed as trees are dropped and skidded to landing decks and understory fuels were treated. Thus skid trails, landings, burn piles and areas where machinery would be working would create a seedbed for noxious weeds.

Past experience indicates that populations of plants with pappiferous fruit, such as Canada thistle (*Cirsium arvense*), have the potential to spread 30 percent a year with disturbance. The amount of disturbance is dependent on the type of equipment used and the time of year. Winter logging in areas currently infested can lessen disturbance and the potential spread of non-natives.

It would be critical that the proposed post harvest activity of using herbicides for noxious weed control be implemented to mitigate the spread of non-natives. Biological controls would be considered for use in areas that were difficult to access, and in riparian areas that were infested. Monitoring of both the effectiveness of treatment and the effect of treatment on sensitive species individuals/habitat would be essential (see Appendix C).

There are various post harvest activities such as fencing, water development, thinning, signing, riparian habitat improvement, and noxious weed control activities proposed for the area. The effects of these projects are summarized in Table 3.36:

Table 3.36: Post Harvest Activities

Post Harvest Activity	Rangeland Vegetation	Sensitive Species Habitat
Fencing	***All these projects would help the rangeland vegetation by either improving livestock distribution and alleviating grazing pressure in other areas, or by allowing for the rehabilitation of native vegetation***.	Benefit as habitat may be enhanced
Water Developments		Benefit as habitat may be enhanced
Thinning		No effect
Riparian Habitat Improvement		*****Benefit as habitat may be enhanced
Noxious Weed Control		*****Benefit as habitat may be enhanced, as long as individual plants are protected
Signing	No effect	No effect

*The effects of the noxious weed control and the riparian habitat improvement on the sensitive species habitat present would need to be monitored.

ALTERNATIVE 3

If implemented, Alternative 3 would have the same effects as Alternative 2 except as follows:

- The 2,637 fewer acres of commercial thinning/POL/Sanitation would result in less available forage and decrease the likelihood of maintaining or improving the desired range condition.

- Fewer acres of fuels treatments may increase the potential for large scale, high intensity fire in the area. Large scale, high intensity fire would be a threat to the sensitive plant species habitat and structural range improvements in the area

Cumulative Effects

The cumulative impact area for this analysis is the Bugtown project area and includes private land. The cumulative effects analysis considered past, present and future activities summarized in Appendix E. Activities beyond the project area have a diminished effect on the rangeland vegetation and sensitive species habitat within the project area. The timing limit for the cumulative effects analysis is estimated at 20 years, ten years prior to the present and ten years into the future, which allows for an adequate length of time to record vegetative changes.

Alternatives 2 and 3 have the potential to introduce and increase the rate of spread of noxious weeds and other exotic plants. This could be detrimental to sensitive plant species and native rangeland vegetation, as invasive species have the ability to out-compete desired native plants. The herbicides used in noxious weed control could also be detrimental to sensitive plants if the individuals were inadvertently exposed to the herbicides. The project design would minimize the potential for noxious weed and exotic plant dispersal. Herbicide treatment of noxious weeds would be closely monitored to insure that sensitive plants were not impacted.

Past timber harvest/thinning may have created, and any future timber harvest/thinning may create, transitory range in the area. Transitory range is an area that temporarily produces an increase in rangeland vegetation due to the removal of the tree overstory. Thus, the amount of available forage is expected to increase, temporarily, with timber harvest or heavy beetle caused mortality. Increasing the amount of forage available can lower the level of livestock utilization, which can lead to maintaining or improving the satisfactory condition of the rangeland vegetation. Removing timber and thinning existing stands of ponderosa pine may reduce the chance of large scale, high intensity fires that may threaten the sensitive plant species habitat. Removing timber and thinning existing stands of ponderosa pine may also create earlier successional conditions that would be beneficial to site colonization by wind-disperse, spore-producing *Botrychium* species, if the associated mycorrhizal species and other microsite conditions are present.

Any activity that causes soil disturbance has the potential to introduce and increase the rate of spread of noxious weeds and other exotic plants. This can be detrimental to sensitive plant species and native rangeland vegetation, as invasive species have the ability to out-compete desired native plants. The herbicides used in noxious weed control can also be detrimental to sensitive plants if the individuals are inadvertently exposed to the herbicides.

There is no new road construction planned for this project, however it is possible there will be new roads constructed in the area in the foreseeable future. Aside from the direct impact on the vegetation (ie – removal of vegetation, soil compaction and introduction of invasive species), road construction has the indirect impact of making formerly inaccessible areas available to both humans and grazing animals. Opening a new area to

grazing can have a positive impact, by helping to distribute grazing animals. It can also have a negative impact by allowing access to areas that may be sensitive species habitat. The likelihood of gates being left open (which increases the chance of livestock being in unauthorized areas) increases as the number of roads increase.

In the Bugtown area, the primary impacts from recreational use to the rangeland vegetation resource are the negative direct impacts to the vegetation (ie – removal of vegetation, soil compaction, introduction of invasive species) that result from off-road travel. Off-road travel also indirectly impacts the rangeland vegetation resource by increasing the likelihood of gates being left open by the public. Leaving gates open makes livestock management difficult and often results in livestock being in unauthorized areas. Recreational use in an area increases the likelihood of plant collecting which can have an impact on sensitive species populations.

When properly managed, livestock grazing could have positive impacts on the rangeland vegetation. In the Bugtown area, the known sensitive species habitat is in locations that are not readily accessible by grazing animals.

An increase in the development and subdivision of private land in the area may lead to an increase in the introduction of exotic plants and noxious weeds. Treatment of noxious weeds on National Forest would be expected to be sufficient to reduce the potential for weed populations to increase overall. Development of private land in the area could lead to an increase in the likelihood of gates being left open which would increase the chance of livestock being in unauthorized areas. The increase in development of private land could result in direct impacts to sensitive plant species and/or their habitat if they occur in those specific development locations.

All of the above uses are limited in intensity and duration and therefore when combined with the alternatives analyzed, including the No Action Alternative (Alternative 1), do not result in cumulative impacts to the rangeland vegetation, nor to the sensitive plant species.

RECREATION

Affected Environment

The project area is designated as Roaded Natural in the Recreation Opportunity Spectrum. Motorized, off-road motorized, and over-the-snow motorized travel is allowed unless restricted by a project decision.

There are no developed recreation facilities within the project area. There are approximately 3 miles of groomed designated snowmobile trail and trailhead in the area. Approximately 1 mile of the Bear Mountain Ski trail is located in the project area. All of the recreation in the area is dispersed in nature and includes activities such as snowmobiling, OHV (Off-Highway Vehicle) travel, hiking, camping, sightseeing, cross country skiing, and hunting.

Field surveys of the project area were conducted during the fall/early winter of 2004 by Forest Service recreation staff. Contacts were made with the South Dakota Black Hills Trails staff as well as the Mystic Ranger District Recreation/Trails Staff.

The affected snowmobile trails are sections of trail numbers 2B, 2S, and 2. Trail 2S begins at a parking area trailhead with a portable warming hut set up during the winter months in an area known as Sourdough Draw. It travels about 1 mile to connect to the main trail 2. Trail 2B is a half mile spur off of trail 2 to Bear Mountain Lookout Tower. These trails occur on sections of FSRS (Forest Service Road System) 293.1A, 293, 293.2B, and 291.3A, along with unclassified roads U300004 and U290052. The designated snowmobile season trail closure order restricts motorized vehicle and plowing on these roads from December 15 to March 31 annually. Snow levels are not always reliable on these trail sections compared to northern areas of the Forest, according to State of South Dakota Staff responsible for maintaining the snowmobile trail system. This makes these trail sections marginal for grooming on a regular basis. However, the parking lot trailhead may see as many as 20 to 30 trailers when there is good snow to provide a well-groomed base for snowmobile enthusiasts. It is estimated from snowmobile registrations that the Black Hills National Forest sees 80,000 plus trail riders in a good snow year. Most of these riders will visit the project area on trail number 2 and the 2B spur to Bear Mountain Lookout where a grand vista awaits.

A short section of Bear Mountain Ski Trail enters the district boundary from north of the Bear Mountain Lookout Tower and follows unclassified road U300003 to the summit. This ski trail area is closed to snowmobiles under a Black Hills Travel Order from December 15 to March 31, annually. The trail was closed to the public for winter logging activities in 2004-2005. The Mystic District characterizes the cross-country ski trail use as low with up to two skiers on an average day when snow conditions allow. This trail is marginal for snow sports, as is the nearby snowmobile trail, because it is not located in a heavy annual snow area. The ski trail sees more use during the summer months as a hiking trail that is maintained by the nearby Boy Scouts (BSA) at Medicine Mountain Scout Ranch. They have up to 100 scouts per year hike the trail to the summit and spend the night near the lookout to earn a camping badge. This use is authorized under a special use Outfitter and Guide permit to the BSA. This is the only recreation special use authorization in the project area.

The rest of the project area is used as a dispersed recreation area for activities such as OHV travel, hunting, mountain biking, and camping. The highest historical use period is during the fall big game hunting season. It is not uncommon to see up to six hunting vehicles parked along the roads during any day of this season. Spring Turkey season is the next highest use time for dispersed recreation but not to the level of the big game season. The area is heavily roaded and provides outstanding opportunities for OHV travel. Heaviest OHV use, where it is typical to observe at least one party of riders most days during the summer months, is around the area south of the Custer Limestone Road in the Wabash Timber Sale. This area is classified as MA5.4 and is closed during late fall to spring to motorized travel for Winter Big Game Habitat. All other roads in the project area are open for OHV travel with the exception of winter closures for the snowmobile trail and cross country ski area around Bear Mountain.

Driving for pleasure on gravel surfaced roads, mountain biking on primarily unclassified roads, and car camping occur in the project area as well. The Custer Limestone Plateau located in the middle of the project area is a short distance from the town of Custer and provides a close location for these activities. The ability to visit Bear Mountain Lookout on good gravel roads and attain scenic vistas from its 7,166 feet elevation in less than an hour drive from Custer makes it a popular summer attraction.

Environmental Consequences

Direct and Indirect Effects

The alternatives do not propose any permanent change to recreational uses, including motorized use and open roads. The effects of the alternatives to the recreation resource are related to the expected change in landscape features and short-term impacts occurring during project implementation.

ALTERNATIVE 1 - NO ACTION

The expected increased mortality of dense stands of timber due to Mountain Pine Beetle infestation within the next 5 years will cause this area to be a less desirable place for the public to recreate. The visual aesthetics will be degraded as the views will encompass larger areas of dead trees rather than a green forest. Standing dead trees will pose a risk to forest users and may fall across roads and ski or snowmobile trails.

The potential for large scale, high intensity fire is the greatest under this alternative. Wildfire has a direct impact of changing the landscape in many ways. When large scale, high intensity wildfire happens, the resultant soil disturbance from water erosion can affect recreation travel corridors making many areas inaccessible. This would be particularly true along major drainages such as French Creek, a popular area for horse, foot, and OHV travel. This effect was seen on the Hell Canyon Trail as a result of the Jasper Fire in 2000, which will be recovering for many years yet to come. Tourism tends to decrease after large-scale wildfires, as evidenced by a reported decrease of 50 percent in outfitted use by the public in the year 2000 on the Hell Canyon District when the 82,000-plus acre Jasper fire occurred . It was the largest recorded wildfire in Black Hills history.

ALTERNATIVE 2 – PROPOSED ACTION

This alternative will have positive effects on recreation in the long term (more than 5 years) with some short term (less than 5 years) negative effects. The short term negative effects on recreation are increased dust; noise and activity during vegetative treatments; loss of aesthetics due to logging slash, road work, and other associated disturbance; periods of smoke from pile burning; loss of big game hunting opportunities during harvest activities; and possible closing or relocating a section of the snowmobile trail system and the Bear Mountain Ski Trail. The BSA has alternative sites for activities authorized in their current permit outside of the project area, should the trail need to be

closed during harvest operations. All of these impacts would be limited in scope and duration.

The long term positive effects are related to maintaining a green, live forest in the future, rather than one with large areas of dead trees. Live trees would be less likely to fall across roads and trails used for recreational travel, dispersed camping, and hunting. The area would be more aesthetically desirable to the average forest user than under no action due to the maintenance of live, forested vegetation. The potential for a large scale, high intensity wildfire is dramatically reduced under this alternative. The negative effects of a wildfire, as discussed under alternative 1, would be less likely to occur.

ALTERNATIVE 3

The effects expected under this alternative are similar to those described in Alternative 2. Alternative 3 differs from Alternative 2 by deferring commercial treatments on approximately 2,637 acres. This would result in more dense stands remaining on the landscape. These stands would be more susceptible to mountain pine beetle attack. The proposed treatment, however, would reduce the expected beetle-caused mortality in the project area as a whole, just not to the same degree as Alternative 2. There would be an increase in the potential for large-scale wildfire to occur as compared to Alternative 2, but the potential would be much less than expected with no action.

Cumulative Effects

The cumulative effects area is the project area because outside activities have not had impacts within the project area. The cumulative effects analysis considered past, present and future activities summarized in Appendix E. Activities within the project area that may result in adverse cumulative effects have been considered from 5 years into the past and 5 years into the future because these activities have the potential to cause cumulative effects.
There has been no change to motorized recreation opportunities within the project area in the last 5 years and none is proposed under any alternative. There is potential for change within the next 5 years as the Forest considers an OHV management plan for the Black Hills. No decisions or recommendations have been made for the project area.

Use of the project area for dispersed recreational activities has been little affected by past activities. As with the action alternatives, past management activities tend to cause short term, localized disruptions in recreational use. Lack of management would be expected to result in large areas of dead trees. Changes to aesthetic values may make the area less desirable, but would not preclude use. No future activities are known which would impact dispersed recreation in the project area.

Use of the snowmobile and ski trails is largely dependent upon snow levels. The only impact from the alternatives would be the varying potential for dead trees to fall on these trails and a potential short term re-routing during management operations.

No cumulative effects to recreation are expected under any of the alternatives.

VISUAL QUALITY

Affected Environment

The Bugtown Gulch project area is located northwest of Custer in the Black Hills National Forest. Homeowners travel through the project area to get from Custer, or major travel routes (Hwy. 16 or 385) to their residences, year-round. Recreationists and permittees also cross this area. During the spring and fall, the area is well traveled by hunters.

Landscape Character

Landscape character gives a geographic area its visual and cultural image, and consists of the combination of physical, biological, and cultural attributes that make each landscape identifiable or unique. Existing landscape character may range from predominantly natural landscapes to those that are heavily culturally influenced. The landscape character units are derived from an ecological framework utilizing ecological land descriptions and existing landscape uses. Ecological units are the mapped landscape analysis units used for ecosystem planning and management. The visual image created by the physical, biological, and cultural factors in the ecological land unit description helps define the landscape character for scenery management. The Bugtown Gulch project area is located in the western portion of the Harney Range Portion of the Mountainous/Mixed Forest Landscape Character Unit.

The Mountainous/Mixed Forest LCU (Landscape Character Unit), Harney Range Portion includes ponderosa pine as the predominant tree species, covering more than 90 percent of the area. Composing perhaps the most striking vegetation throughout this LCU are the mature ponderosa pines called ``yellow-barks'' which majestically tower over the road corridors. Granite outcrops, spruce, aspen, other hardwoods, and meadows comprise the remaining 10 percent. The ponderosa pine forest is dense with some openings at the lower elevations. Adjacent to meadows the ponderosa pine overstory is open and the trees occur at much lower constancy and frequency than other areas. Lower elevations sometimes contain pockets of oak and cottonwood.

Management of this area includes timber harvest, grazing, and mining activities. Although these activities are occurring and have occurred in the past they are subtle and for the most part not visually dominant.

There are residents who live on scattered parcels of private land. Some are permanent residents, while others live in cabins or retreats only during the warmer months.

Scenic Class

Scenic Class is used to compare the value of scenery with the value of other resources. The components of Scenic Class are Scenic Attractiveness (which is based upon human perceptions of the intrinsic beauty of landform, water characteristics, vegetative pattern,

and cultural land use) and Landscape Visibility (which is based upon the distance zones from the observer and the concern level for scenery).

The higher the Scenic Class, the more important it is to maintain the highest scenic value. The inventoried Scenic Class Values, on the Black Hills National Forest, are 1 (Highest), 2, 3, and 4 (Lowest). The scenic class values demonstrate the importance of the views in different areas. Approximately 1 percent of Bugtown Gulch area is designated as Scenic Class 1, 55 percent in Class 2, 32 percent in Class 3, and 12 percent in Class 4.

Scenic Attractiveness

This determines which landscapes are most important and those that are of lesser value from the standpoint of scenic quality. The classification is based on the premise that all landscapes have some value, but those with the most variety or diversity have the greatest potential for high scenic value. The combination of valued landscape elements such as landform, water characteristics, vegetation, and cultural features are used in determining the measure of scenic attractiveness.

Scenic attractiveness classifications are: Class A - Distinctive, Class B - Typical, and Class C - Indistinctive. Class A refers to unusual, unique, or outstanding scenic quality. Class B refers to ordinary or common scenic quality. Class C refers to low scenic quality. Approximately 9 percent of the Bugtown Gulch area is in the Class A - Distinctive classification, 62 percent in the Class B – Typical, and 29 percent in the Class C – Indistinctive.

Landscape Visibility

Travelways and use areas are identified and classified during the Forest-wide planning process, in order to determine which observer locations, and their importance, to use in the landscape visibility analysis. Sensitivity Level 1 travelways that lead to important scenic features, residential areas, resorts, recreation areas, unique natural phenomena, wilderness trailheads, national parks, and state and county parks, attract higher percentage of users having high concern for scenic quality, thus increasing the importance of those travelways.

There are no Sensitivity Level 1 travelways in the Bugtown Gulch project area. Sensitivity Level 2 travelways within the project area or along the boundary include Forest Service Roads System (FSRS) 284, 285, 286, 287, 288, 291, 292, and County Road T317.

Existing Scenic Integrity

Existing scenic integrity represents the current status of a landscape. It is determined on the basis of visual changes that detract from the scenic quality of the area. Existing scenic integrity is the current visual state, which is measured in degrees of deviation from the natural appearance of the landscape character type. The existing scenic integrity of

the Bugtown Gulch area is generally Moderate to High, depending upon viewing location and distance.

Scenic Integrity Objectives (SIO)

Scenic Integrity Objectives are the management objectives that were adopted from the scenic class values. Scenic Integrity is a measure of the degree to which a landscape is visually perceived to be "complete". The highest scenic integrity ratings are given to those landscapes that have little or no deviation from the character valued by constituents for its aesthetic appeal. Areas with a High Scenic Integrity Objective should appear natural and management activities should not be visually evident. Areas with a Moderate SIO should only appear slightly altered from the more naturally appearing forest. Area with a Low SIO should appear moderately altered from a natural state.

Within the Bugtown Gulch area, approximately 1 percent has a HIGH SIO, 53 percent a MODERATE SIO, and 46 percent a LOW SIO.

Environmental Consequences

Direct and Indirect Effects

ALTERNATIVE 1 – NO ACTION

The expected mountain pine beetle-caused mortality under this alternative would result in whole hillsides of dead trees. These trees would generally remain standing for 5 to 15 years, depending upon wind, rate of decay, and size of the tree. As these trees fell, these areas would be more visible in the landscape as large openings. During periods when the ground would be snow covered, these areas wwould be highly visible in the landscape. These areas may, or may not, be similar in shape and size to meadows and other existing natural open areas in the landscape. Eventually seeds carried in the wind from the surrounding trees would land in the area, new trees would sprout, and the area would recover. The potential for large scale, high intensity fire to occur is the highest under this alternative. The impacts of a large-scale, high intensity wildfire would be similar to those discussed for beetle-caused mortality.

In areas with a High or Moderate SIO, large areas of trees killed by fire or insectswould move away from the desired future condition for more open park-like stands. In small areas, such as 1 to 3 acres where trees are killed, a mosaic of tree sizes and openings would be maintained that would move toward the desired future condition. In some areas where the insect attacks dominate the landscape, large open areas exceeding the size of openings normally found in this area could be created, dramatically changing the appearance of the forest.

ALTERNATIVE 2 – PROPOSED ACTION

How well commercial treatments blend into the characteristic landscape and meet the Scenic Integrity Objective (SIO) is based upon the slope, aspect, and vegetation remaining on the site. Reducing soil disturbance, uneven spacing of the trees remaining

in the landscape, and cleaning up the slash (branches and tree tops left when trees are commercially removed from the forest) to natural levels could result in an appearance that is in harmony with the landscape character, often resulting in a higher SIO being achieved.

Variable Density Cuts generally mimic natural vegetation spacing patterns that blend in to the natural character of the landscape. Stumps would be evident in the treated areas when viewed in the immediate foreground. This treatment method generally meets a Moderate to High SIO.

Commercial thinning could result in a uniform appearance of the remaining forest stand, both in size and spacing. In the Foreground and Middleground, textural differences would be the most evident while in the Background, textural changes might be evident, but form, lighting (shadows), and color differences could be the most evident. Commercial Thin treatment methods generally meet a Moderate to High SIO.

Sanitation treatments would remove the live trees that exhibit the signs of being under attack by mountain pine beetle. Beetle hit trees may occur individually or in groups which would create openings. These openings would mimic natural openings in form and scale that, even though apparent, would blend in with the natural character of the landscape. Stumps would be evident in the treated areas when viewed in the immediate foreground. This treatment method generally meets a Moderate to High SIO.

Byproducts of vegetative treatments include tops, limbs, and small trees that are cut up and placed on the forest floor. Once the needles on the down tops and limbs turned red, the slash on the ground would visually dominate the landscape. After the red needles fell, the slash generally would still dominate the landscape as light reflected off the dry gray limbs until the snow crushed it down, it decayed, or until it was chipped or mulched.

When slash is piled, it is usually burned within 1 to 2 years. Once the dried slash was burned, circular burn marks would be clearly evident on the ground. Normally, these burn marks would no longer be visible once new grasses and other vegetation grew up the following spring. Should any of these piles burn into the surrounding area, a low intensity fire would likely occur. Black scorch marks may be evident on the boles of the trees, from less than 1 foot to 3 feet in height but these marks would fade over time. After three years, they should blend with the bark on trees. Often shrubs are stimulated by fire and would begin to grow in these areas, depending upon the amount of tree cover. Areas that have received a low intensity fire often meet a High SIO within 1 to 2 growing seasons.

The quantity of slash, along with the treatment method, determines what level of scenic integrity can be achieved. Normally slash left to await a crushing snowfall would only meet a Low SIO. Piling and burning could meet a range from High to Low SIO.

POL (Products Other than Logs) and Fuel Treatments would result in the removal of understory trees within a stand. These treatments would result in screening from vegetation being reduced and views into the forest would be increased. Thinning the understory would further increase the emphasis and visibility of the larger diameter trees

in the landscape. Under story grasses and shrubs would be more evident, offering seasonal variety of light and color when spring flowers bloomed. When these activities were completed, they would generally meet a Moderate to High SIO.

This alternative would treat the majority of the planning area, resulting in a variety of tree densities and textures, from open to dense across the landscape. The dense, continuous layer of trees currently covering the forested landscape would have a diverse appearance across the project area. When viewed from less than one-half mile away, large individual trees could be easily identified since the view into the forest would be increased. These prescriptions would not create forms or lines on the landscape when viewed from a distance, as often can happen when most of the vegetation is removed. These prescriptions should create a textural pattern, similar to that found in a ponderosa pine ecosystem, where cool periodic fires thin the understory.

When viewed from beyond one-half mile away, textural differences would be more prevalent; however, these differences would be within the normal range currently found within the project area. Open areas, currently only evident in the valley bottoms, would be evident on the hill sides and throughout the area, mimicking natural patterns. These openings would be created whether the trees are removed or not; the trees would be removed by Sanitation treatments or the beetles would attack the trees, the trees would slowly die, and eventually the trees would fall. This alternative would likely reduce the size of the openings by slowing down or stopping the beetles. However, it would create these open areas more quickly than natural processes. This alternative would limit the amount of brown, insect-killed trees evident in the landscape.

There would be potential for hardwoods to emerge, creating a greater amount of fall color in these landscapes as a result of the removal of the dense overhead pine stands and reduced competition. As the thinned forest continued to grow and pine trees increased in diameter, leaving the “black bark stage”, the orange bark of larger diameter ponderosa pine trees would likely become more visible in the landscape. Up close, grasses, flowers, and shrubs may become more visible.

ALTERNATIVE 3

This alternative would treat fewer acres than Alternative 2. In addition, there would be less fuel treatments in the understory that would reduce the ability to see into the forest. This could result in a greater variety of tree densities and textures, from open to dense, across the landscape than Alternative 2. More areas of dense forest could be maintained in this alternative depending upon the level of beetle activity. Otherwise the effects would be similar to Alternative 2.

Cumulative Effects

The boundary on the ground for analyzing cumulative effects is primarily that of the project area, with some minor additions to the northeast and northwest. This identified area is the landscape that is evident in the foreground and middle ground from the main

travel routes. The additional areas allow the viewed landscape to be evaluated as a whole, such as when traveling along the bottom of a drainage, both visible sides of the drainage are included in the analysis.

The time boundary for this analysis extends from 1980 to present, including known management activities and activities that are planned but have yet to be accomplished. The cumulative effects analysis considered past, present and future activities summarized in Appendix E. Although fire suppression over the past century has played a role in the increased density of the vegetation on the forest, we have limited data specific for this planning area. Likewise, much of the forest was pre-commercially thinned by the Civilian Conservation Corp in the 1930's and 1940's, however we do not know if that effort included any or all of this project area. Review of fire history over the past century does not show any major fires in this planning area beyond the 2000 Jasper Fire.

Alternative 1 – No Action

If the insect activity does not abate within the project area, the Existing Scenic Integrity would steadily change as the trees continue to die and their red/brown color becomes more evident, and large openings are created. These dead and down trees can be highly evident in the landscape. During this process, the color and texture of the forest will differ from the current appearance. In approximately 30 years a young forest may have grown up and filled in these large openings – however, this would be dependent upon some mature trees surviving the insect attacks, to provide a seed source. If no mature trees survive the insect attack, the landscape would likely remain predominantly open and take much longer to become reforested.

Long term, natural changes in the landscape, such as from high intensity fire, insect activity and disease, will potentially change the character from a landscape with a forest overstory, to one that would likely contain large open hillsides, hillsides with fire-killed trees, and hillsides of young trees. "…Analysis of fire intervals from 1450 to 1998 yield a mean fire interval of 13 years with a range of 1 to 43 years." (Ecology, Silviculture, and Management of Black Hills Ponderosa Pine, page 40). The elimination of fire in the ecosystem, and any vegetation management (that mimics the removal of vegetation in the understory by fire), will increase the potential for natural events to occur within the vegetation that can dramatically change the landscape character. Depending on how wide spread, or concentrated, these natural processes occur would determine how dramatically these changes would be evident in the landscape.

Since 1980, vegetation management of approximately 8,947 acres has occurred or is under contract to be completed. This includes patch clearcuts, shelterwood prep / seed / and removal cuts, overstory removals, permanent land clearing and commercial thinning. These treatments can be quite evident, such as overstory removals, shelterwood removal cuts, shelterwood seed cuts, and patch clearcuts. Other treatments within the area, that tend to have a short term visible effect include 5,043 acres of pre-commercial thinning, aspen regeneration, aspen release, meadow restoration, and sanitation.

Remarkably few of these treatments are highly evident as one drives through the area on the main roads. Roads and power lines are linear forms that are located across the landscape, however due to the rolling landscape and the vegetation present, they generally are not evident, and where they are it is only a short segment that does not dominate the landscape. The area generally maintains a natural forested landscape appearance, particularly when viewed from the private land scattered throughout. Primarily when traveling on secondary roads are vegetation treatments more dominant. The exceptions to this are the areas impacted by the Jasper Fire in the northwest corner of the area and along the road to Bear Mountain Lookout - FSR 293.

Currently Mountain Pine Beetle activity is highly evident in large pockets west and south of Bear Mountain, with smaller pockets scattered throughout the planning area. This beetle activity will create conditions that will lead to openings in the vegetation. Small pockets of activity, where the beetles leave the area and move on will leave small openings that could be normally expected. However, where the beetles move steadily through an area, such as around Bear Mountain, where the majority or all trees are killed, large openings will be created – drastically changing appearance of the vegetation on the landscape.

At a minimum, the northwest corner of the area will have a Very Low Scenic Integrity as a combination of past management activities, roads, and beetle activity becomes more evident. The remainder of the area is expected to be in a similar condition within 5 years. Given the number of private homes and ranches and main roads in the area, the potential is high for their viewshed to be highly impacted by the current beetle activity, with a Moderate to Very Low Scenic Integrity being created in portions of the planning area. Therefore, this alternative is expected to result in an adverse cumulative effect on visual quality.

Alternative 2 – Proposed Action

This alternative, at most, will treat 10,740 acres, approximately 80% of the National Forest lands within the area. Given the commercial thin treatments, the current vegetation appearance would not be very different than the current condition. However, sanitation/salvage treatments could be more visible, particularly along east face of the ridges running north-south from Bear Mountain to Round Mountain. The east faces of this series of ridges are the most visible, and tend to form the backdrop for the whole area. The beetles are active, and pockets of killed trees are evident along this east face. If these pockets exceed 3 acres they could be quite evident. As long as the beetle pockets and the corresponding treatment stay small and scattered – and the beetle activity can be reduced (as a product of these treatments) a less dense forested landscape may be maintained across the landscape. Roads and other activities that change the natural contours may be more evident with the removal / thinning of the vegetation on the landscape. A forested backdrop to private land could be maintained with a Moderate level of Scenic Integrity being maintained in the planning area. Therefore, no adverse cumulative effects are expected to visual quality as a result of this alternative.

Alternative 3

Under Alternative 3, fewer acres would be treated than in Alternative 2. Due to the location of these areas that would not be treated - rolling terrain versus on the east side of the prominent north – south ridge line (Bear Mountain - Round Mountain), these areas will be less evident. The cumulative visual effect to the scenery, when the area is viewed from the main roads will be similar to Alternative 2. More high risk dense stands, and corresponding beetle activity, may be evident from secondary roads within the planning area. No Adverse cumulative effects to visual quality are expected under this alternative.

HERITAGE RESOURCES

Affected Environment

A Class I inventory of previous projects and previously recorded sites within the project area was conducted prior to fieldwork. Fifty-four previous Level III cultural resource surveys adequately covered portions of the project area and documented 50 cultural resource sites. A current Level III inventory was proposed and conducted for the remaining 4,819 acres. As a result of the Level I inventory, 52 previously recorded sites were identified within the proposed project area. As part of the current project, all eligible, potentially eligible, unevaluated, and unknown previously recorded sites were revisited to monitor and/or evaluate current condition and National Register of Historic Places (NRHP) eligibility status.

There are four sites which have been determined to be eligible for listing on the NRHP and four additional sites which are unevaluated and therefore, require the same consideration as eligible sites. These eight sites represent Euro-American occupation including homesteading, mining, and a CCC camp. There are no known TCPs (Traditional Cultural Properties) within the project area.

Environmental Consequences

ALTERNATIVE 1 – NO ACTION

If there is no federal action, then there is no undertaking, as defined in 36 CFR Part 800.16(y), for Section 106 of the National Historic Preservation Act (16 U.S.C. 470f). However, ***no action*** may result in the destruction of cultural resources due to the unchecked mortality of thousands of trees. These may include disturbance of archaeological contexts due to increased erosion (from tree mortality), tree falls on standing historic structures and prehistoric sites, destruction of historic wooden structures by large scale, high intensity wildfire due to increased fuel loads, and exposure of artifacts from increased erosion could increase the potential for collection and vandalism.

ALTERNATIVES 2 AND 3

Management actions include using thinning, sanitation, and salvage strategies to reduce

beetle infestations while minimizing adverse effects to natural and cultural resources. Associated actions include noncommercial thinning to reduce the risk of wildfires, further insect infestations, and to increase forest diversity. Proposed activities within the project area will also include landing construction, mechanical slash piling and burning, and wildlife habitat improvements.

Pursuant to Section 106 of the National Historic Preservation Act of 1966 (as amended), the Office of the South Dakota State Historic Preservation Officer (SHPO) concurs with the determination of No Adverse Effect for the proposed undertaking on the non-renewable cultural resources of South Dakota, provided that the mitigation stipulations in the cultural resources report are followed, such that sensitive areas and features within the boundaries of all eligible sites are marked for avoidance. Avoidance measures for these sites and adjacent project activities will be monitored by an archaeologist. All unevaluated sites will also be marked for avoidance. No ground disturbing activities should occur within the boundaries of these sites and all avoidance measures monitored by an archaeologist. If during the course of any ground disturbance related to this project, any bones, artifacts, foundations, or other indications of past human occupation of the area are uncovered, the project must be temporarily stopped until the SHPO has been notified and had a chance to comment. Concurrence of the SHPO does not relieve the federal agency official from consulting with other appropriate parties, as described in 36 CFR Part 800.2(c).

Cumulative Effects

The cumulative effects analysis considered past, present and future activities summarized in Appendix E. The loss of archaeological resources has happened in the past and will happen in the future. Over time fewer archaeological resources will be available to learn about past human life-ways, to study changes in human behavior through time, and to interpret the past to the public. Recording and archiving basic information about archaeological sites in the proposed project area serves to partially mitigate potential cumulative effects to cultural resources.

Other cumulative effects to cultural resources may be the result of natural processes of unchecked beetle infestation and fuels loading. The death of a large number of trees from a Mountain Pine Beetle infestation will increase the rate of surface erosion. As a result, archaeological contexts are in danger of exposed and made visible to collectors and vandals. High tree mortality may also result in a higher risk of large scale, high intensity wildland fire that could destroy perishable cultural resources, such as historic wooden structures. High tree mortality and subsequent tree falls could also result in historic and prehistoric cultural resources being destroyed or covered.

LANDS and SPECIAL USES

Affected Environment

There are a total of twelve private parcels of land within the Bugtown project area with the remainder of the land base consisting of federal land administered by the Forest Service. These in-holdings are surrounded by National forest. Several of these private parcels are subdivided into smaller tracts and include the Danby Park, Fork I and II, and Big Medicine Subdivisions. Access to private land is provided through system and/or non-system forest roads.

The specific objectives outlined in the Forest Plan are identified in Objectives 502 and 503 to provide timely response to landowners for access across National Forest land and acquire right-of-ways to improve Forest Service access. No additional access needs through private land was identified for this proposal.
There are currently six FLPMA (Federal Land Policy and Management Act) easements and two FRTA (Forest Road and Trails Act) easements issued within the project area. The FLPMA easements are issued to private landowners and the FRTA easements to Custer County. The County is responsible for the maintenance of several forest roads that serve the more heavily populated areas. There is also a Forest Service look-out tower and communication site that includes State communication equipment. It is located Township 2 South Range 3 East Section 15.

Environmental Consequences

Direct and Indirect Effects

ALTERNATIVE 1 – NO ACTION

This alternative would not have any effect on the lands resources. There could be an increased threat of wildfire due to higher bug mortality. A fire might start on private land and move on to National forest or from forest on to private land. Applications for small tracts acts, special use permits, easements, and opportunities to acquire right-of-ways through the Lands and Special Uses programs would continue to be considered.

ALTERNATIVES 2 AND 3

These alternatives would not have any effect on existing easements or special use permits. Short-term effects include dust and noise from increased traffic during harvest operations. Reduction in dead and down material could help reduce fire intensities, making it easier to stop should a fire start on forest and endanger private property.

Cumulative Effects

There would be no adverse cumulative effects because no direct or indirect effects would occur under any alternative.

ECONOMICS

The economic analysis for this project was conducted using the software package QUICKSILVER (QUICKSILVER v. 5.003 - USDA Forest Service Economic Analysis Tool, 1997). The financial analysis only includes direct costs and revenues to the Forest Service. The analysis only includes those actions connected to the project that will occur over the next 5 to 10 years. The financial analysis does not include an estimate of non-monetary values for recreation, wildlife, and forage.

The following sections describe costs and revenues that are used in the analysis and their source. In addition, any assumptions that may affect the analysis are presented. Most assumptions are designed to simplify the analysis. Though costs could be distributed in different ways over the analysis period, the important aspect is to keep assumptions consistent across alternatives to facilitate meaningful comparisons. In situations where actual economic returns are an issue and decision criteria, it would be necessary to do a more exact analysis. In this analysis, the most important information is relative differences between alternatives. In most cases where assumptions depart from what would normally be expected, the assumptions result in a lower economic value than what would be expected, or are designed to be consistent with other assumptions in the analysis. Scheduling of activities that follow the sale is based upon a 5-year sale length and current district experiences in the timing of activities.

Costs

Sale preparation/administration costs are based upon a 3-year average of costs for the Forest. Normally, all of the administration portions of costs are spread out over the contract period. Rather than trying to develop specific assumptions on what costs occur in what year, all the costs are lumped in year 1. This assumption results in a lower economic value than if the costs were spread out.

Road costs are based upon the estimated costs given the amount of work that needs to be done.

Costs for pre-commercial thinning, fuels treatments, and weed control are all based on the recent planning costs used in recent timber sales. The costs include district administration and overhead. Also, some design criteria costs have been added in.

Benefits

The stumpage values are the average experienced on the forest as documented by the Regional Office. The revenues are assumed to occur all at one time. This assumption simplifies the situation that would normally occur with the revenues occurring throughout the life of the sale. This assumption by itself would tend to raise the economic value of the project, but it is consistent with the assumption on sale administration costs, which tend to lower the economic value of the project.

All cost and benefit values are entered into the “Quick-Silver” program. This program analyzes the costs and benefits for a variety of investments or operations in order to compare the economic performance (costs and revenues) associated with each alternative. The results of the analysis are displayed in Table 3.37 below. The values shown are intended to show relative efficiency of each alternative and serve as a means of

comparing alternatives. The values will fluctuate with changes in costs and stumpage values, and do not reflect actual costs and revenues.

The only benefits included in this analysis were those revenues associated with the sale of sawtimber.

Table 3.37: Financial Analysis Results by Alternative for the Bugtown Gulch Mountain Pine Beetle and Fuels Project.

Financial Measure	*Alternative 1 – No Action*	*Alternative 2*	*Alternative 3*
Present Value Costs	0	-$3,351,491,	-$2,744,744
Present Value Benefits	0	$2,888,400	$1,937,200
Present Net Value	0	-$463,091	$807,544
Benefit/Cost Ratio	0	0.86	0.71

ALTERNATIVE 1 – NO ACTION

As documented in this EIS, Alternative 1 poses the greatest risk of large scale, high intensity wildfire within the project area. Although potential costs associated with such an occurrence is not integrated into this financial analysis, the actual cost of no action could potentially be much higher than the action alternative in both economic and environmental terms. Recent large wildfires on the Black Hills have experienced costs in the millions of dollars for suppression alone. For example, suppression costs for the 2003 Battle Creek fire on the Mystic Ranger District are estimated at $6.5 million and the 2000 Jasper fire on the Hell Canyon Ranger District at approximately $11.5 million. Costs of rehabilitation, economic loss of resources and property values are significant additional costs of these wildfires.

There will not be any costs or benefits associated with the No Action Alternative.

ALTERNATIVE 2 – PROPOSED ACTION

Alternative 2 produces the greatest revenues, but also has the greatest associated costs. This alternative shows a benefit/cost ratio below zero because associated costs are higher than associated benefits. For this project, the only benefit included in the analysis is the expected timber revenues. This project includes considerable costs associated with pre-commercial vegetation treatments. These treatments are included in the project to reduce the potential for wildfire, particularly around private lands, and to manage stand density. These pre-commercial treatment costs are a contributor for the negative PNV (Present Net Value) in this alternative. Management of understory fuels is labor intensive and therefore, costly.

This alternative has the greatest impact in terms of reducing mountain pine beetle-caused mortality and the potential for large scale, high intensity wildfire and the economic and environmental costs associated with both. This difference is not reflected in the financial measures shown above.

ALTERNATIVE 3
The main factors leading to the differences in financial measures between Alternatives 2 and 3 are the volume of timber harvested (benefits) and differences in the number of acres treated (costs). Alternative 3 does not harvest as much timber as Alternative 2, resulting in less revenue. However, costs associated the timber sale and post sale activities are lower than Alternative 2. Alternative 3 would result in a somewhat higher risk for mountain pine beetle-caused mortality and large scale, high intensity wildfire than in alternative 2, but again, would be dramatically lower than the risks for alternative 1.

Short-term Uses and Long-term Productivity

NEPA requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). As declared by the Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

Please refer to the Silviculture and Soils sections in this chapter for a discussion related to short-term uses and long-term productivity.

Unavoidable Adverse Effects

The following is a description of adverse effects that are unavoidable with implementation of action alternatives. Project design criteria (see Appendix B) is included which will lessen these effects as much as possible. For further discussion of the effects on the resources listed below, see Chapter 3 under the respective resource topics.

Wildlife Habitat: Certain species of wildlife will be adversely affected to varying levels with implementation of the action alternatives.

Soils: It is possible that soil erosion or compaction may occur.

Travel: During project implementation, there will be increased traffic on project area roads. Short-term increases in noise and dust levels will occur.

Recreation: Short-term displacement of users on the snowmobile and ski trails will occur during implementation.

Visual Quality: will be adversely affected for some observers by the various levels of vegetation treatment and other actions planned.

Heritage Resources can be disturbed or destroyed where human or natural activities take place.

Fire/Fuels hazard will be increased during the short-term in some areas as a result of slash created from vegetation treatment. With disposal treatment this hazard will be reduced. Alternative 1 (No Action) would have a higher long-term potential for large scale, high intensity wildfire than the action alternatives.

Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line rights-of-way or road. For further discussion of the effects on the resources listed below, see Chapter 3 under the respective resource topics.

Irreversible Commitments: There are no irreversible commitments of resources under any alternative.

Irretrievable Commitments: These include the timber harvested, loss of future growth on that harvested timber, as well as snags removed.

Cumulative Effects

Cumulative effects are addressed in environmental consequences 'topic' discussions earlier in this Chapter.

Other Required Disclosures

NEPA at 40 CFR 1502.25(a) directs "to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with …other environmental review laws and executive orders."

The project does not involve impounding or diverting water, , or adverse impacts to threatened or endangered species, therefore, formal consultation with the Fish and Wildlife Service under the Fish and Wildlife Coordination Act is not required.

No ground disturbing actions would occur in known eligible historical places. Section 106 of the National Historic Preservation Act has been conducted as required and the State Historic Preservation Officer has concurred with a finding of no impact to eligible historic or prehistoric sites.

A specific consideration of equity and fairness in resource decision-making is encompassed in the issue of environmental justice. Executive Order 12898 provides that "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority population and low-income populations". No adverse effects from the proposed actions to minorities or low-income populations are known.

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CHAPTER 6 LIST OF PREPARERS

Interdisciplinary Team

Michael Lloyd

District Ranger - Bachelor of Science, Outdoor Recreation, Colorado State University, 1973; minors in soil science and forestry. Twenty-one years of Forest Service experience as a District Ranger on the Shoshone, Arapahoe-Roosevelt, and Black Hills National Forests. Two years experience as a field soil scientist with the Soil Conservation Service. Two years experience with the Forest Service as a Forest Soil Scientist and four years experience as District Staff.

Kelly Honors

ID Team Leader – Bachelor of Science, Forestry, State University of New York, College of Environmental Science and Forestry, 1985. Bachelor of Science, Environmental Science and Forestry, Syracuse University, 1985. Nineteen years of Forest Service experience at the district level in timber and planning; sixteen years of those years at Black Hills National Forest. Fifteen years experience in writing NEPA documents.

Patricia Hudson

Co- ID Team Leader – Bachelor of Science, Forest Management, Stephen F. Austin State University, 1990. Fifteen years of Forest Service experience at the district level as a silviculturist, NEPA planner, and program manager in Texas, Oklahoma, Arkansas, Wyoming, and South Dakota. Program manager for planning, timber sale preparation, wildlife, GIS, and fuels on the Hell Canyon Ranger District of the Black Hills National Forest.

Donald Boone

Silviculturist – Bachelor of Science, Forest Science, University of Wisconsin-Madison, 1979. Twenty-five years of Forest Service experience as a Forestry Technician, Pre-Sale Forester and Silviculturist on the Routt and Black Hills National Forests. Six years experience with the South Dakota Division of Forestry and two years experience with Custer State Park, South Dakota.

Kurt Allen

Entomologist – Master of Science, Forestry and Entomology, Iowa State University. Fourteen years of Forest Service experience in New Hampshire and South Dakota as an entomologist.

Margaret Farrell	GIS/Database Management Specialist – Bachelor of Science, Geology, University of Wyoming, 1985. Fifteen years of Forest Service experience in database management, including nine years experience in ESRI GIS products.
Thomas Willems	District Archeologist- Master of Science, Anthropology/Archaeology, University of Wisconsin-Milwaukee, 1998. Seven years experience as a Registered Professional Archaeologist; Three years experience as the Wisconsin State Regional Archaeologist; Three years experience as an Associate Lecturer at the University of Wisconsin-Stevens Point; Three years experience as the Center Director and Staff Archaeologist at the Wisconsin State Regional Archaeology Center; Four years of Forest Service experience at the district level in the Black Hills of South Dakota as Supervisory Archaeologist.
Les Gonyer	Hydrologist – Bachelor of Science, Forestry minor in Hydrology, University of Minnesota, 1977. Twenty-eight years of Forest Service experience at the district and forest levels in Utah, New Mexico, Oregon, Idaho, Wyoming, California, and South Dakota in watershed, timber, special uses, minerals, fire, engineering and environmental analysis. Red carded firefighter, FFT2. BAER (Burned Area Emergency Rehabilitation) and RAT (Rapid Assessment Team) team experience.
David Pickford	Recreation - Bachelor of Arts in Outdoor Recreation from Eastern Washington University, 1984. Fifteen years of Forest Service experience as the District level on the Ottawa and Black Hills National Forests. Outdoor recreation experience with the National Park Service, U.S. Fish & Wildlife Service, U.S. Air Force, and New Hampshire State Parks Division.
Bradley J. Phillips	Wildlife Biologist – Bachelor of Science, Wildlife Management, Humboldt State University, 1980. Seventeen years of Forest Service experience at the district level, fifteen years of that on the Black Hills National Forest. Rocky Mountain Region contact for issues relating to bats.
Lori A. Bell	Lands – Bachelor of Science in Natural Resource Management, University of Wisconsin-Stevens Point, 1982. Twenty-three years of Forest Service experience at the district level in Colorado, Wyoming, California, Idaho, Florida, and South Dakota as a backcountry ranger, park ranger, reforestation/timber stand improvement forester, pre-sale forester, timber sale administrator, and land

specialist.

Mark Nelson — Minerals – Bachelor of Science, Geology, Ohio State University, 1986. Master of Science, Geology and Geological Engineering, South Dakota School of Mines and Technology, 2000. Twelve years of experience in the mining industry in the fields of exploration and mining geology, geochemistry, hydrology, environmental remediation, and environmental management. Four years experience as a Senior Hydrologist with the South Dakota Department of Environment and Natural Resources. One and a half years of Forest Service experience on the Black Hills National Forest.

Dennis Shreves — Civil Engineer– Bachelor of Science, Civil Engineering Technology at Kansas State University. Twenty two years of experience as Instructor/Associate Professor at Kansas State University; Six years experience as Director of Planning and Economic Development for Custer County, South Dakota; Four years with the Forest Service as a Civil Engineer as inspector, designer, and contract administrator on stream crossings, bridges and trailheads projects. Certified in the National Construction Certification Program for Roads, Bridges, Administration of Public Works, Advanced Administration of Public Works, and Administration-Timber Purchases.

Matthew Spring — Fire/Fuels Specialist – Sixteen years of Forest Service experience in fire suppression and prescribed fires. This includes eight years on a wildfire engine, two years with helitack, four years as an Assistant Fire Management Officer for Fuels on the Black Hills National Forest. Two years as the Assistant Fire Management Officer for Fuels on the Chippewa National Forest. Redcarded firefighter as Fire Behavior Analyst Level II, Ignition Specialist Level II, Engine Boss, Helicopter Manager, Division Group Supervisor, Task Force Leader, Strike Team Leader. Certified in the use of Fire Regime and Condition Class software and scorecard use. Education includes BEHAVE, S-490 Intermediate Fire Behavior Calculations, S-491 National Fire Danger Rating System, RX-410 Smoke Management, RX-310 Fire Effects.

Angie Henn — Fuels Technician – Bachelor of Science, Forestry with emphasis in Forest Management and Fuels Science, 2005. Six years of Forest Service experience on the Black Hills National Forest as SCEP.

Stephen Keegan — Landscape Architect - Bachelor of Science, Landscape

	Architecture & Environmental Studies, State University of New York - College of Environmental Science and Forestry (ESF), 1980; Bachelor of Science, (dual degree with ESF), Syracuse University 1980; Associates of Arts, Humanities, State University of New York - Onondaga Community College, 1978. Twenty-two years of Forest Service experience at the forest and zone level in Oregon, South Dakota, Montana, Idaho conducting Scenic Resource Assessments for: vegetation and fuels management, watershed analyses, recreation construction and reconstruction, and burned area emergency rehab. Fire experience in Type 1-4 incidents with USFS; experience as chief and assistant fire chief for City and Rural Fire Departments in New York, Idaho, Oregon and South Dakota.
Cynthia Buckert	Botany Technician – BS in Range Science from SD State University, 1985; Qualified for OPM 430 Botany in 2003; Nine years of Forest Service experience as a Rangeland Management Specialist on the Nebraska, Toiyabe and Black Hills National Forests; Two years experience conducting plant surveys and sensitive plant surveys on the Black Hills National Forest.
Jeff Tomac	Rangeland Management Specialist – Bachelor of Science in Rangeland Management from South Dakota State University in 1991; Met X-118 Qualification Standards for Botanist, 1992; Fourteen years of Forest Service experience as a rangeland management specialist.
Carol Kjar	Editor – Bachelor of Science, Mathematics, Black Hills State University, 1990, Bachelor of Science, Math Education, Black Hills State University, 1991; Three Years experience in technical writing, editing, and newsletter publication; Three years of Forest Service experience at the District level in the Black Hills of South Dakota in timber sale accounting systems. Two years of Forest Service experience as a seasonal and volunteer archaeological technician in the Black Hills.

CHAPTER 7 – FINAL ENVIRONMENTAL IMPACT STATEMENT DISTRIBUTION LIST

Congressional:

Senator Tim Johnson
Senator John Thune
Congresswoman Stephanie Herseth

Native American Tribes

Tribal Chairwoman	Yankton Sioux Tribe
Tribal Historic Preservation Officer	Yankton Sioux Tribe
Tribal Chairperson	Crow Creek Sioux Tribe
Tribal Historic Preservation Officer	Northern Cheyenne Tribe
President	Rosebud Sioux Tribe
Tribal Chairman	Sisseton-Wahpeton Sioux Tribe
Cultural Preservation Office	Three Affiliated Tribes
Tribal Chairman	Flandreau Santee Sioux Tribe
Tribal Chairman	Cheyenne River Sioux Tribe
Tribal Chairman	Three Affiliated Tribes
Tribal Chairman	Eastern Shoshone Tribe
Fifth Members Office	Oglala Sioux Tribe
Tribal Chairman	Northern Arapahoe Business Council
Tribal Chairman	Lower Brule Sioux Tribe
Cultural Resource Office	Lower Brule Sioux Tribe
Tribal Historic Preservation Officer	Cheyenne River Sioux Tribe
Tribal Historic Preservation Officer	Standing Rock Sioux Tribe
	Spirit Lake Sioux Tribe
Tribal Chairman	Standing Rock Sioux Tribe
Southern Arapaho Nagpra Nhpa	Southern Arapaho Tribe
	Grey Eagle Society
President	Northern Cheyenne Tribe
President	Oglala Sioux Tribe
Acting Tribal Vice Chairman	Cheyenne/Arapahoe Tribes of Oklahoma
Tribal Chairman	Santee Sioux Nation
	Kiowa Ethnographic Endeavor for Preservation
Tribal Vice-Chairman	Cheyenne River Sioux Tribe
Tribal Chairman	Spirit Lake Sioux Tribe
	Oglala Sioux Tribe
Tribal Historic Preservation Officer	Cheyenne-Arapaho Tribes of Oklahoma
Rosebud Sioux Tribe	Sicangu Lakota Treaty Council Office
Tribal Planner/Director	Northern Cheyenne Tribe

Tribal Chairwoman	Yankton Sioux Tribe
Tribal Chairperson	Crow Creek Sioux Tribe
Tribal Historic Preservation Officer	Northern Cheyenne Tribe
President	Rosebud Sioux Tribe
Tribal Chairman	Sisseton-Wahpeton Sioux Tribe

Federal Agencies:

Director, Planning and Review, Advisory Council on Historic Preservation
Natural Resources Conservation Service, National Environmental Coordinator, USDA
USDA, National Agricultural Library
US Army Engineers, Northwestern Division
US Environmental Protection Agency, Office of Federal Activities
Environmental Protection Agency, Region VIII EIS Review Coordinator
US Department of Interior, Director, Office of Environmental Policy and Compliance
Federal Aviation Administration, Regional Director Great Lakes Region
Federal Highway Administration, Division Administrator, South Dakota (HAD-SD)
US Department of Energy, Office of NEPA Policy and Compliance

State, Local, and County Agencies:

South Dakota Department of Game, Fish & Parks
South Dakota Wildland Fire Suppression
South Dakota Department of Environment and Natural Resources
Governor's Officer – Governor Mike Rounds
Custer County Commissioners
Pennington County Commissioners
Rapid City Public Library

Individuals:

Ardell Nelson	Thomas Ostrander
Alan Krienke	Todd Fish
Layne Noser	Dan Swain
Tom Patterson & Margaret Prahl	Bill Myers
Steven Riss	Gary Chappell
James Engle	Robert Bassett
James Hughes	Pete Gober, US Fish & Wildlife Service
Dave Keffeler	Pennington County Commissioners
Tom & Doris McDill	Aaron Everett, BH Forest Resource Assn.
Bob & Elaine Kloss	Brian Kelly, US Fish & Wildlife Service
Frank Petera, WY Game & Fish Dept.	Shelly Deisch, SD Game, Fish & Parks
Jim Hoxie	James Margadant, BH Group Sierra Club
Archie Gray	Jeremy Nichols, Biodiversity Conservation
Roger Herman	Laurin Hagen
Mark Thompson	Bill Boyum

Joe Lowe, SD State Wildfire Coordinator
B. Sachau
Gordon Pederson, SD State Rep
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Doug Ottema
Keith Harding, Wyoming Sawmills
David Froiland
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