Wind River Regeneration Harvest
Pre-decisional Environmental Assessment

May, 2002

Shoshone National Forest
Wind River Ranger District

Fremont County, WY

Lead Agency:	USDA Forest Service
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	This document is available on the Internet: *http://www.fs.fed.us/r2/shohsone/forestmgt/nepa/projectinfo.htm*

Abstract. This Environmental Assessment (EA) is a public document that will provide evidence and analysis for determining whether or not to prepare an Environmental Impact Statement or a Finding of No Significant Impact. The proposed action is to regenerate approximately 90 acres of lodgepole pine stands within the Horse Creek and Cartridge Creek Drainages on the Wind River District of the Shoshone National Forest. There are three alternatives: Alternative 1 (proposed action), Alternative 2 (no action), and Alternative 3 (minimize fuel loading). The proposed harvest areas are approximately 14 miles north of Dubois, WY, in Fremont County.

Notice to Comment: This EA will be available for a 30-day public comment period, beginning May 8, 2002 and ending June 7, 2002. **All written comments must be postmarked no later than June 7, 2002.** Written comments may be submitted to Ellen Jungck at the address listed above. Reviewers should provide the Forest Service with their comments during the review period of the EA. We ask that comments be specific to the issues and actions identified in this EA.

Comments received in response to this solicitation, including names and addresses of those who comment, will be considered part of the public record on this proposed action, and will be available for public inspection. Comments submitted anonymously will be accepted and considered; however, those who submit only anonymous comments will not have standing to appeal the subsequent decision under 36 CFR Part 215. Additionally, pursuant to 7 CFR 1.27 (d), any person may request the agency to withhold a submission from the public record by showing how the Freedom of Information Act (FOIA) permits such confidentiality. Persons requesting such confidentiality should be aware that, under FOIA, confidentiality may be granted in only very limited circumstances, such as to protect trade secrets. The Forest Service will inform the requester of the agency's decision regarding the request for confidentiality, and where the request is denied, the agency will return the submission and notify the requester that the comments may be resubmitted with or without name and address within 10 days.

Interdisciplinary Team (IDT)

ID Team Member	Occupation	Team Responsibility
Steve Keller Allen Madril	Archaeologist Archaeologist	Cultural Resources (01/2000 – 10/2000) Cultural Resources (05/2001 – present)
Burns Davison	District Ranger	Decision Maker
Karl Brauneis	South Zone Fire Management Officer	Fire/Fuels
Ray Zubik	Fisheries Biologist	Fisheries Resources
Liz Oswald	Hydrologist	Hydrology
Mark King	NEPA Coordinator	NEPA consultation
Brad Russell	Range Conservationist	Range Resources
Skip Shoutis	Outdoor Recreation Planner	Recreation Resources
Jeff Hogenson	Forester	Silviculture
Kent Houston	Soil Scientist	Soil Resources
Patrick Heuer Ellen Jungck	Forester Forester	Team Leader/Silviculture (01/1999 - 10/2000) Team Leader (07/2001 – present)
Karin Lancaster Kort Andersen	Civil Engineer Civil Engineering Technician	Transportation and Travel Resources (01/1999 – 11/2001) Transportation and Travel Resources (11/2001 – present)
Chiara Palazzolo	Landscape Architect	Visual Resources (01/2000 - 10/2000)
Mark Hinschberger	Wildlife Biologist	Wildlife Resources

Abbreviations Used in this Document

Abbreviation	Meaning
ASQ	Allowable Sale Quantity
CEO	Council of Environmental Quality
EA	Environmental Assessment
FEIS	Final Environmental Impact Statement
Forest	Shoshone National Forest
Forest Plan	Shoshone National Forest Land and Resource Management Plan
HCRA	Horse Creek Roads Analysis
HCWA	Horse Creek Watershed Assessment
HCWIP	Horse Creek Watershed Improvement Project
ROD	Record of Decision

Table of Contents

Chapter 1 Purpose of and Need for Action

1.1 Introduction and Project Location

An EA is not a decision document. It is a document disclosing the environmental consequences of implementing the proposed action and alternatives to that action. The decision is documented in a decision notice signed by the responsible official. A decision would be prepared and distributed, along with publication of a legal notice, after 30 days of public review and comment on the EA.

This environmental assessment (EA) describes the environmental effects of a proposal, as well as alternatives to it, to regenerate lodgepole pine stands within the Horse Creek and Cartridge Creek Drainages on the Wind River District of the Shoshone National Forest (Forest).

The proposed harvest areas are approximately 14 miles north of Dubois, WY, in Fremont County (*see* Appendix A, figure 1). The legal description of the proposal is in:

- section 11, T.43N., R.107W., 6th P.M.
- section 6, T.43N., R106W., 6th P.M.
- sections 27, 28, 33, and 34, T.44N, R.106W., 6th P.M.

The area adopted for analysis in the EA corresponds to the Cartridge Creek watershed and the middle segment of the Horse Creek watershed between Burroughs Creek and Parque Creek (*see* Appendix A, figure 2). The analysis area is approximately 14,827 acres. Approximately 90 acres are proposed for harvest.

1.1.2 Tiering and Related Actions

This EA is tiered to the Final Environmental Impact Statement (FEIS) and Record of Decision (ROD) for the Forest Land and Resource Management Plan (Forest Plan; USDA Forest Service, 1986) as amended by the Allowable Sale Quantity (ASQ) ROD (USDA Forest Service, 1994) and the Oil and Gas Leasing ROD (USDA Forest Service, 1995). All references are available at any of the Forest offices in Cody, Dubois, and Lander.

This EA references the Wind River Regeneration Harvest project file (project file). The project file planning records and analyses related to this EA.

This document is also tiered to the Horse Creek Watershed Assessment (HCWA; USDA Forest Service, 2001) and it's supplementary Roads Analysis Report (HCRA; USDA Forest Service, 2001).

The HCWA and HCRA provided resource recommendations for the Horse Creek watershed. These recommendations were made based on amended Forest Plan goals, management direction, and standards and guides.

The Horse Creek Watershed Improvement Project (HCWIP) was proposed and scoped by the Forest in December 2001 and January 2002. The HCWIP stemmed from recommendations made in the HCWA and HCRA. Some of the actions proposed in the HCWIP will have effects on the proposed actions presented in this document. These will be discussed throughout this analysis as appropriate. A decision on the HCWIP is expected in the fall of 2002. Copies of the HCRA, HCWA, and scoping documents for the HCWIP are available at the Wind River Ranger District office in Dubois.

Tiering is done in accordance with CEQ regulations (40 CFR 1502.20 and 1508.28), which allow the responsible official to focus on site-specific issues that are within the scope of a broader plan, program or analysis that is already approved. In this case, the Forest Plan (as amended) allocates lands to vegetation management, and prescribes standards and guidelines that apply. All alternatives, including the proposed action, are to be framed in the context of the Forest Plan management area direction. Standards and guidelines form the basis for how projects are to be implemented to meet the management emphasis for an area, and to mitigate associated impacts. The primarily goal to be met drives alternatives, while application of existing standards and guidelines generally ensures that secondary goals and other resource needs are met.

1.2 Purpose of and Need for Action (40 CFR 1502.13)

1.2.1 Purpose of Action

The purpose for this proposal is to improve the overall health and productivity of forest vegetation within the Horse Creek and Cartridge Creek watersheds and to provide protection from dwarf mistletoe infection in recently thinned stands of young lodgepole pine trees that are adjacent to the proposed harvest units. Treatment will also reduce wildfire risk.

Forest Plan Goals (Desired Future Condition). The purpose of the proposed action is derived from the following Forest Plan goals. Goals are numbered sequentially for this proposal; they do not refer to Forest Plan goal numbers:

- *Goal 1* - Reduce damage by insect, disease, and other forest pests to acceptable levels through integrated management of vegetation (Forest Plan III-10)
- *Goal 2* – Implement an integrated pest management program to prevent and control insect infestations and disease (Forest Plan III-8)
- *Goal 3* - Improve tree age class and species diversity to benefit forest health, recreation experiences, visual quality, and wildlife habitat (Forest Plan III-8)
- *Goal 4* - Reduce the accumulation of natural fuels (Forest Plan III-8)
- *Goal 5* - Manage the timber resources on lands suitable for timber management to provide saw timber, round wood, and firewood to meet resource management objectives (Forest Plan III-8)
- *Goal 6* - Manage vegetation types outside of wilderness to provide multiple benefits commensurate with land capability and resource demand (Forest Plan III-6)

- *Goal 7* - Improve the health and vigor of vegetation types outside wilderness and selected types in wilderness where necessary (Forest Plan III-6)
- *Goal 8* - Maintain or improve soil productivity and water quality (Forest Plan III-8)
- *Goal 9* - Develop a transportation system that meets land and resource management needs at lowest cost and least disturbance to the environment (Forest Plan III-10)

Forest Plan Management Area Direction (Desired Future Condition).

Management areas provide further guidance for management activities within the Forest. The analysis area contains the following seven management areas (*see* Appendix A, figure 3).

- 2A – Semi-primitive Motorized Recreation
- 2B – Rural and Roaded Natural Recreation
- 5A – Big Game Winter Range (Nonforested)
- 7E – Wood Fiber Production
- 8B – Primitive Wilderness
- 8C – Semi-primitive Wilderness
- 9A – Riparian Area Management

All of the proposed treatments fall within management area 7E. Table 1-1 summarizes the management emphasis for this area.

Table 1-1 . *Forest Plan management area and summary that apply specifically to the proposed action*

Management Area	Emphasis Summary
7E (Forest Plan III-173)	Management Emphasis is on wood-fiber production and utilization of large roundwood of a size and quality suitable for sawtimber. The harvest method by forest cover type is clear-cutting in aspen and lodgepole pine; shelterwood in Englemann spruce-subalpine fir, lodgepole pine, and mixed conifers, and selection in all-age stands of Englemann spruce-subalpine fir. The area generally will have a mosaic of fully stocked stands that follow natural patterns and avoid straight lines and geometric shapes. Management activities are not evident or remain visually subordinate along forest arterial and collector roads and primary trails. In other portions of the area, management activities may dominate in foreground and middleground, but harmonize and blend with the natural setting. Roaded natural recreation opportunities are provided along forest arterial and collector roads. Semi-primitive motorized recreation opportunities are provided on those local roads and trails that remain open. Semi-primitive non-motorized opportunities are provided on those that are closed.

Management direction (MD) specific to the proposed action is summarized below. Management directions are numbered sequentially for this project; they do not refer to Forest Plan management direction numbers:

- *MD-1*: Clear-cuts may be applied to dwarf mistletoe infected stands of any forest cover type (Forest plan III-63, III-177)

HCWA and HCRA (Desired Future Condition). Recommendations from these analyses identified forest health and transportation system needs are of the highest priority (HCWA p.6). These analyses recommended the following. Recommendations are numbered sequentially for this project; they do not refer to HCWA recommendation numbers:

- *HCWA-1:* Aggressively manage forest vegetation, through the use of timber harvest and prescribed fire, to regenerate aspen, control insect and disease infestation, and reduce the risk of catastrophic wildfire (HCWA p.7)

The scope of analysis, in sum, incorporates alternatives that improve stand health or resistance to insects and disease, improve age-class diversity in the forested area, and reduce wildfire risk.

1.2.2 Need for Action

Existing Condition. The need for this proposal is evident by the current condition of the identified stands. The majority of trees have dead tops from comandra rust, are heavily infected with mistletoe, are exhibiting significant net growth loss, and are in a general state of decline. Consequently, mortality within these stands is relatively high, occurring on a regular basis and resulting in increasing fuel accumulation and wildfire risk. These types of stands readily lend themselves to stand replacement by fire. Effective fire suppression since the early 1900s, however, has likely influenced this natural occurrence. Silvicultural treatments can achieve similar results while posing minimal risk to adjacent young stands.

Opportujnites. The desired condition for the area relates to the above listed goals and management area direction. Opportunities exist to improve forest health and visual quality through vegetation management. These opportunities include:

- Treating lodgepole stands to reduce disease infestation and improve structural diversity (Goals 1-3, 5-7; MD-1, HCWA-1)
- Treating lodgepole stands to reduce natural fuel buildup and reduce wildfire risk (Goal 4, HCWA-1)
- Treating vegetation to provide wood products to local communities (Goals 5-6)

1.3 Public Involvement and Issues

1.3.1 Public Involvement

Public involvement in this project began when the Wind River Regeneration project was listed in the Forest's Quarterly Schedule of Proposed Actions (SOPA). The project has appeared in each issue of the SOPA since then, with status updates as the project reached the stages described below.

Scoping was conducted in January and February of 1999. On January 14, 1999 a scoping statement was mailed to the District's general mailing list of interested or affected members of the public, other federal and local governmental agencies, and the Wyoming State Government Clearing House. By these actions, scoping comments were solicited from the general public, other agencies (federal, state and local), and potentially affected parties. Comments that were received during this scoping period were addressed in two Decision Memos signed on September 3, 1999. However, due to a 1999 court ruling an Environmental Assessment and Decision Notice must be prepared in lieu of the Decision Memos. Subsequently, the proposed action was rescoped for a two-week period beginning January 20, 2000. Those who expressed an interest in this proposal by responding to the initial scoping were notified of the rescoping period and mailed a copy of the original scoping statement. The proposed action remained unchanged through this process.

All letters received from both scoping periods are located in the project file. All letters received were evaluated. Appendix B contains a summary of all scoping comments, how they were categorized, and responses to the comments. Additional information on issues generated from scoping is described below.

A legal notice of distribution of this pre-decisional EA has been published in the Dubois *Frontier* on May 8, 2002. Through this distribution and notification, the public was informed of the opportunity to comment.

1.3.2 Identification of Issues

Significant Issues. The IDT identified issues relating to the proposed action based on input from Forest Service resource specialists, other agencies, organizations, landowners, and members of the general public. Pertinent comments from these sources were used to develop the issues to be studied in detail. These issues were considered significant in terms of the National Environmental Policy Act (NEPA). Significant issues are those that are used in the formulation of alternatives, prescribing mitigation measures, or analyzing environmental effects. Issues are significant because of the extent of their geographic distribution, the duration of their effects, or the intensity of interest or resource conflict. These issues are summarized below. They are also addressed through alternatives (Chapter 2), through mitigation measures (Chapter 2), through the analysis process and/or disclosure of effects (i.e. Chapter 4, Appendix C, project file), or through comment disposition (Appendix B).

1. *Slash Disposal.* Concerns were raised that the proposed action to use the clear-cut with reserve tree silvicultural method limits the ability to effectively reduce natural and activity generated fuels following harvest through the use of prescribed fire. An alternative was developed to address this issue.

2. *Harvesting Effects on Wildlife, Forest Health, Roadless Areas, Soils, Water Quality, and Fisheries Resources.* Many concerns were raised about the effects harvesting would have on various resources. The affected environment and associated impacts are discussed in Chapters 3 and 4 and Appendix C. Associated mitigation

measures are discussed in Chapter 2. Other comments are addressed through the disposition in Appendix B.

3. *Recreation.* Concerns were raised about potential conflicts with horse users using the Horse Creek trailhead accessing the Five Pockets area. This issue is discussed in the Recreation Resources sections Chapters 3 and 4.

4. *Economics.* Some concerns were raised about the overall economics of the project and net public benefits. These issues are discussed in Chapters 3 and 4 and Appendix D.

Other Issues. Other issues and concerns raised by the public were considered by the IDT. These issues are not used in the environmental analysis, generally because they are outside of the scope of the proposed action, they are already decided by law, regulation, Forest Plan or other higher decision, or are general statements of opinion. These comments are summarized and responded to in Appendix B.

1.4 Proposed Action (40 CFR 1508.23)

The Wind River District proposes to treat approximately 90 acres to improve the long-term health and productivity of three lodgepole pine (*Pinus contorta*) stands located in the Horse Creek and Cartridge Creek drainages. It would enhance the age-class diversity across the forested landscape and protect recently thinned stands of young lodgepole pine from dwarf mistletoe infection that are adjacent to proposed harvest units. It would also reduce fire risk.

Direct actions associated with the proposed action include:

- Using the clear-cut with reserve tree regeneration method in lodgepole pine stands to improve forest health and productivity and reduce wildfire risk. Scattered overstory Engelmann spruce (*Picea englemannii*) and whitebark pine (*Pinus albicaulis*) trees would be identified for reserve. (Goals 1-7; MD-1; HCWA-1).

Connected actions associated with the proposed action include:

- Possible "fill in" or full planting to ensure sufficient regeneration (Forest Plan III-66-68).
- The use of existing roads including pre-use maintenance and spot reconstruction to access two of the three stands. Pre-use maintenance and a temporary road would be used to access the third stand. (Goals 11, 12).
- The use of approximately 0.2 miles of temporary road. All temporary roads would be obliterated, recontoured, and, if necessary, seeded, after use (Goal 12; Forest Plan III-88, ASQ ROD pp. 5-6).
- Broadcast or jackpot burning concentrations of slash following harvest (Forest Plan III-28, III-96-97).

- Fill in or full planting would be scheduled as deemed necessary to achieve desired stocking levels and meet required regeneration requirements (ASQ ROD Appendix A, Page 5 and Forest Plan III-66-68, III-178-180 – E04).

The proposed action would be implemented within Forest Plan standards and guidelines, including specific mitigation measures. The proposed action with mitigation is present in detail in Chapter 2.

Alternatives to the proposal must also meet the underlying purpose for which the proposal is being made. The proposal and alternatives to it facilitate the management direction specified for this part of the Forest.

1.5 Decision to be Made

The decision to be made is whether to implement the proposed action, or to select an alternative to the proposed action. The decision could be a mix of activities that are evaluated in the three alternatives. The decision is to include any mitigation measures that might be needed in accordance with impacts that are disclosed in the assessment, including but not limited to those that are presented in the alternatives. If the environmental analysis indicates to the decision maker that impacts associated with the alternatives would be significant, then she or he would not make a finding (FONSI, 40 CFR 1508.13) that allows the action to proceed without performing an environmental impact statement.

Chapter 2 Alternatives Including the Proposed Action

2.1 Alternatives Analyzed in Detail

Based on the significant issues listed in section 1.4.2, three alternatives are identified and analyzed in detail. They are described below as to the major defining actions, the issues they respond to, and the mitigation measures that are associated with them. Figures 2, 5, 6, and 7 in Appendix A depict location of treatments in action alternatives. Table 2-1 provides a tabular summary of all the alternatives. All units (acreages, mileages, etc.) listed in Table 2-1 are approximations.

2.1.1 Alternative Description

Alternative 1 - Proposed Action. This alternative represents the Forest's proposal to meet the underlying purpose and need derived from the Forest Plan and from conditions outlined in the HCWA. It presents silvicultural treatments for changing the existing condition of forest vegetation to move the area toward desired conditions of vegetative health and diversity. It represents the conventional approach and preferred silvicultural system, given the forest condition and trend. Under this alternative, the following three lodgepole pine stands, totaling approximately 90 acres, would be treated using the clear-cut with reserve tree regeneration method. Lodgepole pine seedlings and saplings within or adjacent to harvest units found to be infected with dwarf mistletoe would be cut following harvest using Knutson-Vandenberg (KV) Funds generated by the timber sale:

- *Rainbow Lake.* Approximately 38 acres located off of the Burroughs Creek Road (FSR 510). This unit is adjacent to a young stand of lodgepole pine that was regenerated by a clear-cut in the 1960s and precommercially thinned in the fall of 1998.

- *Cartridge Creek.* Approximately 30 acres located off of the Wiggins Fork Road (FSR 285) south west of Cartridge Creek. The proposed harvest is the second and final entry for this stand. The first entry removed approximately 40 percent of the trees, all of which were dead. The second entry would remove the remaining mistletoe and comandra rust infected lodgepole pine.

- *Horse Creek.* Approximately 20 acres accessed by FSRs 507 and 701. This unit is adjacent to a young stand of lodgepole pine that was regenerated by a clear-cut in 1957 and precommercially thinned in August of 1995.

Reserve Trees. All healthy and vigorous overstory Engelmann spruce trees and scattered mature whitebark pine trees would be designated for reserve. Although the stands proposed for treatment contain predominantly mistletoe and comandra rust infected lodgepole pine trees, there are scattered lodgepole pine trees that are relatively vigorous and free of disease. Any exceptionally healthy and cone producing lodgepole pine trees would also be designated for reserve. Selected trees meeting these criteria would be retained within the stand until

regeneration is established. The retention of green trees in conjunction with clear-cutting would promote more visually appealing stands while moving these stands toward the desired condition. Retaining green trees would also provide for additional structural diversity within the regenerated stands, a potential seed source for natural regeneration, and habitat for certain species of wildlife. Although natural regeneration was very successful in adjacent stands that were clear-cut in the 1960s, low seed production associated with numerous dead tops in the stands proposed for harvest would likely affect the natural regeneration capability of these stands proposed. As a result, "fill in" or full planting may be necessary to ensure sufficient regeneration.

With the exception of lodgepole pine, all reserve trees would be retained throughout the life of the regenerated stand or as long as they live. The reserved mature lodgepole pine would be removed or girdled after regeneration is firmly established. Young understory spruce trees would be protected to the extent possible during harvest operations.

Site Preparation and Regeneration. Slash would be lopped and scattered to a depth of 24 inches or less. Landing slash and other concentrations of slash not adjacent to reserve trees would be jackpot burned by the Forest Service as soon after sale closure as possible. Natural regeneration would be monitored one, three and five years following harvest. Fill in or full planting would be scheduled as deemed necessary to achieve desired stocking levels and meet required regeneration requirements.

Alternative 2 – No Action. The Forest Service Handbook (FSH) requires the Forest Service to study the No Action alternative in detail, and to use it as a baseline against which impacts of action alternatives can be measured (FSH 1909.15, 14.1). Under this alternative, none of the specific management activities proposed in this document would occur. Ongoing activities such as recreation, fire suppression, and road maintenance would continue. This alternative would not address the purpose and need of improving the overall health and productivity of the Forest. No silvicultural treatments would occur. The significant issues of slash disposal would not be addressed. No mitigation measures are necessary.

Alternative 3 – Minimize Fuel Loading. This alternative responds to the issue of how the proposed action limits the ability to effectively reduce natural and activity generated fuels following harvest. It includes silvicultural treatments that meet the basic purpose and need for action while addressing fuel loading concerns.

This alternative would treat the three stands identified under the proposed action using the clear-cut method. There would be no reserve tree under this alternative. Following harvest operations natural and activity-generated fuels would be broadcast burned. Lodgepole pine seedlings and saplings within or adjacent to harvest units found to be infected with dwarf mistletoe would be cut following harvest using Knutson-Vandenberg (KV) Funds generated by the timber sale.

Site Preparation and Regeneration. Concentrations of slash following harvest would be broadcast burned as soon after sale closure as possible. Natural regeneration would be monitored one, three and five years following harvest. Fill in or full planting would be

scheduled as deemed necessary to achieve desired stocking levels and meet required regeneration requirements.

2.1.2 Features Common to all Action Alternatives

Access and Logging Systems. Treatments would be conducted using existing roads and standard ground based and road supported logging systems.

- *Rainbow Lake.* Access would be from the Burroughs Road (FSR 510). This road would require spot reconstruction to widen a switchback and relocate a 300-foot stretch of the road out of a meadow[1]. Approximately 0.2 miles of temporary road maybe necessary within the harvest unit to locate an appropriate landing/decking area.

- *Horse Creek.* FSRs 507 and 701 would require pre-use maintenance and spot reconstruction to repair sections of the road with deep ruts and install proper drainage structures.

- *Cartridge Creek II.* Access would use FSR 285.2H. This road is currently closed. This road was closed following the Cartridge Creek I salvage sale in 1999 and would require reopening. Reopening this road would involve removing several large water bars and berms. This road would be closed again after harvest activity is completed.

All temporary roads would be obliterated, recontoured and if necessary, seeded following harvest operations.

Sale Duration. The duration of timber sale activities would be two years. Slash and other post-sale treatments (i.e. fill-in planting, removal of disease infected understory, etc.) should occur within five years of sale closure.

Table 2-1. *Comparison of action alternatives (all units are approximations)*

Alternative Features	Alternative 1	Alternative 2	Alternative 3
Clear-cut acres	0	NA	90
Clear-cut with reserve acres	90	NA	0
Slash treatment method	Lop and scatter; burn concentrations		Broadcast burn
Sale Duration	2 years	NA	2 years

2.2 Mitigation

The proposed action and alternatives to it would be implemented using selected Forest Plan standards and guidelines. The following mitigation measures are implicit in meeting

[1] The switchback at the intersetion of FSRs 504 and 510 would be widened. Presently the switchback is too tight for log trucks or vehicles with trailers. Additionally, a short section of FSR 510 is currently located through a meadow. This section of road would be relocated into the timber above the meadow.

standards, and have been demonstrated to be effective at achieving their purpose. Unless otherwise specified, they would be included in all action alternatives. Forest Plan page numbers, standard and guideline reference codes, and/or references to other portions of the EA are used to associate the mitigation measure with appropriate direction.

2.2.1 Silviculture and Timber Harvest

- Lodgepole pine would be removed or girdled after regeneration is firmly established. This would prevent mistletoe infection in the newly established stand (Forest Plan III-63 and III-177 - 0138, *see* section 4.2.1).
- Fill in or full planting would be scheduled as deemed necessary to achieve desired stocking levels and meet required regeneration requirements (ASQ ROD Appendix A, Page 5 and Forest Plan III-66-68, III-178-180 – E04).
- Harvest unit boundaries would be placed along natural type breaks to the extent possible to prevent reinfection of dwarf mistletoe (*see* section 4.2.1).
- Young understory spruce trees would be protected from harvest damage to the extent possible during harvest operations (Forest Plan III-66-68 III-177-178 – E04).

2.2.2 Travel and Transportation

- There would be no net increase in roads (ASQ ROD Appendix A, page 5 and Forest Plan III-88 – L01 & L20).
- All temporary roads would be obliterated, recontoured, and if necessary, seeded following harvest operations (ASQ ROD Appendix A, page 5 and Forest Plan III-88 – L01 & L20).
- FSRs used for timber access and haul shall be maintained to current standard and condition by the purchaser (*see* section 4.3).
- Logging traffic/safety signing would be used as appropriate (*see* section 4.3).

2.2.3 Recreation Resource Protection

Unless snow levels are light enough and where otherwise agreed to by interested parties, no hauling would be permitted from December 1 to April 1 on the Cartridge Creek harvest unit to prevent conflicts with commercial dogsled operations (*see* section 4.5.1).

2.2.4 Cultural Resource Protection

Standard practices used for the protection of cultural or heritage resources would be applied (Forest Plan III-23 – A02).

2.2.5 Soil, Water, and Aquatic Resources Protection

- Best management practices for soil and water conservation would be applied (*see* section 4.8).

- Harvest activities would be restricted to periods of low soil moisture to prevent soil compaction and rutting (*see* section 4.8, Forest Plan III-86 – KA1, III-219 – KA-1).
- A 100-foot equipment buffer zone would exist from all water bodies; no heavy equipment would encroach in wetlands/water bodies and at least 80% of potential ground cover would be maintained within the buffer zone (*see* section 4.8, Forest Plan III-215 – F05 & F06).
- Temporary roads, skid trails, log landings shall avoid cutting landslide toe slopes. (*see* section 4.8).
- Erosion control structures would be used on temporary roads to prevent sedimentation into riparian areas (*see* section 4.8).

2.2.6 Wildlife Habitat Protection

- Food and garbage storage regulations for grizzly bear use areas would be followed (Forest Plan III-50, Grizzly Bear Special Order).
- Harvest operations would be prohibited from April 1 through June 30 to minimize disturbance to calving elk and grizzly bears (*see* sections 4.9.1 and Appendix C).
- Complete all harvest activities in one unit at a time so that activities are localized (*see* section 4.9.1, Appendix C).
- For the Cartridge Creek unit, close the access road into the unit by gating to prevent public access while harvest activity is occurring (*see* Appendix C).
- In order to minimize the risk of human/bear conflicts, mandatory educational sessions would be held yearly for employees working in grizzly bear habitat on these projects. The training would include proper storage and disposal of any potential grizzly bear attractants, proper behavior in bear country, and do's and don'ts in a bear encounter (*see* Appendix C).
- Retain existing large down woody debris during timber harvest and broadcast burning (*see* Appendix C).
- If winter logging occurs, allow no increase in travel ways (plowed roads and groomed snowmobile routes) than is necessary for the activities that are occurring (*see* Appendix C).
- In clear-cut harvest units larger than 20 acres, retain an island of large-diameter trees and down wood material by grouping leave trees and snags for these units into uncut patches three to five acres in size on the down wind side of the units and preferably as far as possible from the road (*see* Appendix C).

2.2.7 Noxious Weeds

- Canada thistle, Russian knapweed, whitetop, and marsh sowthistle should be treated prior to project initiation (*see* section 4.9.3 and Forest Plan III-58-D02).

2.3 Monitoring

The following items would be monitored after harvest activities are complete.

For silviculture and timber harvest:

- Natural regeneration would be monitored one, three and five years following harvest (ASQ ROD Appendix A, Page 5 and Forest Plan III-66-68, III-178-180 – E04).
- Regeneration within or adjacent to harvest units should be monitored for signs of mistletoe infection and removed (*see* section 4.2).

For noxious weeds:

- The project area would need to be monitored for three consecutive years and provide control of new infestations (*see* section 4.9.3 and Forest Plan III-58-D02).

Chapter 3 Affected Environment

3.1 Introduction

This chapter describes the elements of the environment that have the potential to be affected by the proposed action and the alternatives to it. The affected environment generally is limited to the analysis area.

3.2 Vegetation

The analysis area ranges in elevation from 7,600 to 10,200 feet. Approximately 78% of the analysis area is forested. Approximately 10% is in grass/forb cover types and 9% is in shrub cover types. The remainder is rock (3%) and lakes or ponds (<1%). A mosaic of mature timber, regenerated clear-cuts, sagebrush openings, large open parks, rock outcroppings, and willow bottoms broadly characterize the analysis area.

3.2.1 Forest Cover

Table 3-1 summarizes forest composition in the analysis area. Lodgepole pine and spruce-subalpine fir (*Picea englemannii/Abies lasiocarpa*) stands comprise slightly over 70 percent of the forested area. Douglas-fir (*Pseudotsuga menziesii*) comprises approximately 20 percent and whitebark/limber pine and aspen (*Populus tremuloides*) respectively, comprise the remaining 10 percent. Approximately 74 percent of these forested stands contain trees that average at least nine inches in diameter at breast height (DBH) and are classified as mature. Approximately 22 percent are classified as seedling or saplings. The remaining five percent are classified as pole timber.

Table 3-1. *Forested acres by size class and species*

SPECIES	Seedling/Sapling 5.0 Inches	Pole size 5.0 to 8.9 Inches	Mature > 8.9 Inches	Acres By Spp	Percent By Spp
Lodgepole	2,350	457	1,526	4,333	37
Spruce-fir	124	59	3,916	4,099	35
Whitebark-limber	33	48	749	830	7
Douglas fir	0	1	2,476	2,477	21
Aspen	0	1	10	11	<1
Acres by size class	2,507	566	8,677	11,750	100
% by size class	22	5	74	100	

Larger diameter trees are generally older; Table 3-1 indicates that the current size-class distribution within the analysis area is toward older age stands. This trend is largely attributable to an absence of fire and/or lack of other stand-replacing disturbance such as clear-cutting or other types of regeneration harvest. Consequently, aspen abundance has declined, fuel accumulation in most stands has increased, and dwarf mistletoe and comandra rust infection of lodgepole stands has become more severe.

Diversity. Forest diversity is best judged from a landscape perspective. The analysis area represents an appropriate context. Vegetation diversity is important primarily as an indicator of forest health, which relates to a variety of habitats for vertebrate and invertebrate animal communities, visual diversity for the forest visitor, and resistance to rapid, large scale changes over the landscape. A diverse forest is comprised of stands of different tree species with multiple canopy layers and different ages and even aged stands of different age, size class and acreage. Based on Table 3-1, the analysis area is relatively diverse in terms of species composition, aspen being the notable exception. In terms of age and size-class diversity however, the analysis area is somewhat lacking. While younger age classes of lodgepole are present from harvest activities performed in the 1960's, generally younger age classes are under-represented. These younger age-classes provide horizontal diversity and edge habitats required by many plant and wildlife species.

Lodgepole pine. Mature lodgepole pine stands within the analysis area are in a general state of decline. Mortality exceeds growth in many stands due to comandra rust and dwarf mistletoe infection. Comandra rust kills the top or seed producing portion of trees while dwarf mistletoe, a parasitic plant, absorbs water and nutrients from the host tree, reducing vigor and the tree's ability to grow or produce cones. Both diseases can directly cause mortality, but often the infected trees are weakened and become susceptible to insect attacks or root and stem rots. Both diseases infect numerous stands. Consequently, the reproductive potential of lodgepole pine within the analysis area has been significantly reduced due to low seed production resulting from the proliferation of these two diseases. Lodgepole stands with Engelmann spruce or sub-alpine fir seed sources are slowly moving towards mid- to late seral stages of forest succession.

Stands regenerated through past harvest currently contain young healthy trees but are at risk of infection from adjacent stands. A discussion of past management within the analysis area is provided later in this section.

Spruce- Subalpine fir. Spruce-subalpine fir stands within the analysis area are healthy and vigorous compared to lodgepole pine. These stands tend be longer lived and are less susceptible to stand replacement by fire. Due to the relative shade tolerance of Engelmann spruce and subalpine fir, they are able to reproduce in the understory of mature stands. Consequently, in the absence of stand replacing disturbances, these stands are able to remain productive and perpetuate themselves as a climax or late seral vegetation type. Approximately 35 percent of the forested stands within the analysis area are classified as spruce-fir.

Whitebark Pine. Approximately seven percent of the forested vegetation is classified as whitebark pine within the analysis area. However, many lodgepole stands contain upwards of 40 percent whitebark. In many instances this can be attributed to the Clark's nutcracker's propensity to plant seeds either when these stands were established following fire or when openings were created by dying trees or past harvest treatments.

These disturbances play an important role in shaping the structure of whitebark pine communities. Natural disruptions are vital to the perpetuation of whitebark pine in habitat types where it is seral. The presence and dominance of whitebark pine depends on its environmental tolerances and its competitive abilities. Its relatively low capacity to compete typically restricts it to harsh sites where growth of more competitive trees is hampered by physical factors or, on better sites, by disturbance. This holds true for most stands within the analysis area. The colder, upper subalpine habitat types allow whitebark pine to assume dominance on many sites. In the lower subalpine habitat types whitebark pine occurs more as suppressed saplings (Arno et al., 1989)

Whitebark pine seed production is generally unpredictable. Large seed crops are produced at irregular intervals, with smaller crops and crop failures in between. Evidence indicates that seed planting by wildlife (i.e. Clark's nutcrackers, red squirrels) facilitates the regeneration and spread of whitebark pine. Despite its heavy wingless seed, this species often regenerates promptly on burned or clear-cut areas where a seed source is locally absent. Moreover, whitebark pine seedlings often arise together in tight clumps containing two to five trees.

Whitebark and limber pines have been increasingly infected with white pine blister rust on the Wind River Ranger District. The disease has been noticed in the area during the past 10 years, yet is already causing mortality. This is a non-native fungal disease that would kill non-resistant five needle pines such as whitebark and limber pines. Due to the recent arrival of this disease, it is unknown whether there are any resistant trees in the area.

Aspen. Aspen presently comprise less than one percent of the forested landscape within the analysis area. Historically however, this species was probably much more common since the regular occurrence of fire has been directly linked to aspen abundance in the interior west. Fire suppression efforts over the last 80-100 years have likely played a role in the decline of aspen within the analysis area.

3.3 Travel and Transportation Resources

An in-depth Roads Analysis (HCRA) was completed for the HCWA in 2001. The Rainbow Lake and Horse Creek units both fall within the area analyzed for the HCRA. The Cartridge Creek unit falls within the Cartridge Creek watershed. A separate roads analysis was not completed for this unit because

- No construction or reconstruction activities are required to access this unit.
- A temporary road would be used to access this unit. A roads analysis is not needed for using temporary roads to access timber harvest units.

The HCRA documents are included in the Wind River Regeneration project file and are incorporated into this EA by reference. Key points are summarized below. Copies of the HCRA may be requested by contacting the Wind River Ranger District.

Table 3-2 and the narrative below describe the Forest Service Roads (FSR) that are contained within the analysis area. All roads are open unless otherwise specified. *See* figure 2 for road locations.

Table 3-2. *Description of FSRs within the analysis area. All roads are open unless otherwise specified.*

Road Number ***(Name – if assigned)***	**Length (miles)**	**Surface/Lanes**	**Suitable or Maintained Use**
285 *(Wiggins Fork)*	5.6	Aggregate/Single	Passenger cars
285.2HA	0.3	Native/Single	High clearance
285.2K	0.8	Native/Single	High clearance
504 *(Parque Creek)*	4.5	Native/Single	High clearance
507 *(Horse Creek Trail)*	3.3	Native/Single	High clearance
509 *(Bog Lake)*	0.6	Native/Single	High clearance
510 *(Burroughs Creek)*	2.1	Native/Single	High clearance
510.K	0.1	Native/Single	High clearance
692 *(Burnt Timber Lake)*	1.2	Native/Single	High clearance
692.B	0.6	Native/Single	High clearance
700.A	0.1	Native/Single	High clearance
701	2.5	Native/Single	High clearance
708 *(Cartridge Creek)*	2.0	Native/Single	High clearance
708.1D	0.4	Native/Single	High clearance
736 *(Tee Cross)*	1.8	Native/Single	High clearance

The analysis area is accessed by three main system roads: FSRs 285, 504, and 510. These roads were developed to access timber sale sites within the area in the post World War II era. The majority of the cutting units associated with these sales were clear-cuts. Following harvest, the units were either broadcast burned or piled and burned to reduce fuel loading and prepare the seed bed for shade intolerant species. It is estimated that about 2,000 acres were treated in this area from 1950 to 1990. The acres treated in this area represent a substantial economic investment in the land to produce timber for present and future generations (*see* description of the 7E management area in Chapter 1).

FSR 285 is the main access into the analysis area and, as such, receives high and intense use by wheeled motorized vehicles in the late spring, summer and early fall and use by snowmobiles in the winter. The lower portions of FSR 285, which access private lands both inside (the Utzinger Ranch) and off of the Forest, are open year-round to wheeled vehicles. FSRs 504 and 510 receive slightly less use, and that use is more seasonal, particularly in the fall during hunting season.

Deferred maintenance surveys completed in 1999 by the Forest Service reveal critical health and safety maintenance work items of $59,000 for the entire length of FSR 285.
The analysis area, however, includes less than one-quarter of the entire length of FSR 285. This section of 285 has had more improvements than most of the rest of the road, so an estimate of $10,000 - $15,000 in critical health and safety work items may be more accurate for this analysis. These work items include clearing of roadside vegetation and removal of berms to improve sight distance, stabilizing soils to ensure integrity of the template, and installing proper signing. Capital improvement needs, as documented during the 1999

deferred maintenance survey of FSR 285, recommend reconstruction items including lengthening and adding turnouts, clearing of roadside vegetation to improve sight distance and user safety, and placement of aggregate to ensure a smooth, consistent roadway and prevent washing of native roadway materials.

Additionally, though there is no deferred maintenance survey data to document needs, FSRs 504 and 510 have safety sight distance and surface maintenance concerns. Both roads wind through the forested landscape as single lane corridors with limited turnout opportunities. Fine native materials are slippery when wet and provide less than adequate traction and load support for the expected traffic, creating large mud holes, ruts, and opportunities to slide off the road and/or get stuck. Many local side roads are unsurfaced, thereby creating similar conditions as previously mentioned. Risks are vehicle damage and threats to personal safety.

The road system in the analysis area is native surfaced, primitive and outsloped, built on geologic formations prone to sliding and slumping (Qgm, Qls, Tt). FSR 507, however, has been improved. This project also proposes spot reconstruction for FSR 510 (*see* Chapter 2).

On FSRs 692.B and 507, water bars are filled, which leads to gullying and rilling erosion of the road prism. Connected disturbed areas occur in stream and wetland crossings of FSR 700A in the valley bottom of Horse Creek. There are similar problems in FSR 507 near the Horse Creek Trailhead. Some sloughing of fill slopes has also occurred.

Sediment delivery to streams occurs due to connected disturbed areas throughout the analysis area. Most stream crossings are unarmored fords or streams are piped through culverts designed for the 20-year flood. Several bridges in the area have local influence on stream channels: the bridge on FSR 285 where it crosses Horse Creek, and the bridge on FSR 504 where it crosses Horse Creek above the Utzinger Ranch.

Roads paralleling or crossing streams or other waters of the United States, including FSRs 285, 504, 510, are avenues of potential introduction of pollutants to surface waters. Currently, no de-icing or dust abatement materials are used on roads in the Horse Creek area. Fremont County provides noxious weed spraying services to the Forest Service in this area, as needed. The agreement for these services specifies that no chemical materials be introduced into surface waters. Currently, there are no significant effects to surface waters caused by pollutants mentioned here.

3.4 Range Resources

The Rainbow Lake harvest area is within the Parque Creek cow and horse grazing allotment, which was involved in a permit transfer in 2000. No livestock grazing occurred during the 2000 grazing season.

The Horse Creek harvest area is along road FSR 507 is located in the Horse Creek cow and horse grazing allotment.

The Cartridge Creek harvest area is within the Wiggins Fork cow and horse grazing allotment.

Recent changes in livestock management, which include a revised allotment management plan, the addition of new standards for bank trampling, stubble height and shrub utilization, and the transfer of the permit to a new permittee indicate improvements in rangeland, wetland, and riparian health.

3.5 Recreation Resources

The major recreational activities in and around the harvest areas are commercial dogsledding, snowmobiling, hunting, firewood gathering, Christmas tree cutting, and viewing scenery (*see* the Visual Resources section for additional information). Two marked, ungroomed snowmobile trails are present in the analysis area. One passes by the Cartridge Creek harvest unit on FSR 285 and the other passes through the Rainbow Creek unit on FSR 510. Both of these trails receive low levels of snowmobile use. A commercial dogsledder uses the Double Cabin trail throughout the winter and has a winter base camp for his guests at Double Cabin. Moderate levels of firewood and Christmas tree gathering occur in the analysis area. Only very low levels of fishing occur. Rainbow Lake receives some fishing use with very minimal use in Horse, Cartridge, or Parque Creeks. A high level of hunting use using ATVs and four-wheel drives occurs throughout the analysis area in October and early November if snow levels allow.

The Horse Creek trailhead (located at the end of FSR 507) is the only developed recreational facility in the analysis area. This trailhead currently receives moderate use. The HCWIP proposes to relocate this trailhead to improve user access, provide acceptable parking, and reduce impacts to the roads accessing the trailhead.

Forest Service Road 285 cuts through the eastern edge of the analysis area near the Cartridge Creek harvest unit. It is the busiest road from a recreation standpoint. This road serves the Double Cabin area, which has a developed campground, a wilderness trailhead, and popular dispersed campsites. Heaviest use occurs from about July 1 through the October hunting season.

Recreation use monitoring indicates increased use of motorized forms of recreation, particularly ATVs, within the Horse Creek watershed (HCWA, 2001). This increased use is resulting in road network expansion, conflicts between user groups, and issues of safety.

3.6 Visual Resources

Although lodgepole pine predominates in the three sale areas, a variety of tree species exist: lodgepole pine, Engelmann spruce, whitebark pine, and Douglas-fir. A continued high level of variety would help to maintain the natural appearance of these areas. The surrounding area is mountainous but the sale areas have flatter, gradual slopes. The flatter the ground, the less impact the sale would have visually. Higher than normal fuel loadings exist, as well as a high

rate of stand deterioration due to the dwarf mistletoe and comandra rust infection; this contributes to poor aesthetics and creates an unhealthy forest appearance.

Classification of scenic attractiveness for all three sales is typical of a montane[2] forest. Typical, or common, refers to the basic matrix within the ecological unit. The landform, vegetation patterns, water characteristics, and cultural features combine to provide ordinary or common scenic quality for its habitat type.

Road concentrations are moderately high in the surrounding area, but road use is low to moderate, depending on the season.

The sensitivity levels in the Cartridge Creek and Rainbow Lake units are high to moderate; the sensitivity level in the Horse Creek unit is moderate. Sensitivity level is determined by the recreation user's expectations and concerns along travel routes and waterways. These sales incorporate two classifications of visual quality objectives (VQO), partial retention and modification. An objective of partial retention is applied to landscapes where the valued landscape character allows a slightly altered appearance. Noticeable deviations must remain visually subordinate to the landscape character being viewed. It provides high to moderate sensitivity throughout the immediate-foreground and foreground. Middle ground, background, and unseen areas can provide a lower sensitivity and allow slight alteration. An objective of modification is applied to landscapes where the valued landscape character allows for an altered appearance. It provides moderate to low sensitivity throughout the immediate-foreground and foreground. Middle ground, background and unseen areas can provide a lower sensitivity and allow alteration. The integrity of the existing landscape appears mostly natural. It is evident, however, in areas of past harvest that the natural landscape has been altered.

The proposed Horse Creek unit slopes mostly to the west. The proposed sale sits at the end of FSR 701, on the edge of a lower montane forest, bordering pockets of drier sagebrush landscape. Past harvest exists adjacent to this unit (*see* Alternative Description in Chapter 2). Currently the visual quality objective for this area is partial retention.

The proposed Rainbow Lake unit slopes mostly to the east. The proposed sale is bisected by FSR 510, which brings the sale within the foreground of road users. It is also adjacent to two past clear-cuts that have since been thinned. A new entry would add cumulatively to visual quality. Currently the visual quality objective for this area is modification.

The proposed Cartridge Creek unit lies on north and east facing slopes above the Cartridge creek drainage and slopes down away from FSR 285. Other harvest areas exist adjacent to this sale, mostly clear-cuts performed in the 1950s, 1960s and 1970s. The proposed Cartridge Creek unit would be a second entry for this stand. Currently the visual quality objective for this sale area is partial retention.

[2]Forested vegetation in lower mountainous elevations.

3.7 Cultural Resources

Cultural resources are a record of human presence in the Forest, often providing the sole indication of former inhabitants and ways of life. Cultural resource surveys of the project were completed during the 2001 field season. The Wyoming State Historical Preservation Office (SHPO) has reviewed the project survey report and provided the necessary clearance in April 2002. All known cultural resource sites would be avoided during timber sale design. If cultural resource sites are discovered after the sale is sold, the contract contains specific clauses to allow sales to be modified or cancelled, which would protect those sites.

3.8 Soil, Water, and Aquatic Resources

The geographic setting places the analysis area within the Wind River Absaroka Range subsection (M331Aj) (McNab, 1994; Houston 1999).

3.8.1 Geology and Soils

The Horse Creek Unit is primarily on the Tepee Trails formation. The Cartridge Creek and Rainbow lake units have areas of both Tepee Trails and Madison formations. The Tepee Trail formation is of Eocene age and consists of green and olive-drab, hard, generally well bedded andesitic conglomerate, sandstone, and claystone. The Madison formation is of Mississippian age and consists of blue-gray massive limestone.

The Wyoming Geologic Survey has mapped the geologic hazards on the Forest (Case, 1989). The Horse Creek unit has been mapped showing areas of multiple block slides, multiple slumps, multiple rockslides, and multiple earth flows. The Rainbow Lake unit has been mapped showing areas of multiple slumps and multiple earth flows. The Cartridge Creek unit has been mapped showing areas of multiple block slides, multiple slumps, and multiple earth flows.

The analysis area is within the boundaries of the Shoshone National Forest Soil Survey – area 656. This survey is in the process of being approved by the NRCS. The areas considered for harvest are found in soil map units 165 and 276. Tentative mapping unit descriptions and interpretations can be found in the project file.

Erosion hazard is slight on 0 to14% slopes and moderate on 15to 35% slopes (NRCS 1997). The Horse Creek unit has dominant slopes ranging from 15% to 35%. The Rainbow Lake and Cartridge Creek units have dominant slopes ranging from 0% to 14%.

Soil compaction and rutting hazards are moderate to severe but can be avoided by restricting activities to periods of low soil moisture (NRCS 1997).

Seedling mortality refers to the probability of the death of naturally occurring or planted tree seedlings, as influenced by kinds of soil or topographic conditions. Seedling mortality is caused mainly by too much water (soil wetness) or too little water (soil droughtiness). Soils

in these map units are rated low. The climate of the analysis area is in the 20 to 30 inch mean annual precipitation zone. Most of this comes in the form of winter snows.

The primary forest vegetation types include habitat types from the subalpine fir and Engelmann spruce series. Understories are typically of the depauperate elk sedge or heart leaf arnica habitat types and common juniper habitat types. Wetlands are scattered within the greater project boundaries. Soil Productivity is considered low to moderate based upon the habitat type data (Steele et al., 1983).

3.8.2 Water Resources

Wetlands. Wetlands, ponds, and small lakes are scattered within the analysis area. They occur primarily in topographic depressions of glacial and landslide deposits.

Regulatory Framework. The Forest Service is directed by five major federal laws, as amended, to protect watershed through sound management (USFS 1996). Other federal laws and regulations complement these five major laws. The Forest Service must also comply with the Wyoming Environmental Quality Act (WyDEQ 1973) and regulations pursuant to it.

State-classified water uses, and the water quality they need, must be sustained to comply with antidegradation policy, unless the State decides that vital economic and social development justify impact. Beneficial uses within and downstream of the analysis area include agriculture, protection of fish and wildlife, human consumption (after treatment), recreation, and scenic value. Water rights exist downstream of the analysis area that are directly tied to these beneficial uses. They include rights primarily for irrigation use and stock watering. Water is also used in the watershed analysis areas by recreationists for human consumption and stock watering.

Floodplains and wetlands within the analysis area are regulated by Executive Orders 11988 and 11990 (Carter 1977). All riparian areas are managed under Forest Plan Management Area Direction 9A.

3.8.3 Fisheries Resources

Streams.

Rainbow Lake. There are no streams with fish within or near the Rainbow unit. Burroughs Creek is the closest stream with fish approximately three-fourths mile away. It currently contains eastern brook trout. Upstream of FSR 510 Burroughs Creek follows a moderate canyon and gradient located in the Absaroka volcanics. As a result, pocket pools create the primary fish holding habitat. Downstream of FSR 510 Horse Creek follows a steep canyon with cascades and pocket pools.

Horse Creek. There are no streams with fish within or near the Horse Creek unit. Horse Creek is the closest stream with fish approximately one-half mile away. In this area Horse

Creek currently contains eastern brook trout and cutthroat hybrids. In this area, Horse Creek is a meandering, low gradient valley stream primarily with willows and other deciduous vegetation.

Cartridge Creek. An unnamed perennial headwaters tributary to Cartridge Creek runs through the Cartridge Creek unit. It currently does not contain fish. Upstream of the proposed unit it drains a wetland. The main stem of Cartridge Creek is the closest stream with fish approximately one-quarter mile away. In this area it contains brook trout and hybrid cutthroat trout. It is located in a steep canyon within the Absaroka volcanics. As a result, pocket pools provide the primary fish holding habitat.

Lakes.

Rainbow Lake. There are no lakes or ponds with fish inside the proposed cutting unit. Virgin Lake and Rainbow Lake are nearby within about one-quarter and one-half mile, respectively. Virgin Lake is a shallow five-acre lake that is fishless. Rainbow Lake is a two and a half-acre lake that contains stocked eastern brook trout. All precipitation within the proposed cutting unit drains away from these lakes.

Horse Creek and Cartridge Creek. There are no lakes or ponds with fish inside or near the proposed cutting units.

Yellowstone Cutthroat Trout. Before white settlers, accessible streams without upstream migration barriers in the Burroughs, Horse Creek and Cartridge Creeks contained Yellowstone cutthroat trout (YSC). They have been reduced to a fraction of their historical range in the entire Yellowstone River Basin from introduction of non-native fish species, habitat modification/degradation, and past over fishing. As a result, they are on the Region 2 sensitive species list. They have recently been petitioned for listing under the Endangered Species Act, however, the Fish and Wildlife Service has decided that the petition to list was not warranted. Over the years, various species and subspecies of fish have been introduced in these drainages. Only introduced or hybridized fish species are currently known to inhabit these drainages. There currently are no known pure populations of YSC in the analysis area.

3.9 Wildlife Resources

3.9.1 Management Indicator Species

Seventeen wildlife species, in addition to game trout, were selected during the Forest planning process to be management indicators. The management indicators species (MIS) for the Shoshone National Forest include five featured species that are hunted, five recovery species, and seven ecological indicator species (s*ee* table 3-3). Methods used to select indicator species or groups of species are explained in detail in the planning records of the Land and Resource Management Plan for the Shoshone National Forest.

The following discussions will focus only on the MIS that relevant to the scope of the proposed action, i.e., their habitat is present in or near the project area. *See* table 3-3 for rationale of MIS selected for this analysis. Some MIS relevant to this analysis are also proposed, threatened, or endangered. Other MIS are listed on the Rocky Mountain Region's list of sensitive species (Forest Service Manual 2600, Supplement 2600-94-2). These species are addressed in section 3.9.2 of this chapter.

Because of the potential effects of this project on elk, their habitat, elk migration, and calving and the elevation of these concerns issues raised during the scoping period, most of MIS discussion will focus on elk.

A variety of other wildlife groups also occur within the analysis area. They include small game, trophy game, predators, raptors, furbearers, and nongame mammals, birds, and amphibians. No crucial habitats for these species have been delineated in the analysis area.

The analysis area is providing habitat for several species of neotropcial migratory birds. The Wyoming Partners In Flight list of priority species was considered when evaluating effects for this project. Only two Level One[3] priority species that uses the habitat in the treatment area is the goshawk and bald eagle. These species are discussed in sections 3.9.2 and 4.9.2.

[3] The level where conservation action is needed.

Table 3-3. *Management Indicator Species selected for the Shoshone National Forest. Those selected for the Wind River Regeneration project are shaded. Species marked with an * are on the Rocky Mountain Region's list of sensitive species. Species marked with two asterisks (**) are proposed, threatened, or endangered species. The latter species are discussed under that heading.*

Shoshone NF MIS	Group or habitat requirement	Rational for selection as MIS for this project
Elk	Featured species, economically important	Habitat and species present
Mule deer	Featured species, economically important	Habitat and species present
Bighorn sheep	Featured species, economically important	Habitat and species not present in project areas
Moose	Featured species, economically important	Habitat and species present
Mountain goat	Featured species, unique and limited habitat	Habitat and species not present in project areas
Bald eagle**	Recovery species, threatened and environmentally sensitive	Habitat and species not present in project area
Canada lynx**	Recovery species, threatened and environmentally sensitive	Habitat present
Black-footed ferret**	Recovery species, endangered and environmentally sensitive	Habitat and species not present in project areas
Gray wolf[2]**	Recovery species, non-essential, experimental, and environmentally sensitive	Habitat present
Grizzly bear**	Recovery species, threatened and environmentally sensitive	Habitat and species present
Marten*	Ecological indicator, restrictive habitat requirements in late successional conifer stages	Habitat present
Goshawk*	Ecological indicator, sensitive to disturbance in nesting areas and representative of late successional conifer stages of large acreages	Habitat present
Brewer's sparrow	Ecological indicator, representative of sagebrush communities	Habitat and species not present in project areas
Hairy woodpecker (*see* Primary Cavity Excavators)	Ecological indicator, representative of late successional aspen communities, snag dependent species	Habitat and species present
Beaver	Ecological indicator, representative of special and limited riparian habitat that may be influenced by management practices	Habitat and species not present in project areas
Blue grouse	Ecological indicator, limited habitat and population may be affected by vegetation treatment	Habitat present
Ruffed grouse	Ecological indicator, representative of multi-storied aspen communities	Habitat present

Elk Habitat. No winter range occurs within this analysis area. The majority of elk in this herd unit winter on ranges near Spring Mountain, EA Mountain, and the State managed winter ranges of Inberg-Roy and Spence-Moriarty Wildlife Habitat Units.

While elk do not winter in this analysis area, they migrate through during the spring and fall periods. No distinctive migration corridors have been identified in the analysis area. However, the general migration routes used are from two population segments. The general pattern of migration in the fall is that elk from summer ranges in the Teton Wilderness and south of Yellowstone Park move through the Wolf Creek-West Dunoir area, then through the Six Mile and Five Mile areas, and then easterly either through the Tappen Creek, Battrum Mountain, and Pony Creek area or through the southern portion of the analysis area depending on weather conditions. The other segment of the population moves through the analysis area north to south from summering areas in Horse, Frontier and Wiggins Fork Creeks. The timing and route of the migration is dependent on weather conditions but usually takes place from late October to mid-December in the fall. If weather is not severe, the herd will travel through the timber on the higher slopes. As long as good weather holds, the migration may pause. Storms force the migration into more open country lower on the slopes of Six Mile, Five Mile, Tappen Creek, Battrum Mountain, and Pony Creek. The spring migration is in a reverse pattern and somewhat more dispersed but usually takes place from late April through June.

The analysis area contains numerous small moist meadow areas surrounded by open to dense timber stands as well as open side hills, aspen stands, and a few small lakes. The lower meadow areas and open hillsides provide foraging areas for elk and the higher timbered areas of adequate density provide necessary hiding cover. Timbered areas with meadows interspersed provide both forage and cover. A small population of resident elk uses these same sites during the spring through fall periods as well as higher elevation alpine meadows and timber cover during the summer period.

Table 3-4 displays the total miles of all existing roads and trails in the analysis area, except roads considered obliterated. The conventional method of determining road density is displayed.

Table 3-4. *Existing miles of road, trail, and snowmobile trails within the analysis area and existing total road density within the analysis area*

	ANALYSIS AREA
Road or Trail Category	**Miles**
Open Road	19.65
Permanently Restricted Roads	3.92
Snowmobile Trail	11.94
Non-Motorized Trails	5.52
Summer Motorized Trail	0
	Density Calculations
Total Road Miles	23.57
Total Square Miles	23.17
Density mi/sq mi	1.02

Open motorized route density includes all open roads and open motorized trails. Table 3-5 displays existing open road and motorized trail densities for the winter and non-winter periods in the analysis area.

Table 3-5. *Existing miles of open road and motorized trail within the analysis area and existing open road density within this area*

	ANALYSIS AREA
Road or Trail Category	**Miles**
Open Road	19.65
Snowmobile Trail	11.94
Summer Motorized Trail	0
	Density Calculations
Total Open Road and Trail Miles (Non-Winter)	19.65
Open Trails (Winter)	11.94
Total Square Miles	23.17
Density mi/sq mi (Non-Winter)	0.85
Density mi/sq mi (Winter)	0.52

Elk Population. Elk that use the 14,827-acre analysis area are part of the Wiggins Fork Herd Unit. The proposed project occurs within the spring, summer, and fall range of this population. The post-season population objective for this herd is 4,800 animals. The Wyoming Game and Fish Department has had this population objective in place since at least 1985 (Annual Big Game Herd Unit Reports, 1989). Elk numbers were maintained at or near this level for the five-year period, 1985-1989. Examination and analysis of Annual Big Game Herd Unit Reports from 1989 through 1999 reveal a growing trend in this particular herd (*see* table 3-6).

Table 3-6. *Population estimates, harvest, licenses, hunter success, and recreation days per elk harvested since 1985 for the Wiggins Fork Elk Herd Unit.*

Six-Year Running Average	**85-90**	**86-91**	**87-92**	**88-93**	**89-94**	**90-95**	**91-96**	**92-97**	**93-98**	**94-99**
Population Estimates[4]	4,888	4,967	5,045	4,919	5,165	5,448	5,770	6,189	6,607	6,931
Post-Hunt Trend Count For Last Biological Year[5] in six year period	2,296	1,756	2,188	ND[6]	4,747	5,806[7]	952[8]	6,079	5,656	5,292
Harvest[9]	905	927	961	1,003	1,122	1,086	1,090	1,093	1,157	1,182
Limited Quota Hunt Area 67 Licenses Available For Last Year[10] in six year period	1,000	1,000	1,000	1,000	1,000	1,100	1,300	1,400	1,550	1,550
Percent Hunter Success	23.4	27.2	28.9	30.1	32.3	31.9	31.0	30.2	32.0	32.8
Recreation Days/Elk Harvested	21.8	20.6	19.7	18.7	17.6	19.5	20.8	21.9	21.0	20.4

[4] Population estimates based on population modeling, which was considered unreliable in biological year 1995 following the completion of the Wiggins Fork Elk Movements Study (Queen and Ryder 1996).
[5] For the biological years 1990-1992 and 1994, these estimates use ground- based counts.
[6] No Data.
[7] Helicopter and fixed-wing counts.
[8] Incomplete count.
[9] Harvest levels highly influenced by weather and on-set of fall migration.
[10] Excluding Limited Quota archery-only licenses.

In the winter of 1997-98, the post-hunt trend count, which was conducted using helicopter and fixed-wing aircraft as in the 1995-96 winter, was 6,079 elk. However, this survey also used a video camera to record and later count the larger groups of elk. These techniques allow a more accurate and thorough survey than in earlier years.

The Wiggins Fork Elk Movements Study (Queen and Ryder 1996) was initiated after the acquisition of the Spence-Moriarty property (Thunderhead Ranch). During the winters of 1992-93 and 1993-94, 34 adult female elk were captured across all wintering areas in the Department's Elk Hunt Area 67 and fitted with radio transmitters. These animals were monitored from February 1993 through October 1996. Results of this study determined seasonal distribution and migration behavior of apparently two distinct herd segments for this hunt area.

Radio-marked animals wintering in the East Fork area generally moved north into the spring transition range in the Wayne's Hole and Caldwell Basin Area. This segment of animals then moved north/northwest and spent the summer months within the Wiggins Fork or Cody Herd Units (South Fork of the Shoshone River and Wood River). Marked elk from the Spring Mountain wintering area moved west to join the animals wintering in the Dunoir or areas near the Forest boundary south of the Ramshorn. These animals moved onto the spring transition area in the Dunoir. These animals either stayed within the herd unit or moved to summer ranges near the South Fork of the Buffalo River and Thorofare area of the Yellowstone River in the Jackson Herd Unit. Nearly 60 percent of the marked animals in this study moved from wintering areas in the Wiggins Fork Herd Unit to summer ranges in other herd units. Since this interchange to other herd units is greater than 10 percent, computer modeling this Wiggins Fork herd to estimate population size has become unreliable.

Post-hunt surveys have become more accurate and thorough in recent years. However, because of the large interchange with other herd units, the ability to reliably model and estimate population size may have decreased, or more likely, the estimated population size, based on modeling, may never have been very accurate. Regardless, the Annual Big Game Herd Unit Reports for 1996, 1997, 1998, and 1999, estimate the post-hunt elk population size at 7,200, 7,500, 7,500, and 6,810, respectively. These estimates are based on intensive winter counts by helicopter and fixed-wing in January 1996, 1998, and January 1999 that indicated there were substantially more elk than predicted by the model. Since elk are primarily concentrated in large groups, it is assumed that a high percentage of elk were counted (80 percent). Based on this figure, it was estimated that as of January 1999 a minimum of 6,800 elk were wintering within the herd unit.

This estimate of 6,800 elk is substantially above the population objective of 4,800, and the estimated population present in the 1985-1989 period. The current estimate is larger, but may not be substantially larger, than the actual numbers during 1985-1989. The number of elk, licenses available, harvest, and hunter success has not declined since the 1985-89 period.

Hunting season length has increased over this period. The argument is that because of previous timber harvest on the Wind River District and other cumulative effects, it is taking

longer to harvest the same number of elk as in years past. This increase in season length is a function of attempting to harvest more elk and place more of that harvest on the migratory segment of the population, which was and is highly influenced by weather. A possible, additional reason that the hunting seasons have gotten longer is the later hunting seasons themselves. It is possible that the hunting pressure stalls that migration by forcing elk to remain in the higher elevations in deeper snow just above where most hunters can physically access during that time of year - many elk simply finish migration after the hunting pressure is over.

Currently, there are liberal elk seasons on probably the largest free-ranging elk population that is not on an elk feed-ground in the State of Wyoming. There are many licenses offered, the seasons are long, and they extend into the early winter with the purpose to place a portion of the harvest on the late migrating segment of this population, the majority of which summers in herd units other than the Wiggins Fork Herd Unit.

Moose. Moose population estimates in the Wind River District have been above the population objective (which was changed to 400 from 350 in 1994) since at least 1991 (Annual Big Game Herd Unit Reports 1996, 1997, 1998, and 1999). The current situation has improved over the early 1980s when the population apparently was declining and licenses dropped from 45 in 1982 to 20 in 1985. Drought was considered to be affecting the calf survival during that time and the population was estimated to be 200 animals in 1985. The number of licenses issued in 1989 was 25. In 1991, 45 licenses were issued. The number of licenses jumped to 55 in 1993, dropped to 35 in 1994, and was back to 55 in 1997, where it has remained. There is very little moose winter/year-long habitat in this analysis area. It occurs in the Wiggins Fork and Horse Creek area. The majority of the analysis area is spring, summer and fall habitat for moose. During the spring through fall period, use is scattered throughout the area with heaviest use in bog or wet areas and heavy timber patches. In winter, use is primarily concentrated in willow bottoms or aspen stands.

Mule Deer. The area provides habitat for a moderate deer population which is distributed throughout the analysis area in summer. In winter, deer move down from the higher elevations and concentrate along stream bottoms and adjacent foothills outside of the analysis area. Mule deer winter/year-long habitat occurs in the same general area as that of the moose winter/year-long habitat. The rest of the analysis area provides spring, summer and fall deer habitat. In 1998, the deer population in the Dubois Herd Unit was estimated at 7,400 animals (Annual Big Game Herd Unit Reports 1999). This level is below the objective population level of 10,000 animals, which was raised from 5,400 deer in 1994.

Forest Grouse. The area provides habitat for both blue and ruffed grouse with blues being the predominant species. Ruffed grouse are heavily dependent on aspen stands or mixed deciduous/conifer stands year round. However during stormy winter weather, they often resort to coniferous stands for cover and may remain there for several days. Blue grouse nesting areas are often in open timber stands along the outskirts of forested cover. Brooding habitat for both species is near meadows or other open areas that provide ample opportunities

for the chicks to feed on insects. Blue grouse are heavily dependent on coniferous needles for winter food and usually migrate higher in elevation during the late fall period.

Primary Cavity Excavators (e.g. Hairy Woodpecker). Standing dead and down trees are a component that occurs throughout the various forested vegetation types. This habitat component can occur in the forested areas in all successional stages, but is usually more prevalent in the later successional stages. Standing dead (snags) provide a portion of the life support systems for many species of invertebrates, birds, and mammals. Wildlife species that use snags include those that excavate their own cavities (primary cavity excavators), those that occupy existing cavities, and those that forage on and in snags and down wood material. In the Rocky Mountains, snags are used to some degree by 65 bird and 19 mammal species. At least 20 bird species (primary cavity excavators) are dependent on snags, or at least dependent on standing dead or excavatable wood.

There are 14,827 acres in the analysis area. Subtracting the acres of wilderness, lakes, and other non-forested areas leaves 9,868 acres, or 67 percent, of the analysis area that have potential to have, or have had, dead and defective tree habitat impacted by management activities. Twenty-five percent (2,491 acres) of the non-wilderness, forested habitat has been impacted by management activities in the past, not counting the construction of the existing roads nor the removal of firewood along those existing roads. The impacts from timber harvest and firewood gathering include reduced amounts and distribution of this habitat. Generally maintaining amounts of this kind of habitat for species viability has not been a problem but having that habitat well distributed across the landscape so that individuals can interact with each other might be. Other benefits, in addition to viability, from maintaining good distribution and quality of dead and defective tree habitat are recreational, non-consumptive uses, and forest insect control.

There are a total of 19.65 miles of road open to firewood gathering in the analysis area. These roads and a variable area on both sides of these roads have, for the most part in forested settings, been affected by past firewood gathering. Using 200 feet above each road and 50 feet below each road as an average for the actual area affected, results in 595 acres (6 % of the non-wilderness, forested habitat) where wildlife habitat has and is impacted by firewood gathering. Some areas along the roads may not be affected to 250 feet because of steep terrain or adjacent non-forested areas, such as meadows. Other areas may be affected by more that 250 feet because of gentle terrain. Generally because of limited access, the influence of firewood gathering downhill from roads tapers off beyond 200 feet on 20 percent slopes. This area influenced by firewood gathering is probably a conservative estimate because this estimate does not include the area accessed by user-built roads that are pioneered by the firewood gathering public and the area previously accessed by roads now obliterated and permanently restricted.

In the analysis area there are currently 11,750 acres of forested vegetation types, or 79 percent of the analysis area. The majority of the forested vegetation types (73 percent) are in the later successional stages that would have potentially more snags and down dead material.

However, there are earlier successional lodgepole pine stands that have high degree of dead tops from disease that also provide dead standing wood.

The proposed stands for harvest currently do provide habitat for primary cavity excavators, including such species as the hairy, black-backed, and northern three-toed woodpeckers. They utilize dead and dying trees for both nesting and foraging for insects. These species inhabit lodgepole pine, Douglas-fir, and Engelmann spruce-subalpine fir forests in Wyoming, especially those forests that have burned.

3.9.2 Proposed, Endangered, Threatened, and Sensitive Wildlife Species

Table 3-7 summarizes the list of proposed, threatened, endangered, or sensitive wildlife species analyzed for the Wind River Regeneration project. Additional information on Yellowstone cutthroat trout can be found in this chapter, section 3.8.3.

Table 3-7. *Summary of proposed, threatened, or endangered wildlife species analyzed for the Wind River Regeneration Project.*

Species	Habitat Present
Threatened or Endangered Species	
Canada lynx	Yes
Grizzly bear	Yes
Bald eagle	No
Gray wolf[11]	Yes
Sensitive Wildlife Species	
Dwarf shrew	No
Water vole	No
Marten	Yes
Fisher	No
Wolverine	No
Northern Goshawk	Yes
Boreal owl	Yes
Black-backed woodpecker	Yes
Northern three-toed woodpecker	Yes
Tiger Salamander	No
Boreal toad	No
Spotted Frog	No
Northern leopard frog	No
Yellowstone Cutthroat trout	No

An in-depth description of the affected environment and important interactions for proposed, endangered, threatened or sensitive wildlife species within the analysis area can be found in the Wind River Regeneration Biological Assessment/Biological Evaluation (BA/BE). The BA/BE is found in Appendix C.

[11] The gray wolf (*Canis lupis*), which was formally listed as threatened, was reclassified as non-essential, experimental in the Yellowstone area with the publication of the Final Rules in the Federal Register (November 22, 1994; Vol. 59, No. 244).

3.9.3 Sensitive Plant Species and Noxious Weeds

Table 3-8 lists the sensitive plants that occur on the Forest. The proposed harvest units do not include habitat characteristics or conditions where the sensitive plant species on the Forest generally occur (Fertig, 1994). There are no known populations or individuals of these species in the analysis area (WYNDD, 2000). Those species generally either occur in the higher elevations, sparsely vegetated rocky, ridgetops, or talus slopes or wet montane or alpine meadows. The project sites contain none of these habitat conditions. There is low likelihood that these species would occur in the project sites because their specific habitats are not present.

Table 3-8. *Sensitive plants on the Shoshone National Forest*

Species Name	Vegetation Type	Soil Type	Habitat Present in Project Area	Project Area Method of Survey	Species Present in Project Area	Notes
Pink agoseris *(Agoseris lackschweitzii)*	Wet Montana/subalpine meadows	Variable	No	Literature cited	No	meadows
Round-leaved orchid *(Amerorchis rotundifolia)*	Coniferous bogs	Calcareous	No	Literature cited	No	Swamp Lake area primary occurrence
Red manzanita *(Arctostaphylos rubra)*	Coniferous bogs	Calcareous	No	Literature cited	No	Swamp lake area primary occurrence
Upward-lobe moonwort *(Botrychium ascendens)*	Wet meadows/willow	Alluvium	No	Literature cited	No	Willow riparian
Livid sedge **(*Carex livida*)**	Floating mats, bogs, fens	Calcareous	No	Literature cited	No	
Wyoming tansymustard *(Descurainia torulosa)*	Rocky slopes and ridges	Volcanic	No	Literature cited	No	Endemic to Absaroka Mountain Range
Kirkpatrick's ipomopsis *(Ipomopsis spicata spp. robruthii)*	Alpine scree	Volcanic	No	Literature cited	No	
Fremont bladderpod *(Lesquerella fremontii)*	Barren slopes and ridges	Calcareous	No	Literature cited	No	meadows
Hall's fescue *(Festuca hallii)*	Montane grassland	Calcareous	No	Literature cited	No	
Marsh muhly *(Muhlenbergia glomerata)*	Bogs, floating mats, fens	Calcareous	No	Literature cited	No	Swamp Lake area primary occurrence

Species Name	Vegetation Type	Soil Type	Habitat Present in Project Area	Project Area Method of Survey	Species Present in Project Area	Notes
Naked-stemmed parrya *(Parrya nudicaulis)*	Alpine	Calcareous	No	Literature cited	No	
Greenland primrose *(Primula egalikensis)*	Bogs, fens	Calcareous	No	Literature cited	No	Swamp Lake area primary occurrence
Absaroka goldenweed *(Pyrrocoma carthamoides var. subsquarrosa)*	Montane meadows, grasslands	Calcareous	No	Literature cited	No	
Myrtleleaf willow *(Salix myrtillifolia var. myrtillifolia)*	Floating mats, bogs, fens	Calcareous	No	Literature cited	No	Swamp Lake area primary occurrence
Rolland bulrush *(Scirpus rollandii)*	Floating mats, bogs, fens	Calcareous	No	Literature cited	No	Swamp Lake area primary occurrence
Shoshonea *Shoshonea pulvinata*	Calcareous Soils & Rock outcrops	Calcareous	No	Literature cited	No	
North Fork easter daisy *(Townsendia condensate var. anomala)*	Rocky slopes and ridges	Volcanic	No	Literature cited	No	Endemic to Absaroka Mountain Range

A weed risk assessment rating (located in the project file) was used to address potential spread, consequences, and adverse effects of noxious weeds. This project has a moderate weed assessment rating. Canada thistle, Russian knapweed, whitetop, and marsh sowthistle are present. Spotted knapweed, musk thistle, common tansey, and houndstongue are other weeds of concern found within the project area.

3.10 Social and Economic Environment

Social and economic concerns relative to the project are symptomatic of general trends occurring in much of the western United States. Issues revolving around access, private lands and ownership rights, regulation, resource impacts, multiple use, growth and development, economic dependency, county and local jurisdiction, et al could enter the discussion.

However, any resolution of these issues is beyond the scope of the analysis for a single timber sale. Feelings are likely to run high on both sides of any issue locally concerning this project.

3.11 Environmental Justice

Presidential Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" was issued in February 1994. This directed federal agencies to consider as part of the NEPA analysis process, how their proposed actions or projects might affect human health and environmental conditions on minority and/or low-income communities.

Two fundamental questions are posed by the CEQ (Council of Environmental Quality) to help agencies address these and related factors: 1) "Does the potentially affected community include minority and/or low-income populations?" and, 2) "Are the environmental impacts likely to fall disproportionately on minority and/or low-income members of the community and/or tribal resources?"

In answering the first question we used 1990 Census data to examine the minority and low-income populations in Fremont County, the county where the proposed action occurs. The minority populations for Fremont County represent less then 20.2 percent of the total population for the county. This compares to 5.8% minority populations for the whole of Wyoming. CEQ guidance identifies a minority population as one where either: a) the minority population of the affected area exceeds 50 percent or b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population. For this analysis the affected area is identified as Fremont County and the state of Wyoming is used as the geographic reference for the general population. Fremont County meets the second condition. Further investigation of the census data indicates that Native Americans make up 18.5% of the population of Fremont County. It is assumed that a majority of this population is located on and near the Wind River Reservation. For the purposes of this analysis the Native American population on and near the Wind River Reservation is identified as a minority population.

The percentage of persons below the poverty level for Fremont County is 19.1 percent as compared to 11.9 percent for Wyoming. Based upon the known demographics of the county it is assumed that a large percentage of these persons are located on and near the Wind River Reservation. For this analysis this population is identified as a low-income population.

3.12 Wilderness and Roadless Areas

There are 3,357 acres designated as wilderness and 1,992 acres of inventoried roadless areas. *See* Appendix A, figure 4 for map of inventoried roadless and wilderness areas. The Cartridge Creek unit falls within a roadless area (*see* Figure 4). According to Interim Directive 1920-2001-1, the Forest Service Chief need not approve the decision to harvest here according to exception 1925.04a-2d:

- The harvest is in a portion of an inventoried roadless area where construction of a classified road and subsequent timber harvest has previously taken place, and the roadless area characteristics have been substantially altered by those activities.

Comparing Figure 4 to Figure 2, it can be seen that FSR 285.2HA is included in the roadless area. These roads are both classified roads, and previous timber harvest activities have occurred in these areas.

Chapter 4 Environmental Consequences

4.1 Introduction

The direct and indirect effects of the proposed action and alternatives to it are disclosed in this chapter for each potentially affected resource. Direct effects are caused by the action and occur at the same time and place as the action. Indirect effects are caused by the action and occur later in time or farther removed in distance. The magnitude of the potential effect is described either in direct or relative terms. The need for mitigation is justified and displayed relative to the potential effects. A summary of all mitigation is included in Chapter 2. Cumulative effects for each resource area are disclosed separately under that title at the end of this chapter.

The effects are conveyed by an assessment of how well the alternative meets the essential purpose and need for action.

4.2 Effects on Forest Vegetation

4.2.1 Alternative 1

This alternative would remove diseased trees from the selected stands only. Diseased lodgepole pine would be targeted for harvest, removing the dwarf mistletoe source of infection within the stands and dead topped or cankered lodgepole pine infected with comandra blister rust. Lodgepole pine seedlings and saplings within the harvest units found to be infected with dwarf mistletoe would be cut following harvest using Knutson-Vandenberg (KV) Funds generated by the timber sale. Other tree species may also be marked for removal if they are diseased, are poor seed sources, or to open up the stand to ensure conditions needed for regeneration are created. Dwarf mistletoe may eventually creep back into the stands from adjacent infection sources, but harvest unit boundaries would be laid along natural type breaks to prevent this to the extent possible. Young, recently thinned lodgepole pine stands adjacent to the harvest unit boundaries may have to be surveyed for any latent mistletoe infections. Any trees found to be infected with mistletoe would be cut to protect the newly regenerated stands and prevent further infection in these adjacent stands.

Little can be done to prevent future infection by comandra blister rust. Salvaging currently infected trees would provide space for younger, healthier trees to become established and occupy the site. Mature, cone bearing lodgepole pine that show no evidence of any disease would be marked as leave trees in the chance that any progeny of these trees may also show disease resistance.

Much the same can be said about white pine blister rust that is infecting whitebark pine as the comandra blister rust that is infecting lodgepole pine. Salvaging infected trees would create space for new regeneration and marking disease free trees as leave trees may increase the chances of producing disease resistant progeny.

Age class distribution among forested stands would improve slightly under this alternative. Approximately 90 acres of the 8,677 acres of mature forest would be set back in succession to the seedling/sapling stage. Presently 74% of the analysis area is typed as mature forest. A variety of stands in different age classes can help mitigate catastrophic bark beetle infestations and other natural events.

The regenerated stands would have greater species diversity, which could lessen disease and insect infestations. Silvicultural prescriptions for all three harvest units are designed to create stands with greater species diversity. Spruce, subalpine fir, Douglas-fir and whitebark pine would be designated as leave trees in hopes to regenerate stands with greater representation of these species. The Cartridge Creek Unit does have some older aspen stems in and adjacent to the unit which should regenerate through root sprouts when the forest canopy is opened up. Designated leave trees would provide partial site protection while also providing structural diversity within the stands.

4.2.2 Alternative 2

Under this alternative natural succession would proceed, with stands of lodgepole and whitebark pine gradually being replaced by climax spruce and subalpine fir stands. The forested area would become a more homogeneous area of uneven-aged stands, with a dead and dying overstory of large trees and a mix of species in the understory. Mortality of mature trees would increase as comandra rust and dwarf mistletoe infections become more common. White pine blister rust would continue infecting and killing non-resistant whitebark and limber pines with very noticeable increases in mortality. All species of pine present in the area are susceptible to mountain pine beetle attacks especially when weakened by the previously mentioned diseases. Pines over nine inches in diameter are the preferred hosts for the mountain pine beetle. With 74% of the forested acres within the analysis area being classified as mature there is a high chance for a beetle outbreak, causing extensive mortality over a large area.

The risk here is the possibility of a greatly altered forest ecosystem – either from a change to a widespread area of insect or disease killed dead trees or a burned landscape resulting from fire. Disease and fire are a natural part of the Rocky Mountain ecosystems, but fire protection and minimal harvesting have put this area beyond the range of natural variability. Extensive mortality caused by the variety of agents listed above would increase fuel loadings. Overstory mortality would open up the canopy and release understory trees, effectively creating ladder fuels. Higher fuel loading over a large area reduces the chance of immediate control of wildfire. The higher fuel loading can create intense fire that would effectively sterilize soil and slow the natural recovery processes. A single large fire can create huge areas of forest with a very narrow age distribution and low species diversity. The fires would happen, but maybe not until years of fuels accumulated from dead and dying trees.

4.2.3 Alternative 3

The effects of this alternative on the forested vegetation would be only slightly different from Alternative 1 where leave trees are left within the harvest units. With this alternative no selection would be made for disease free leave trees, losing the possibility that resistant trees are selected as seed sources for regeneration. The increased burning used in this alternative would kill most existing advanced regeneration, decreasing the possibility of having a mistletoe infection source within the regenerated stand. Continuity of fuels would be lessened, reducing likelihood of a wildfire carrying through the stand to adjacent stands. Slash burning would be easier and cheaper with no leave trees within the burn unit.

This alternative would produce the same small increase in age class diversity as Alternative 1.

This alternative would favor early successional species lodgepole pine, quaking aspen, and whitebark pine due to the total removal of the forest canopy. A favorable mineral soil seedbed for Engelmann spruce regeneration should also be created. If care is taken to leave spruce seed trees near the harvest unit boundaries, especially upwind boundaries, some spruce regeneration should become established. Within stand species diversity may be slightly less than the stand created in Alternative 1 due to the removal of seed trees within the stand. This alternative, however, may encourage greater representation of quaking aspen and whitebark regeneration. This alternative would increase horizontal diversity between stands by favoring early successional species.

4.3 Effects on Travel and Transportation Resources

Under both action alternatives, spot reconstruction on FSR 510 would improve safety conditions where an intersection would be reconstructed and improve water quality where the road would be relocated out of a wet meadow. FSRs used for timber access and haul shall be maintained to current standard and condition by the purchaser. Logging traffic/safety signing would be used as appropriate.

Since neither of the action alternatives (or the no action alternative) can fund identified deferred maintenance and improvement needs in the analysis, safety, maintenance, sedimentation, and water quality concerns would remain as they are. The HCWIP, however, should improve some of these conditions (*see* section 4.12.3). Neither of the action alternatives, therefore, would result in increased water quality or aquatic resource degradation.

4.4 Effects on Range Resources

For both action alternatives, livestock may impact the Rainbow Lake and Cartridge Creek harvest area due to historical trailing along FSR 510 and 285 and the proximity to water, particularly once the treatments have been completed and the area is opened up. Some regeneration may be damaged, but the overall effect should be minimal.

Grazing, due in part to the predominantly forested location and shorter grazing season, would not likely impact the Horse Creek harvest area.

4.5 Effects on Recreation Resources

4.5.1 Alternatives 1 and 2

The effects of the proposed action on recreation would be minimal. No significant increases or decreases in short term or long term recreation use are expected. Since there is a proposal to relocate the Horse Creek trailhead, no conflict with trail users should occur. If the decision is made not to relocate the trailhead, use at would be unaffected by harvest operations as the Horse Creek unit is 0.75 miles away. FSRs 507 and 701 would be improved enough for hauling. This would benefit trail users traveling on FSR 507, as the present road is substandard.

Hauling traffic would be minimal due to the small unit volumes; no conflicts are expected with recreation users on the roads. Unless snow levels are light enough and where otherwise agreed to by interested parties, no hauling would be permitted on roads accessing the Cartridge Creek unit from December 1 to April 1 to avoid conflicts with the commercial dog sled operation. The other two units need no hauling restrictions except for safety signing during hauling.

4.5.2 Alternative 2

This alternative would have little or no effects on recreation resources. Use would remain as described in Chapter 3.

4.6 Effects on Visual Resources

4.6.1 Alternatives 1 and 3

If the Horse Creek trailhead were relocated, there would be no affect to trailhead users. If it is not relocated, regenerating stands of about 15 feet in height buffer the trailhead from the Horse Creek unit. Sale disturbance may be seen, however, from small sections of FSRs 701, 700, 507, 736, 504, or from top of Elkhorn Ridge if regenerated stands do not completely cover the view. Evidence of disturbance would exist in the middle to background areas only and on a very small scale.

Areas where the Rainbow Lake unit would be visible in the foreground are from small sections of FSRs 510, 691, and 692. Areas where the sale may be visible in the middle and background are from small sections of FSRs 701, 702, and trail 810.

The Cartridge Creek unit can be seen from small sections of FSR 285. To view it one must look down beyond a steep hillside strewn with aspen and conifers. Other possible areas that

the harvest may be seen from are in the middle and background only: FSRs 710, 556, and trail 848. It would also be in the viewshed of the few anglers that fish in Cartridge Creek.

Alternatives 1 and 3 are similar in effects from the seen areas described above. The proposed method of clear-cutting 38, 30, and 20 acres in each of the units respectively would meet the VQO criteria. Short-term (within 25 years) effect would be an altered landscape. Long term (beyond 25 years), the site would slowly regenerate, allowing future needed harvest. In Alternative 1, the reserve trees would soften views of the tree removal from within the site itself and add to the buffer. It would also provide some shade for seedlings. In Alternative 3, the absence of reserve trees would project a more modified appearance than Alternative 1.

4.6.2 Alternative 2

This alternative would not be in keeping with the VQO criteria. Short term the effect would have no change on the landscape. However, long term, a continually dying and diseased forest would increasingly become less visually pleasing. This alternative would produce poor aesthetic results for the long term.

4.7 Effects on Cultural Resources

Under all action alternatives, known cultural resource sites would be protected through avoidance.

4.8 Effects on Soil, Water, and Aquatic Resources

4.8.1 Effects on Geology and Soils

Geologic Hazards. Areas of all the proposed units have areas of landslides indicated by Case (1989). Temporary roads, skid trails, log landings shall avoid cutting landslide toe slopes.

Soil Health and Long-term Productivity. Regional guidelines for protecting the soil resource (FS 2509.18-92-1) state that no more that 15% of an area will be left in a detrimentally compacted, displaced, puddled, severely burned, and/or eroded condition. Under all action alternatives, harvest would occur at a time of moderate to low soil moisture conditions. The soils in these map units have a moderate to severe rating for soil rutting hazard. This is evidenced by the severe rutting problems that exist along the FSR 507. However, compaction, displacement, and puddling, during low soil moisture conditions, should be minimal within the sale area.

Skid trails and temporary roads would experience short-term detrimental conditions. Skid trails should be reclaimed following harvesting operations by removing berms, covering with slash, installing waterbars, and if necessary, seeding. Temporary roads would be obliterated by removing culverts and reestablishing natural drainage configuration to the degree possible by constructing permanent water bars or cross drains, outsloping and ripping the road

surface, seeding, spreading slash over disturbed areas, and blocking to normal vehicular traffic.

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 offsite. Under Alternative 1, coarse woody debris would be left at the rate of six to eight tons/acre. In Alternative 3, coarse woody debris would be left at the rate of four to six tons/acre. This material would provide source material for decomposition.

Alternative 1 would have jackpot burning of slash. This creates an intense fire in small areas. Effects of this should be minimal given that no more than 15% of the unit would have this higher intensity fire.

Alternative 3 would have low intensity broadcast burning. It is estimated 60 to 80 percent of the unit would be affected. This activity would lead to a flush release of nitrogen that would be rapidly used by new plant growth. However, some of this rapid release would be in a volatile state and lost in the atmosphere while the rest may move off the site. The movement offsite would be minimal given the low severity of the prescribed fire. The ground cover left in this alternative is estimated at 40%.

Soil Erosion. Under Alternatives 1 and 3 surface erosion amounts would be very minimal until forest cover is reestablished. Using the Water Erosion Prediction Project (WEPP) model (Elliott, 2000), the amount of on site erosion for both alternatives and has been calculated (*see* table 4-1; the actual model data can be found in project file). The WEPP model is a complex computer program that describes the processes that lead to erosion. These processes include infiltration, runoff; soil detachment, transport, and deposition; and plant growth, senescence, and residue decomposition. The model daily calculates the soil water content in multiple layers and plant growth/decomposition. However, it must be noted that WEPP is only a model and it is only a comparison tool. Proportions rather than exact amounts should be compared.

WEPP estimated values were found to be less than four tons/acre for Alternatives 1 and 3. To put this data in perspective, 1/10 of an inch of soil lost over an acre is estimated at 16 tons/acre. It is estimated after five years with adequate tree regeneration the surface erosion rate would be negligible. If the broadcast burning results in a severe fire, surface erosion would increase to 1.45 tons/acre on the Rainbow and Cartridge Creek Units and 3.93 tons/acre on the Horse Creek unit.

Table 4-1: *WEPP Model Predicted Erosion*

Upland Erosion (Tons/Acre)	Alt 1	Alt 2	Alt 3
Horse Creek Unit	2.30	0.0	3.57
Rainbow and Cartridge Units	0.81	0.0	1.13

Implementation of the BMPs located in the project file would minimize the potential erosion predicted above.

Under Alternative 2 no detrimental impacts to soil would result.

4.8.2 Effects on Water Resources

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. None of the proposed activities would result in changes to the hydrologic regime and the capability of the wetlands to function as a water quality filter and facilitate groundwater recharge. No wetland acreage would be harvested or crossed by new roads in any of the alternatives. Moisture conditions within the wetlands should not be affected by the proposed activities because of the location of the harvest units and the burn prescriptions for prescribed fire.

Sale layout would include a 100-foot equipment buffer zone from all water bodies to implement Forest Plan standard and guidelines (III-215). No heavy equipment would encroach in wetlands/water bodies and at least 80% of potential ground cover would be maintained within the buffer zone.

Floodplains. Floodplains are natural escape areas for floods that temper flood stages and velocities. No new road construction would occur in flood prone areas nor are any of the units proposed for treatment located in flood prone areas. Streams in the project area have access to their floodplains, and flood hazard would not be affected by the proposed activities.

Riparian Areas. 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 and age classes.

None of the proposed activities within the Horse Creek or Rainbow Lake sale areas would occur within or near riparian areas. Consequently, the action alternatives would have minimal to no effect on riparian ecosystems for these two sales. The proposed action alternatives would indirectly benefit riparian habitat over the long term by reducing fuel loading and risk of catastrophic fire in the area. The Cartridge Creek sale area does include a portion of a perennial stream. No harvesting would occur in the riparian area itself. However, the temporary road accessing this unit crosses through a riparian area. This temporary road would have erosion control structures in place to prevent sedimentation occurring in the riparian area.

Streams and Lakes.

Sediment. Most sediment delivered to streams comes from runoff from connected disturbed areas like roads and other disturbed soils near streams. Sediment deposits in streambeds harm insect populations and fish habitat and can change the character of the stream channel.

Each of the alternatives carries the risk of sediment delivery from the existing road system. The lack of erosion control structures and the lack of maintenance of erosion control structures (such as sediment filling of water bars and culverts) have caused rilling and gullying of the road prism, some sloughing of cut-and-fill slopes, and the potential of sediment delivery to streams, ponds, and wetlands. Some roads in the analysis area have ephemeral, intermittent, and wetland stream crossings that lack proper fords. Some roads have ineffective closures that have allowed erosion of unmaintained water bars and are poorly vegetated. Most of these concerns were addressed in the HCWA and HCRA. These documents contain recommended watershed improvement measures and are incorporated by reference. *See* section 4.12.3 for a discussion of effects from the HCWIP.

Alternatives 1 and 3, however, would improve existing conditions with spot reconstruction and installing erosion control structures on portions of FSRs 504, 510, and 507, and relocating the road out of a wet meadow near the Rainbow unit. Alternatives 1 and 3 would also rehabilitate the temporary road and landing area of the Rainbow unit and close 285.2HA after its use as a temporary road.

None of the alternatives carries a substantial risk of sediment delivery from the location of the acreage being treated and the types of silvicultural and slash treatment proposed. Erosion and sedimentation would either not occur or would be adequately buffered from sediment delivery to streams and wetlands.

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. None of the alternatives propose harvest units within riparian areas or propose any new stream crossings, so there is no additional risk to the existing condition for bank destabilization and bank vegetation damage.

Flow Regimes. Flow regimes can be altered by major changes in cover type or ground cover, dense road networks, or water projects. Hydrologically, the amount of acreage being treated or disturbed is minimal. The proposed additional 0.2 miles of temporary road would be disconnected from streams, including ephemeral drainage swales, lakes, and ponds. The temporary roads would be physically closed, with any cut and fill areas recontoured and revegetated upon completion of the project such that the possibility of stream network extension is minimized. Because of this, effects on flow regimes are minor with proper administration, compliance, and monitoring.

Temperature and Oxygen. The limited amount of silvicultural treatments and ground disturbance in any of the alternatives would not affect water temperature and oxygenation.

Water Purity. Placing concentrated pollutant sources near water bodies can degrade water purity. The mitigation listed in the BMPs (located in the project file) reduces the risk of affecting water purity to an acceptable level because it includes proven conservation practices that adequately disconnect or buffer project activities from water and because it includes contingency plans for spills. Therefore, the effects of the project, no matter the alternative, are minor with proper administration, compliance, and monitoring.

Aquatic Life. Migration barriers, changed flow regimes, riparian damage, or significantly increased sediment or chemical loads can degrade aquatic life. With proper administration, compliance, and monitoring of the Watershed Conservation Practices, Best Management Practices, and mitigation measures in this document, the effects of timber harvest and roads on riparian habitat and aquatic biota that use them, including fisheries, would be insignificant.

4.8.3 Effects on Fisheries Resources

Overall, either action alternative would have no adverse impacts on perennial streams and lakes with fish including Rainbow Lake. For Rainbow and Horse Creek units, none of the proposed units are near perennial streams. Precipitation from the Rainbow unit would drain away from Rainbow Lake. Erosion control structures on temporary roads, as described above, would prevent sedimentation into the perennial stream in the Cartridge Creek unit. There is adequate filtering and drainage to prevent sediment introduction into live streams. Small acreages would be treated. Units would be planted if natural regeneration does not meet specified standards. There are no new roads proposed. Existing roads would be reconstructed where necessary. A total of approximately 0.2 miles of temporary road may be necessary for access to some harvest units. All temporary roads would be obliterated, recontoured and if necessary, seeded, after use. Also, proper administration, compliance, and monitoring of Watershed Conservation Practices (WCPs), Best Management Practices (BMPs), and mitigation measures contained in the project file would further minimize any potential adverse riparian and fisheries resource impacts.

As a result, potential impacts to fisheries resources are negligible or non-existent with either action alternative. Since no pure Yellowstone cutthroat trout are currently found in the analysis area this species would not be affected by either action alternative.

Either action alternative would be beneficial to these resources in the long term. The no action alternative would not since the existing stands are dead and dying. Timber harvest would somewhat help prevent catastrophic wild fires in these stands and adjacent areas which would also help reduce the threat of significant post fire erosion and excessive sediment introduction into streams significantly exceeding natural levels.

4.9 Effects on Wildlife Resources

All vegetation management activities have some impact either negatively or positively on wildlife species. Vegetative manipulation that favors earlier successional vegetation would provide habitat for and benefit early successional wildlife species. Activities that maintain late successional vegetation would favor species that are dependent on habitat provided by those vegetative species and the structure they provide.

4.9.1 Management Indicator Species

Effects on Elk. Big game, particularly elk, use forested stands in this landscape for hiding or security cover, migration, and travel corridors. Vegetation treatments usually cause a shift in how big game animals use their altered habitat. These effects can be either direct or indirect. Harvesting forested stands that provide hiding/security cover or travel/migration corridors decreases the ability of those stands to function in that capacity, but usually increases forage in those areas in the short-term. A forested stand's ability to function as hiding cover for security or during migration for elk and other big game decreases as the amount of timber removed using logging in that stand increases. Building roads through forested stands also eliminates those stands ability to function as hiding/security cover. Increased indirect effects to elk from more successful predation and hunting can occur when hiding cover is reduced. Effects of the amount of hiding/security cover lost through timber harvest are determined in this analysis by comparing the acres of cover lost through timber harvest and road construction between alternatives.

Road construction, road use, and harvest activities into previously unroaded big game areas usually causes some disturbance and displacement of big game, particularly if the animals have not habituated to these activities. This disturbance and displacement can also be direct and indirect and usually is short-term, but could be long-term depending on the magnitude of adverse impacts and if the roads are left open to motorized travel after the vegetative treatment activities are completed. The differences between alternatives, both during the treatment activities and after, consider the size of the area affected (acres potentially affected and miles of road constructed and open) and the length of time the area is affected. The more area treated, acres clearcut, miles of road constructed and open, and time until activities are completed, the greater the potential impacts to these species that prefer less disturbed habitats.

As mentioned above, habitat conditions generally influence the distribution of big game populations, or how and where they use their habitat, and indirectly affect their vulnerability to hunters and predators. Big game population numbers, however, are often most affected by the severity of winters, the number of hunting licenses sold, the timing and length of hunting seasons, hunter success, and the number of animals actually harvested.

Alternative 1. Proposed treatments in this alternative would eliminate these stands ability to function as hiding cover for elk security cover and travel corridors during the short-term (20 years). However, the Cartridge Creek unit is a second entry and that stand of 30 acres is not

currently meeting characteristics of hiding cover. Eliminating 60 acres of hiding cover in the other two units and converting it to forage areas would change how and when elk use these habitats. These acres amount to a loss of hiding cover of 0.8 percent, and in this analysis area that is a reduction from 46.7 percent cover to 45.9 percent for about 15 to 20 years.

This alternative would construct approximately 0.2 miles of temporary road within the Rainbow Lake Unit to locate a landing/decking area. No new road construction would occur to any of the units; they will be accessed from existing roads.

What does a reduction of cover from 46.7 percent to 45.9 percent in this analysis area mean for elk use in this landscape? If one subscribes to the cover/forage ratios (40:60) recommended in the literature for elk habitat in other areas (Thomas 1979, Hoover and Wills 1984), then this alternative would probably not have much effect. This analysis area would still have hiding cover above these recommended levels for elk and other big game to use for security both during activities and after, especially since there is no new road construction planned. The remaining cover would still be well distributed on the landscape, which will provide for travel and migration across this landscape. After the project, the open road density would remain the same as existing (*see* tables 3-4 and 3-5).

What would change is when and how these altered habitats are used by big game. The new forage areas would likely have more use during the early evening, night, and early morning portions of the day and less use during the middle of the day, just reverse of when these areas were hiding cover. It is unlikely that this amount of conversion from cover to forage would measurably affect elk numbers or effective elk habitat, especially with the close proximity of the treated areas to main open roads.

The amount of big game cover affected in each action alternative is minimal. Under the no action alternative, 46.7% of the analysis area is in big came cover, Alternatives 1 and 3 both leave 45.9% in big game cover, as the area treated in both action alternatives is the same.

Alternative 2. With no harvest of timber planned in this landscape, the habitat for big game would remain relatively unchanged in the short-term (20 years). Areas that currently are providing hiding cover would probably continue to function in that capacity in the short-term. Foraging areas should also continue to supply forage during that period.

Elk would continue to use this landscape for spring, summer, and fall habitat and would continue to move through it on their way to and from winter and other summer ranges. As natural stand succession continues without disruption, forested stands and foraging areas may continue to provide similar habitats for elk and other big game beyond 20 years. However, some of the oldest forested stands may have less canopy closure and more down, woody material on the forest floor due to trees that are dying and falling over. If regeneration is not occurring that would add multiple age classes and canopies to these stands, this could reduce elk use of these stands because of the reduced canopy coverage and difficulty of travel through the stands.

It is possible that in the short or long-term one or more disturbances could occur in this landscape. These disturbances, including high wind events, insect and disease epidemics, and natural or human-caused wildfire, have the potential to alter large portions of this landscape. Generally, wind thrown trees and insect or disease killed timber predisposes those areas to fire. The direct and indirect effect of these types of disturbances result in earlier successional vegetation, which mentioned earlier, would favor early successional wildlife species possibly to the detriment of wildlife species dependent on late successional habitats, depending on the extent of the altered landscape.

Non-hunted elk populations are considered early successional species and respond favorably to large landscapes of early successional vegetation, similar to what has happened in Yellowstone National Park since the fires of 1988. However, the Wiggins Fork Elk herd is a hunted population and may be adversely affected by large amounts of lost hiding cover for security and migration during the hunting season. It is likely these major changes in the habitat on this landscape could lead to higher hunter success and elk harvest which could reduce elk numbers below population objectives and eventually lead to fewer elk licenses and shorter seasons.

If the extent of this altered landscape is large, if a mosaic pattern of remaining cover is not retained, and if large patches of cover are removed, potentially fragmenting cover for travel and migration through this landscape, then these large early successional vegetation areas would dominate the landscape and any remaining cover may not be well distributed. Large created openings across this analysis area may likely change how, where, and when elk travel from summer range to winter ranges, especially during the late elk hunting season. These changes could involve delayed or later migration (elk remain in the higher elevations, more remote areas), or move during night across these burns. If a catastrophic event occurs and alters large portions of this landscape, the effects are potentially greater in this alternative than the action alternatives, because an event of this nature has the greatest potential to bisect and possibly disrupt elk movements from the west to the east. However, a catastrophic event could occur regardless of alternative, even though the action alternatives are designed to help reduce potential effects from such an event.

Alternative 3. This alternative would harvest the same three units (approximately 90 acres) as Alternative 1. The difference is that clear-cutting with no reserve trees is the silvicultural treatment under this alternative and would include broadcast burning slash. Impacts to elk would be similar as those described in alternative 1.

Recommended Mitigation. The following measures are recommended to reduce impacts to elk and their habitat:

- Suspend harvest activities from May 1 through June 30 to minimize conflicts with elk calving.
- Complete all harvest activities in one unit at a time so that activities are localized.

Effects on Moose and Mule Deer. There would be modifications to the structure of the forested stands and the landscape after the proposed treatments in both action alternatives and after any potential natural disturbances. There would be a reduced forested setting, from clear-cuts with snags to clear-cuts with reserve trees, which reduces vertical and physical structure in the stands and increases horizontal diversity in the landscape in the short-term.

Similar effects described above for elk by alternative would apply for moose and deer.

Effects on Forest Grouse. All alternatives that promote vegetative and horizontal diversity would benefit both ruffed and blue grouse. Any efforts to promote or enhance aspen regeneration and various age classes would be especially beneficial to ruffed grouse. However, there would be a short-term loss of habitat from the harvest while these areas are revegetating. None of the proposed alternatives would significantly affect these species.

Effects on Primary Cavity Excavators (e.g. Hairy Woodpecker). The harvesting of these stands can impact primary cavity excavators by removing habitat, particularly the dead and dying trees. It is likely that Alternative 3 (which removes most of the timber from the stands) would adversely affect more habitat than the other alternatives. Alternative 1 would result in reducing habitat, but not as greatly as Alternative 3, since some forested canopy would be left after harvest and less large woody debris would be lost due to the slash treatment. However, the trend on the forest has been toward a late-successional stage, mature conifer environment, which includes mid to high-level densities of dead and dying trees. This higher level of mature and older structural stages would favor these cavity dependent species.

Neither action alternative is likely to result in a significant loss or reduction in habitat. The reduction in potential primary cavity excavator habitat in the analysis area is 0.49 percent and 0.77 percent for Alternatives 1 and 3, respectively. Because the three units are widely distributed across the landscape and occur within close proximity to main roads where firewood gathering has already been occurring and are, neither alternative would significantly affect distribution of that habitat in the analysis area over the existing situation.

4.9.2 Proposed, Threatened, Endangered, and Sensitive Wildlife Species

An in-depth analysis and evaluation process for the determination of effects to threatened, endangered, and sensitive wildlife species was completed for this EA. This analysis is documented in the Wind River Biological Assessment/Biological evaluation (BA/BE), which can be found in Appendix C.

Table 4-3 summarizes the findings of the BA/BE. For additional information on Yellowstone cutthroat trout, *see* this chapter, Section 4.8.3.

A determination of "not likely to adversely affect" was made for Canada lynx and grizzly bear. A determination of "is not likely to jeopardize" was made for the gray wolf. Concurrence was received for the project in April 2002 after informal consultation.

Table 4-3. *Summary of determinations of effects to threatened, endangered, or sensitive species relevant to the proposed action, taken from the analysis in the BA/BE.*

Species	Habitat Present	Alternative 1 Proposed Action	Alternative 2 No Action	Alternative 3 Minimize Fuel Loading
Threatened or Endangered Species				
Canada lynx	Yes	Not likely to adversely affect	No effect	Not likely to adversely affect
Grizzly bear	Yes	Not likely to adversely affect	No effect	Not likely to adversely affect
Bald eagle	No	No effect	No effect	No effect
Gray wolf[12]	Yes	Is not likely to jeopardize	No effect	Is not likely to jeopardize
Sensitive Wildlife Species				
Dwarf shrew	No	No impact	No impact	No impact
Water vole	No	No impact	No impact	No impact
Marten	Yes	May impact some individuals, but not likely to cause a trend toward federal listing or loss of species viability	No impact	May impact some individuals, but not likely to cause a trend toward federal listing or loss of species viability
Fisher	No	No impact	No impact	No impact
Wolverine	No	No impact	No impact	No impact
Northern Goshawk	Yes	May impact some individuals, but not likely to cause a trend toward federal listing or loss of species viability	No impact	May impact some individuals, but not likely to cause a trend toward federal listing or loss of species viability
Boreal owl	Yes	No impact	No impact	No impact
Black-backed woodpecker	Yes	May impact some individuals, but not likely to cause a trend toward federal listing or loss of species viability	No impact	May impact some individuals, but not likely to cause a trend toward federal listing or loss of species viability
Northern three-toed woodpecker	Yes	May impact some individuals, but not likely to cause a trend toward federal listing or loss of species viability	No impact	May impact some individuals, but not likely to cause a trend toward federal listing or loss of species viability
Tiger Salamander	No	No impact	No impact	No impact
Boreal toad	No	No impact	No impact	No impact
Spotted Frog	No	No impact	No impact	No impact
Northern leopard frog	No	No impact	No impact	No impact
Yellowstone Cutthroat trout	No	No impact	No impact	No impact

[12] The gray wolf (*Canis lupis*), which was formally listed as threatened, was reclassified as non-essential, experimental in the Yellowstone area with the publication of the Final Rules in the Federal Register (November 22, 1994; Vol. 59, No. 244).

4.9.3 Sensitive Plant Species and Noxious Weeds

The activities associated with the action alternatives and the habitat modified would not impact sensitive plant species listed in Table 3-8.

Canada thistle, Russian knapweed, whitetop, and marsh sowthistle should be treated before project initiation. The project area would need to be monitored for three consecutive years and provide control for new infestations.

4.10 Effects on the Social and Economic Environment

The scale of this project is such that there would be no measurable impact on social or economic systems in Fremont County, Wyoming. Social and economic concerns relative to the project are symptomatic of general trends occurring in much of the western United States. Issues revolving around access, private lands and ownership rights, regulation, resource impacts, multiple use, growth and development, economic dependency, county and local jurisdiction, et al, could enter the discussion. However, any resolution of these issues is beyond the scope of the analysis for a single timber sale. Feelings are likely to run high on both sides of any issue locally, concerning this project. The discussion of economic and social effects is tiered to the Forest Plan, as amended by the Allowable Sale Quantity EIS and ROD.

Possible changes in the social or economic environment are immeasurable at this scale of activity in a way that would allow some comparison between alternatives. The relative financial feasibility of each alternative, in terms of cost efficiency, is a different economic measure. The cost efficiency determination is addressed below.

Management of the project area to achieve the desired forest condition would provide a mix of multiple use goods and services that maximize net public benefit from the Shoshone National Forest. This mix of goods and services requires attaining and maintaining specific ecosystem conditions for maximizing net public benefit. Actions such as the proposed vegetation treatments are deemed necessary to achieve the desired forest conditions and to maintain these through time over an area large enough to enhance such items as wildlife habitat, vegetative and habitat diversity, visual diversity and quality recreation experiences.

Table 4-4 below summarizes the results of the financial analysis conducted by alternative for the proposed silvicultural treatments. This financial analysis is based strictly on market values (quantitative). Non-market (qualitative) values, such as wildlife habitat, scenic quality, and watershed protection, are difficult to assign values to. The financial analysis displayed in Table 4-4 and effects discussion elsewhere in this chapter must be reviewed concurrently so that a decision can be made taking into consideration both quantitative and qualitative resource values.

Table 4-4: *Financial analysis by alternative*

	Alternative 1	Alternative 2	Alternative 3
Present value benefits	$170,564	$0.00	$189,516
Present value costs	$116,582	$15,000	$121,653
Net present value	$53,982	-$15,000	$67,862
B/C ratio	1.46	0.00	1.56

The analysis of strictly revenues and costs for action Alternatives 1 and 3 reveals a positive present net value and associated revenue cost ratio of greater than 1[13]. From a strictly financial perspective Alternative 3 is better than Alternative 1. All costs are deemed necessary and appropriate to move the vegetation in the analysis area toward the desired condition using silvicultural treatments while taking into consideration necessary design criteria and mitigation. The detailed analysis can be found in Appendix D.

4.11 Environmental Justice

In considering potential environmental justice concerns, we evaluated the potential effects on the Native American population on and near the Wind River Reservation. Given the small size of this project, the socioeconomic effects are insignificant at the county scale. In addition we do not believe those effects will be disproportionately larger or smaller on the population of concern. In summary, we do not believe there are any environmental justice concerns with this project.

4.12 Effects on Wilderness and Roadless Areas

There would be no effects to currently designated wilderness or roadless areas. The Cartridge Creek II unit, which falls within a roadless area, currently contains a classified road and has had previous timber harvest. Additional harvest in this area would not alter the roadless characteristics of this area.

4.13 Cumulative Effects

4.13.1 Analysis Process

Cumulative effects are impacts on the environment that result from the incremental impact of an action when added to other past, present and reasonably foreseeable actions regardless of what agency or person undertakes such actions (40 CFR 1508.7). The following procedure for cumulative effects analysis is consistent with Council On Environmental Quality guidance. The assumptions used in identifying possible cumulative effects are:

[13] Net present value is the discounted benefits minus discounted costs of a project. A value that is greater than zero shows that benefits are greater than costs. A benefit cost ratio is obtained by dividing the anitcipated discounted benefits of a project by its anticipated discounted costs to obtain a measure of expected benefits per unit of cost. A B/C ratio greater than 1 indicates a postive return on a project. The higher the ratio, the greater the benefits over cost.

- Mitigation measures and guidelines for prescribed management activities would be followed and implemented for all present and future proposed activities.
- No new natural disturbances, such as major wildfires, would occur during the next 10 years.
- There would be no net increase in the miles of roads.

The Area Potentially Subject to Cumulative Effects. Cumulative effects are a function of: 1) types of impacts in relation to resources of concern, 2) duration of impacts, and 3) distances that impacts can travel. Unless otherwise stated, the area of concern for each resource area is the analysis area described in Chapter 1 and shown in Figure 2.

Potential Sources of Impact. Sources of impacts or change are those activities, developments, or events that, cumulatively, have the potential to change the biological or physical character of a given area. Sources of change include forest management activities that alter vegetation, such as timber sales, or developments that cause increases in use, such as road construction. Other sources of impact that might be associated with adjacent land use are subdivision developments, oil and gas development, and wildfires. Past sources of impact are described for each resource of concern addressed below. Other possible sources of impact are indicated in each resource area subject to cumulative effects. If not discussed earlier in this chapter, sources of impact will consider the combined effects of the HCWIP.

Total Cumulative Impact on the Resource of Concern. For each resource of concern, considering the area subject to cumulative effects and the applicable sources of impact, the total effect of these sources plus the proposed action is evaluated. The total effect is described in relative terms of intensity (e.g. negligible, unmeasurable, small, moderate, major, extensive).

4.13.2 Cumulative Effects on Vegetation

Area Considered. The structure, age, condition and continuity of forested areas adjacent to the analysis area.

Potential Sources of Impact. Table 4-5 displays a summary of past vegetation management within the analysis area by treatment method. In addition, portions of the analysis area were tied-hacked in the 1940's and 1950's.

Other potential sources of impact include wildfire and insect and disease occurrence. As described in previous chapters, disease is already prevalent throughout the analysis area. A spruce beetle epidemic is currently occurring in the Washakie Wilderness from the North Fork to Shoshone Pass. White pine blister rust and mountain pine beetles in limber and whitebark pines are both increasing.

Table 4-5. *Summary of past vegetation management within the analysis area*

ACTIVITY	Acres Treated	Percent of Analysis Area
Clearcut	2,172	15
Shelterwood	36	<1
Individual Tree Selection	83	<1
Precommercial Thin	1,258	8

Total Effect on the Resource. The combined effect of the proposed action with past vegetative treatments has and will improve the structural diversity and health of vegetation in the analysis area as a whole.

The spruce beetle epidemic in the Washakie Wilderness could potentially spread to the analysis area if weather or other conditions do not change to cause a die-off in the beetle population. Since 35% of the analysis area is in spruce-fir cover types and 96% of these types are classified as mature, any large diameter spruce in these areas could potentially become infested and die. It is also expected that white pine blister rust will continue to spread, and that mountain pine beetles could also become more prevalent. Both could potentially increase within the analysis area. This would cause increased mortality, with a potential reduction in seed source for whitebark pine. In the long term, blister rust could reduce the amount of whitebark pine from the area. With potentially increased mortality from spruce beetle, blister rust, and pine beetle in addition to die-back and mortality from mistletoe and comandra rust in lodgepole, the probability of large, intense wildfires could increase.

Past management in the analysis area, however, has created areas where young forests have been established. The horizontal diversity created by these past harvests could cause a change in wildfire spread, should one be ignited within or adjacent to the analysis area. If a large wildfire were to occur within the analysis area, potential seed sources to reforest the area would be more limited, and the area may stay in earlier structural stages (grass/forb) for longer time periods.

4.13.3 Cumulative Effects on Travel and Transportation

Total Effect on the Resource. The HCWIP project proposes to decommission roads, some of which would fall into the analysis area. Decommissioning roads would stabilize and revegetate road surfaces. This would reduce sedimentation that is currently occurring on some local roads within the analysis area. Although the number of miles that are proposed for decommissioning is not known at this time (a final decision on the HCWIP will not be made until later in 2002), cumulatively, the overall effect, combined with the proposed action presented in this document, would be an overall improvement in road conditions throughout the analysis area.

Decommissioning roads reduces the mileage of roads that need maintenance. This would allow increased maintenance funds that could be applied to other roads. This would improve the overall condition of the transportation system within the analysis area.

In addition, some alternatives in the HCWIP include improving the types of road closures to make them more effective and increasing enforcement of closures. This would reduce the amount of damage occurring to existing closed roads, again reducing maintenance costs and improving watershed health.

4.13.4 Cumulative Effects on Range, Recreation, and Visual Resources

There are no measurable effects to the range or recreation resources. *See* sections 4.5 and 4.6 for a discussion of effects from the HCWIP on the recreation and visual resources.

4.13.5 Cumulative Effects on Soil, Water, and Aquatic Resources

Potential Sources of Impact. Numerous factors particularly related to watershed cumulative effects were considered during analysis. Consideration was given to the following:

- Additive effects of past, present, and reasonably foreseeable activities
- Location of proposed disturbances relative to sensitive areas and degraded systems
- Timing, severity, and duration of disturbances and their effects
- Effects on State-classified water uses
- Effects on stream health and aquatic life limiting factors
- Overall effects on functions of the riparian and wetland network
- Long-term soil productivity
- Use of this project to assist recovery of existing watershed condition
- Use of the HCWIP to assist recovery of existing watershed condition

Past and present management activities affecting water resources in the analysis area include timber harvesting and associated road building in the 1950s through the 1970s, and grazing of livestock since the turn of the century.

Assessments of these activities and their effects on stream health were made in a watershed road inventory in 1994, stream reach inventories prior to 1996, the Environmental Assessment for 36 Grazing Allotments on the Shoshone National Forest in 1996, and the HCWA and HCRA in 2001.

Total Effect on the Resource. Review of the analysis area indicates past and present activities have not created a watershed cumulative effect concern, nor will reasonably foreseeable activities contribute substantial concerns.

The stream reach inventories included a reach along Horse Creek near FSR 504 crossing within the middle Horse Creek composite, and a reach within Cartridge Creek. Both were functioning in dynamic equilibrium. In addition, a reach of Horse Creek on private land within the middle Horse Creek watershed was identified as a reference reach for a Rosgen C4 stream type.

Because of the Grazing EIS, allotment management plans are effecting improved grazing practices.

Watersheds experience periodic disturbance events that vary in size, duration, intensity, and frequency. Because these events are random, some level of risk is implied. This risk is a product of event probability.

Proven techniques, management requirements, and special mitigation measures (BMPs) as documented in the project file provide adequate control to mitigate the potential effects of the alternatives with proper administration, compliance, and monitoring. Thus, any contribution to watershed cumulative effects, provided disturbance events exceeding the design storm (10-year, 24-hour) do not occur, have either been eliminated or minimized. However, if a lower probability, higher magnitude event were to occur, any of the three alternatives could contribute to watershed cumulative effects.

4.13.6 Cumulative Effects on Wildlife Resources

Endangered Species Act Cumulative Effects. There are no other private or State permitted activities that are expected to occur within the project influence zone that would result in significantly modifying the conclusions reached, as outlined in Chapter 4 or the BA/BE, regarding anticipated effects on species or their habitat. Two parcels of private land occur within the analysis area. The T-Cross Ranch parcel is within one mile of the Horse Creek unit. No other private land occurs in close proximity to the project sites. The primary state permitted activity in the area is regulated wildlife hunting/trapping and fishing seasons. The proposed project is not expected to have any influence on or be affected by these non Forest Service permitted or regulated activities.

Area Considered.

Elk. The area considered for the portion of the Wiggins Fork herd includes the winter range areas on and off the Forest near Spring and EA Mountains across Horse, Pony, and Tappen Creek to the Ramshorn area. Additional areas considered include the Dunoir and areas in the Teton Wilderness all the way to the South Buffalo Fork and Thorofare Creek where some of these elk summer. This includes the southern portions of the Horse Creek and Wiggins Fork watersheds; most of the Brent, Bench, and Tappen Creek watersheds; and the northern portion the DuNoir watershed, but also includes upper watersheds in the northeastern portion of the Teton Wilderness.

Primary Cavity Excavators. No other area besides the analysis area.

Canada Lynx. The forested portion of LAU numbers 9 and 11. These fall primarily on national forest lands.

Grizzly Bear. The area north of Highway 26/287 primarily on National Forest lands. This area is approximately defined from the home ranges of several adult female grizzly bears over a 13-year period.

Sensitive Species. Their respective habitats on the Shoshone National Forest.

Potential Sources of Impact. Domestic livestock grazing, commercial timber harvest, precommercial thinning, hunting, oil and gas exploration, horseback riding, fishing, personal use firewood gathering, camping, and general dispersed recreation are past sources of impact. Some of these past activities have occurred over a long period of time and many presently occur. Past modifications to wildlife habitat have come primarily from the establishment of roads, harvest of timber, grazing of livestock, residential development adjacent to National Forest System lands, and suppression of wildfire.

The current conditions within the areas of concern are a result of a combination of past and present activities, both natural and human-caused. For the purposes of this analysis, the management activities and natural events considered as having potential influence during the past, present, or reasonably foreseeable future are identified below:

- Road construction
- Timber harvest
- Natural disturbances
- Residential development
- Off-road vehicle use
- Recreation use

Activities within the above categories were considered for all ownerships within the areas of concern, including lands managed by the Bureau of Land Management, the State of Wyoming, and private individuals or corporations.

Besides those sources of impact listed above for the analysis area including the proposed timber harvest, additional sources of impact for the following species include:

Elk. Sources of impact are constructed and maintained roads, off-road trails, primitive roads, timber harvest, oil and gas exploration, dispersed and developed recreation sites, multiple residence subdivisions off-forest, oil wells off-forest, residential or guest ranches, outfitter camps in the Dunoir Special Management Area and Teton Wilderness, and the associated fall hunting, summer pack trips, and dispersed summer and fall use in these areas. Timber harvests and associated roads and recreational use in the Long Creek watershed are also sources of impact to this segment of the Wiggins Fork elk herd. Additional reasonably foreseeable sources of impact include Double Cabin, Spring Mountain, and Ramshorn Timber Sales, and continued adjacent residential development. The HCWIP project proposes to decommission some roads, all of which fall into the area considered for elk. Decommissioning roads would reduce open road density and motorized travel that is currently occurring on some local roads within the analysis area.

Primary Cavity Excavators. Continual pioneering of roads by the public for firewood removal. The HCWIP project proposes to decommission some roads, some of which fall into the analysis area, the area considered for primary cavity excavators. Decommissioning roads would increase the amount of primary cavity excavator habitat over time. Potential wildfires that may start in the analysis area are also sources of potential impacts, either adverse or beneficial.

Canada Lynx. The same sources and types listed above for elk but limited to LAUs 9 and 11.

Grizzly Bear. The same sources and types listed above for elk. Additional sources include outfitter camps in the South Fork of the Shoshone and Five Pockets areas of the Washakie Wilderness and the associated fall hunting, summer pack trips, and dispersed summer and fall use in these areas.

Sensitive Species. Since analysis for sensitive species is considered at the Forest level, listing potential sources of impact to each species or groups of species could involve a long list and a large map. As mentioned earlier, potential sources of impact that have modified habitat in the past include the establishment of roads, harvest of timber, grazing of livestock, residential development adjacent to National Forest System lands, and suppression of wildfire.

Total Effect on the Resource.

Elk. Past human activities in and near the area of concern have contributed to the existing conditions in this area. Previous timber harvest and road building activities have occurred in this area of concern. In the analysis area, that activity included tie hacking, which occurred in the 1940s. Within portions of the area of concern, the majority of the harvests were predominately clear-cuts that are now, for the most part, restocked and are providing hiding cover for big game species. These past management activities have contributed to the stand and landscape characteristics that have made this desirable habitat for big game species. Recreation activities have increased in the last 30 years. The amount of livestock grazing has declined on National Forest System lands in the same area during the same period, while livestock grazing on BLM, State, and private lands adjacent to the analysis area has probably been relatively constant. Some illegal off-road vehicle use has occurred in this area, primarily associated with hunting seasons during the fall. At the same time elk, deer, and moose populations have increased, particularly elk in the Wiggins Fork herd unit. As mentioned earlier, numbers of big game are most affected by the severity of the winters, the number of hunting licenses sold, the timing and length of hunting seasons, hunter success, and the number of animals actually harvested. Habitat conditions generally influence the distribution of these populations on the landscape.

Previous sources of impacts, along with the proposed timber harvest, can add to the cumulative effects on elk and other big game and their habitats. The proposed actions should

enhance the horizontal diversity of vegetation on the landscape in both the short and long term. The treatment of a relatively small portion of the forested area of this analysis area may modify where elk would use this forested cover in the short term, but they would not abandon this area. The proposed activities in any action alternative would not significantly add to the cumulative effects on elk or other big game habitat in the analysis area or the larger area of concern.

Roads, open or closed, generally decrease habitat effectiveness for wildlife, particularly species that prefer less disturbed habitat, like elk and grizzly bear. It is recognized that, apart from the direct habitat loss, it is not the road itself but the human activity associated with the road that is of concern. Since road construction and the use connected to it and its effects on grizzly bear and elk were significant issues, road density, both total motorized road density and open road density changes are good measures of effects on these species. And because roads are related to past, present, and these proposed projects' activities, these density measurements before and after project activities are a good measure of cumulative effects. The areas of concern for elk and grizzly bear are similar enough that analysis of road density for elk applies to grizzly bear. This analysis is presented in Chapter 3 (*see* tables 3-4and 3-5).

There are no differences in effects between these projects' alternatives because there will not be any increase in open road miles after completion of project activities. Cumulative effects to big game and their habitat are small at the landscape level. These projects, as designed with mitigation, would not significantly add to the cumulative impacts on elk. Although the number of miles that are proposed for decommissioning in HCWIP is not known at this time (a final decision on the HCWIP will not be made until later in 2002), cumulatively, the overall effect, combined with the proposed action presented in this document, could be an overall improvement in big game habitat security.

Primary Cavity Excavators. The impacts from timber harvest and firewood gathering include reduced amounts and distribution of this habitat. There has been 2491 acres (25 percent) of the non-wilderness, forested habitat impacted by management activities in the past, not counting the construction of the existing roads nor the removal of firewood along those existing roads within the analysis area.

When the reconstruction and use of the existing roads is included there is an estimated additional 595 acres (6 percent of the non-wilderness, forested habitat) where wildlife habitat has been and is impacted by firewood gathering. Some areas along the roads may not be affected to 250 feet because of steep terrain or adjacent non-forested areas, such as meadows. Other areas may be affected by more that 250 feet because of gentle terrain. This area influenced by firewood gathering is probably a conservative estimate because this estimate does not include the area accessed by user-built roads that are pioneered by the firewood gathering public. Regardless, the extent of past activities that have influenced primary cavity excavator habitat has been moderate in the analysis area (31 percent of the non-wilderness, forested habitat or 26 percent of the forested vegetation)

In the analysis area there are currently 11,750 acres of forested vegetation types or 79 percent of the analysis area. The majority of the forested vegetation types (73 percent) are in the later successional stages that would have potentially more snags and down dead material. However, there are earlier successional lodgepole pine stands that have high degree of dead tops from disease that also provide dead standing wood. The trend on the forest has been toward a late-successional stage, mature conifer environment, which includes mid to high-level densities of dead and dying trees. This higher level of mature and older structural stages will favor these cavity dependent species.

The reduction in primary cavity excavator habitat in the analysis area is 0.49 percent and 0.77 percent for Alternatives 1 and 3, respectively. Because the three units occur within close proximity to main roads where firewood gathering has been occurring and are distributed across the landscape, neither alternative will significantly affect distribution of that habitat in the analysis area over the existing situation. Also neither harvest alternative is likely to add significantly to the cumulative effects on this habitat or change the trend toward late-successional habitat. Although the number of miles that are proposed for decommissioning in the HCWIP is not known at this time (a final decision on the HCWIP will not be made until later in 2002), cumulatively, the overall effect, combined with the proposed action presented in this document, would be an overall improvement in primary cavity excavator habitat.

Canada Lynx. Numerous past activities in the area of concern for lynx have created the existing habitat and conditions for lynx. These activities included: conversion of and disturbance to lynx habitat from residential development on the periphery of the Forest; roaded access to higher elevation, remote habitat which provided easier access for past trapping and other disturbances to lynx; increases in snowmobile access into lynx habitat that also allowed easier access for past harvest of and disturbance to lynx by both humans and other lynx predators and competitors; fire suppression and natural succession that has created a disproportionate amount of late-successional habitat at the expense of early successional habitats which lynx also need; and regeneration timber harvest 20 to 40 years ago that has provided potential snowshoe hare habitat and lynx foraging habitat.

The direct and indirect effects of the proposed actions and alternatives to these actions are disclosed in the BA/BE as being insignificant and short-term negative impacts. Considering existing and foreseeable impacts to lynx over the area of concern, the proposed actions, with mitigation, or alternatives to them would not significantly add to the cumulative effects and the habitat manipulations should benefit lynx in the long-term. Although the number of miles that are proposed for decommissioning in the HCWIP is not known at this time (a final decision on the HCWIP will not be made until later in 2002), cumulatively, the overall effect, combined with the proposed action presented in this document, could be an overall improvement in habitat security for lynx.

Grizzly Bear. As stated above, roads, open or closed, generally decreases habitat effectiveness for wildlife, particularly species that prefer less disturbed habitat, like elk and grizzly bear. Road density, both total road density and open road density changes before and

after project activities are good measures of direct, indirect, and cumulative effects on grizzly bear. This analysis is presented in the BA/BE.

Grizzly bear use has been expanding in these areas on and off the district outside of the recovery zone in the recent past and is continuing even with human activities and past habitat modifications. There is a relatively higher degree of human activity in these areas than many of the areas within the recovery zone, without a proportionate higher increase in human/bear conflicts. These past and current activities have contributed to the present habitat conditions and the effectiveness of the habitat. The cumulative impact of these projects, together with the effects of past, present and reasonably, foreseeable activities, were determined to have a small effect on the grizzly bear. These activities are not different than what has been happening in these areas in the past with bear use expanding and increasing. In addition, bears are not likely to be adversely affected as the treated areas are small in scale, are bordered by adequate forest cover, and have adjacent security areas; prey species populations would remain unaffected, and open road density would not increase after the projects are completed. These projects, as designed with mitigation, would not significantly add to the cumulative impacts on grizzly bears. Although the number of miles that are proposed for decommissioning in the HCWIP is not known at this time (a final decision on the HCWIP will not be made until later in 2002), cumulatively, the overall effect, combined with the proposed action presented in this document, could be an overall improvement in habitat security for grizzly bear.

Sensitive Species. It is not likely that any of these alternatives would result in eliminating any biological communities or sensitive species populations. Although the quantity or number of acres of any given plant and animal assemblage could be slightly lowered, the overall community variation across the Forest is expected to remain the same. Similarly, species diversity would not decrease unless species occurring on the Forest were to be eliminated because of implementing any of these alternatives. This possibility is very unlikely. The objective of maintaining habitat for viable populations of all existing wildlife and plant sensitive species is still attainable.

The term wildlife habitat diversity as used in the Forest Plan generally relates to the successional or structural stages of plant communities and their relative abundance and arrangement across the forest environment (horizontal diversity). It also relates to the layering from top to bottom of vegetation within plant communities or stands (vertical diversity). It is recognized that other non-vegetation factors such as rock, scree, talus, and water environments provide habitat and contribute to diversity. However, the intent of the following discussion is to focus on vegetation horizontal diversity across the forest.

The Forest Plan contains a description of broad vegetation types including alpine, coniferous forest, montane meadow-parkland, sagebrush-grassland and riparian. The Allowable Sale Quantity EIS (1994) listed the following seven broad types of forested wildlife habitats: Engelmann spruce, subalpine fir, limber pine, whitebark pine, Douglas-fir, lodgepole pine, and aspen. That document also stated that these types are often grouped into the spruce-fir forest, mixed conifer forest, lodgepole forest, and aspen forest, with the mixed conifer

typically dominated by Douglas-fir mixed with other conifers. The recently completed EA for 36 Range Allotments listed the following broad vegetation types for Shoshone Forest rangelands: riparian, meadow, sagebrush/grass, grassland, conifer with forage, aspen/forb, alpine/grassland, and transitory range. For this analysis, forest vegetation was broadly defined as it exists in the database by the following structural types: grass/forb, shrub/seedling, sapling/pole, mature forest, and old growth forest.

An examination of the available forest-wide vegetation data was made to determine the existing situation in terms of vegetation types and structural stages. The data was also split by ranger district to examine the distribution of habitat diversity/structural stages across the Forest. The overall results of that analysis are shown in Table 4-6.

Table 4-6. *Estimated acres of wildlife habitat structural stages on the Shoshone National Forest*

	Habitat Structural Stages[14]					
District	**1**	**2**	**3**	**4**	**5**	**Total**
Clarks Fork	131,114	31,390	33,072	250,708	5,250	451,534
Greybull	145,561	25,669	5,905	132,155	652	309,942
Washakie	59,670	27,488	95,453	100,891	1,682	285,184
Wapiti	171,931	41,219	17,808	512,052	4,442	747,452
Wind River	145,739	46,553	52,537	251,364	10,508	506,701
Forest-Wide	654,015	172,319	204,775	1,247,170	22,534	2,300,813
Percent	29	7	9	54	1	

Of the total acres on the Forest that have vegetative cover and have been classified (2,300,813 estimated acres) over half (54 percent) are classified as mature forest. The vast majority of that is mature coniferous forest, as only slightly more than 5,000 acres of the 10,000 plus acres of forest hardwoods is currently estimated as mature hardwoods (aspen or cottonwoods). An additional 29 percent of forest-wide vegetation is currently in the grass/forb stage, of which approximately 40 percent is on lands that will ultimately succeed to forested lands while approximately 60 percent is permanent grasslands of various types. The remaining forest-wide vegetated acres are comprised of an estimated 7 percent shrub/seedlings, 9 percent sapling/poles, and 1 percent old growth. While the estimated amount of forested area currently classified as old growth forest is very low, it must be remembered that while extensive acres of mature forest occur on each district, a considerable amount will logically succeed to old growth forest over time. A relatively small amount of habitat currently exists in the shrub/seedling and sapling/pole stages, and a relatively small amount currently exists in the grass/forb stage as potential replacement for shrub/seedlings and sapling/poles.

The present status of wildlife habitat diversity as measured by the type and relative abundance of structural stages should not be too surprising. Historically, disturbance agents, particularly wildfire, played a much more significant role in shaping the vegetation type,

[14] Stage 1= grass/forb; Stage 2= shrub/seedling; Stage 3= sapling/pole; Stage 4= mature forest; Stage 5= old growth

pattern, and structure across the forest than in the recent past or present times. That and insect and disease activity combined with the variation in terrain, aspect, and forest geology resulted in the presence of a wide variety of vegetative structure with varying stand densities and a high amount of edge. This described a very diverse wildlife habitat situation.

In the past decade, the Clover Mist and Unit 40 wildfires in 1988 burned approximately 130,000 acres. Although burn intensity and other characteristics were different from many historic burns, if it were not for these events, the amount of mature forest habitat would be even higher and earlier successional stages lower. The amount of designated wilderness, highly dissected nature of the terrain, and other factors limit options for manipulating timber stands through conventional logging systems. With the Forest Plan ASQ amendment, current timber harvest affects only about 690 acres on the Forest each year. The majority of treatments on these acres are shelterwood harvests which often help provide vertical diversity, but do not alter the structural stage in terms of setting back succession similar to treatments like clear-cuts or seed tree harvests.

On forested lands, it is likely that the trend toward a late successional forest will continue unless the historic role fire has played can be re-established to some degree. Thus many of the sensitive wildlife species that favor late-successional habitats will benefit from this trend. Because of the trend toward late successional forests, the value of a natural mix of intermingled non-forest plant communities with the various forest structural stages becomes even more apparent when considering the needs of species that prefer earlier successional habitat stages.

Cumulative effects to wildlife habitat must consider the past, present and foreseeable future (within the next 10 years) actions near the proposed actions. The future rate and amount of new road construction and timber harvest in these areas of concern will probably be much lower than in the past, even though technology has and will improve and the demand for wood products has and will increase. The reason for the decline from the past levels, in part, has been the reductions in Allowable Sale Quantity in the original 1986 Forest Plan and the 1994 ASQ amendment to the Forest Plan.

A large portion (74 percent) of the forested landscape in this analysis area is large (9.0 to 16.0 inch diameter) and very large (>16 inch diameter) tree size classes (*see* table 3-1). The forest landscapes in these areas of concern, including the previously treated stands, will continue to mature and become more homogeneous in stand structure, diversity, and fuel loading thereby making successful fire suppression more difficult. As stated above, this type of landscape will favor late-successional species that have large home range requirements of contiguous habitat. Landscape biodiversity will decline.

Looking out over the next several decades, the fire disturbance regime will probably have the most significant cumulative effect on habitat for late-successional species. Grazing by domestic livestock in the Forest portions of these areas of concern has declined over past levels and will decrease over recent levels, since the decision on the EA for the 36 Grazing Allotments on the Forest was made. Thus, there is a potential for ungulate use of the grasses

and forbs to decrease, thereby causing an increase of fine fuels available for starting wildfires. This potential increase in fine fuels in the non-forested areas and the increase in amount and continuity of fuels in the forested landscapes will make human- and natural-caused fires more numerous, harder to control, and potentially much larger in size and intensity than in the past. Depending on the size of the fire disturbances, these landscapes may then favor early-successional species and biodiversity could be low again until the stands and landscapes recover from wildfire and follow ecological processes.

The preceding processes will probably occur in the future regardless of what management takes place in these areas of concern because of the small scale and amount of management or treatment that can occur in these large areas. When considered at the landscape scale, these small scale modifications to habitat in both the short- and long-term would not significantly add to the cumulative effects to species that utilize late-successional habitats over relatively large geographic areas.

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