CHAPTER 3: AFFECTED ENVIRONMENT AND ENVIRONMENTAL EFFECTS

3.1 Introduction

This chapter is organized by resources and presents the affected environment and the effects of the alternatives related to the purpose and need for the project (Section 1.3) and issues (Section 1.9). The affected environment and environmental effects are included for selected resource areas related to issues identified by the public and the Forest Service. This chapter also presents the scientific and analytical basis for the comparison of alternatives presented in Chapter 2, *Alternatives, Including the Proposed Action. Issues*, as listed in Section 1.9, are referenced where relevant.

Direct, indirect, and cumulative impacts are presented in the environmental effects discussions for issues presented in Section 1.9. Other resource areas also are discussed in this chapter, even though the effects of the alternatives on those resources would be minor, because disclosure of all effects must be discussed as per Council on Environmental Quality (CEQ) regulations (40 CFR 1502.16, p.475).

Direct effects occur at the same time and place as the triggering action. Indirect effects are caused by the action, but occur at a later time or different place than the triggering action. Cumulative effects result from the incremental effect of the proposed project plus other past, present, or reasonably foreseeable future actions, regardless of who is taking the action.

Within a resource area, environmental effects associated with Alternative A (No Action Alternative) are discussed first. This provides an environmental baseline or benchmark for comparison to Alternative B (Proposed Action Revised). Table 3-1 lists the projects that were considered in the analysis of cumulative effects. These include relevant projects that were among those listed in the October 1, 2008 to September 31, 2009 *Schedule of Proposed Actions* (SOPA) for the BTNF, as well as relevant past and reasonably foreseeable future actions.

The Greys River Landscape Scale Assessment presented existing and desired future conditions for resources in the analysis area (USFS 2004). The analyses presented below use information presented in this assessment, as well as new information collected since the assessment was prepared.

Table 3-1: Projects/Activities Considered in the Cumulative Effects Analysis for the Upper Greys River Vegetation Management Project

Project/Activity		Location
1.	Noxious Weed Prevention and Control	Lincoln County
2.	Recreation Use	Upper Greys drainage
3.	Road Use	Upper Greys drainage
4.	Vegetation treatments under contract: Campground Combo, No Bull, Cottonwood Cabins/Swift Creek, and Lynx/Moose Campground decks	Greys River drainage
5	Proposed vegetation treatments over next 5 years: Three Forks, Spring Creek, Firetrail and Little Greys	Greys River drainage
6.	Proposed prescribed burning over next 5 years: Bug Creek, Bradley, Three Forks prescribed burns	Greys River Ranger District
7.	Domestic livestock grazing	LaBarge and Mink Creek Grazing Allotments: Greys River and Kemmerer Ranger District s
8.	Road maintenance and reconstruction activities	Upper Greys Analysis Area
9.	Past timber harvests	Upper Greys Analysis Area and Greys River Ranger District
10.	Past wild fires	Upper Greys Watershed and Greys River Ranger District

PROJECT AREA LOCATION AND MANAGEMENT HISTORY

The analysis area encompasses approximately 11,885 acres in the Upper Greys River drainage, east of the river, including the tributaries of East Fork of the Greys River, Lookout, Boco, Shale, Kinney and Poison Creek drainages, which lie within Management Area 35. The elevation ranges from approximately 7,800 to 11,378 feet, with annual precipitation ranging from 30 to 40 inches. The area is primarily a west facing slope at the base of the Wyoming Range. The project area is located in the lower portion of the analysis area, which is characterized by mild slopes and benches below 9,000 feet. The upper portion of the area increases in slope with some slopes over 40%.

The major forest type in the analysis area is mixed conifer, with lodgepole pine, subalpine fir and Engelmann spruce. All proposed treatments occur in this area. In the upper portion of the analysis area, whitebark pine dominates. There are also minor areas of Douglas-fir and a few small scattered patches of aspen. Non-forested habitats include sagebrush/grass and riparian types. Many species of wildlife reside in the analysis area including, mule deer, elk, moose, lynx, and black bear. Snake River cutthroat trout and other sensitive species reside in the drainages, as do other native fish and introduced trout species. Dispersed recreation is

popular and is supported by a network of roads. Timber harvesting, followed by reforestation, has occurred since the 1950's, when removal of trees for saw timber began. Timber harvest has affected approximately 1,374 acres in the analysis area, including 1,107 clear-cut acres and 267 acres partial-cut. Livestock grazing is common throughout the drainages on 2 grazing allotments (one is cattle and one is sheep).

3.2 Forested Vegetation Resources

Information provided in this environmental impact statement about forested vegetation is excerpted from the *Forested Vegetation Report for the Upper Greys River Vegetation Management Project* by Forester Jeff Laub and Silviculturist Heidi Whitlach. The full text of this report is incorporated by reference.

3.2.1 AFFECTED ENVIRONMENT

The Upper Greys analysis area consists of several forest vegetation types interspersed with large openings of sagebrush grasslands. Current vegetation types are influenced by soils, precipitation patterns, the broken topography of the west slope of the Wyoming Range, and forest fire disturbance.

Overview

The analysis area is approximately 70% forested with 30% non-forested, including areas of sagebrush, grasses and forbs, riparian areas of willows and sedges, and rock and barren ground. Forested vegetation is primarily mixed conifer, with lodgepole pine (*Pinus contorta*) and mixed stands of subalpine fir (*Abies lasiocarpa*) and Engelmann spruce (*Picea engelmannii*). Whitebark pine (*Pinus albicaulis*) forests dominate the upper elevations of the analysis area. There are minor amounts of aspen (*Populus tremuloides*) and a small amount of Douglas-fir (*Pseudostuga menziesii*). This variety of forested patches and openings with species and age class diversity provides cover and forage habitat for the diverse wildlife species discussed in the Wildlife Section.

Habitat types are in the subalpine fir series with subalpine fir/grouse whortleberry, subalpine fir/heartleaf arnica, and subalpine fir/pinegrass represented (in order of descending frequency).

The tables below depict forest and non-forest vegetation for the analysis area. This data is derived from the Bridger-Teton Forest Plan Revision GIS Vegetation Layer (Figure 3-1).

Table 3-2: Upper Greys Vegetation Layer

Vegetation Types		
	acres	***percent***
aspen	*14*	0%
subalpine fir	*4,033*	34%
whitebark pine	*2,200*	19%
lodgepole pine	*1,949*	16%
douglas-fir	*60*	1%
sagebrush	*1,206*	10%
riparian	*504*	4%
grass/forb	*1,462*	12%
rock/barren	*457*	4%
TOTAL	*11,885*	
All Forested	*8,256*	69.5%

Approximately 4,400 acres of the Upper Greys River analysis area is classified as suitable timber in the Forest Plan.

Stand Structure

Stand structure is the physical and temporal distribution of trees and other plants in a stand (Helms, 1998). Stand structure componets of interest for the analysis area include age classes and tree size classes.

Age: The current age class distribution for forested stands within the analysis area is approximately:

- 0% grass/forb stage (generally 0-20 years old)
- 3% seedling/sapling stage (generally 5-40 years old)
- 10% young (generally 30-60 years old)
- 0% mid-aged forest (generally 50-100 years old)
- 87% mature and old forest (generally 100+ years old)

These phases tend to overlap temporally due to differences in species, tree vigor, site productivity, stand composition, density, spacing, disturbance patterns and climactic fluctuations.

The grass/forb stage is the early successional stage directly following a disturbance (not to be confused with the grass/forb vegetation type). This is the time when new individuals and species begin to occupy a site after disturbance. This stage is also known as stand initiation (Oliver et al. 1990).

The seedling/sapling stage is the timeframe when a site is dominated by young trees that are either seedlings (trees less than 4.5 feet tall) or saplings (trees taller than seedlings, but less than 5 inches diameter a breast height [DBH]). This is also known as the stem exclusion stage (Oliver et al. 1990), where new individuals and species no longer appear on the site,

and some existing ones die. The surviving stems grow larger and express differences in diameter and height. In the analysis area these areas are a result of previous harvest.

Young forests and mid-aged forests are mid-successional stages. Understory reinitiation may start at this stage, where advanced regeneration-seedlings appear again and survive in the understory, although they may remain small (Oliver et al. 1990). In the analysis area most of these areas are a result of previous harvest.

Mature and old forests (see Figure 3-1) may also be in understory reinitiation stage, but will eventually move into the old growth stage, where overstory trees die in an irregular fashion, and some of the understory trees begin growing to the overstory (Oliver et al. 1990).

Size Classes: The following table depicts the tree size classes of forested vegetation types for the analysis area. This data is derived from the Bridger-Teton Forest Plan Revision GIS Vegetation Layer.

Table 3-3: Acres of Tree Size Classes by Vegetation Type in Analysis Area

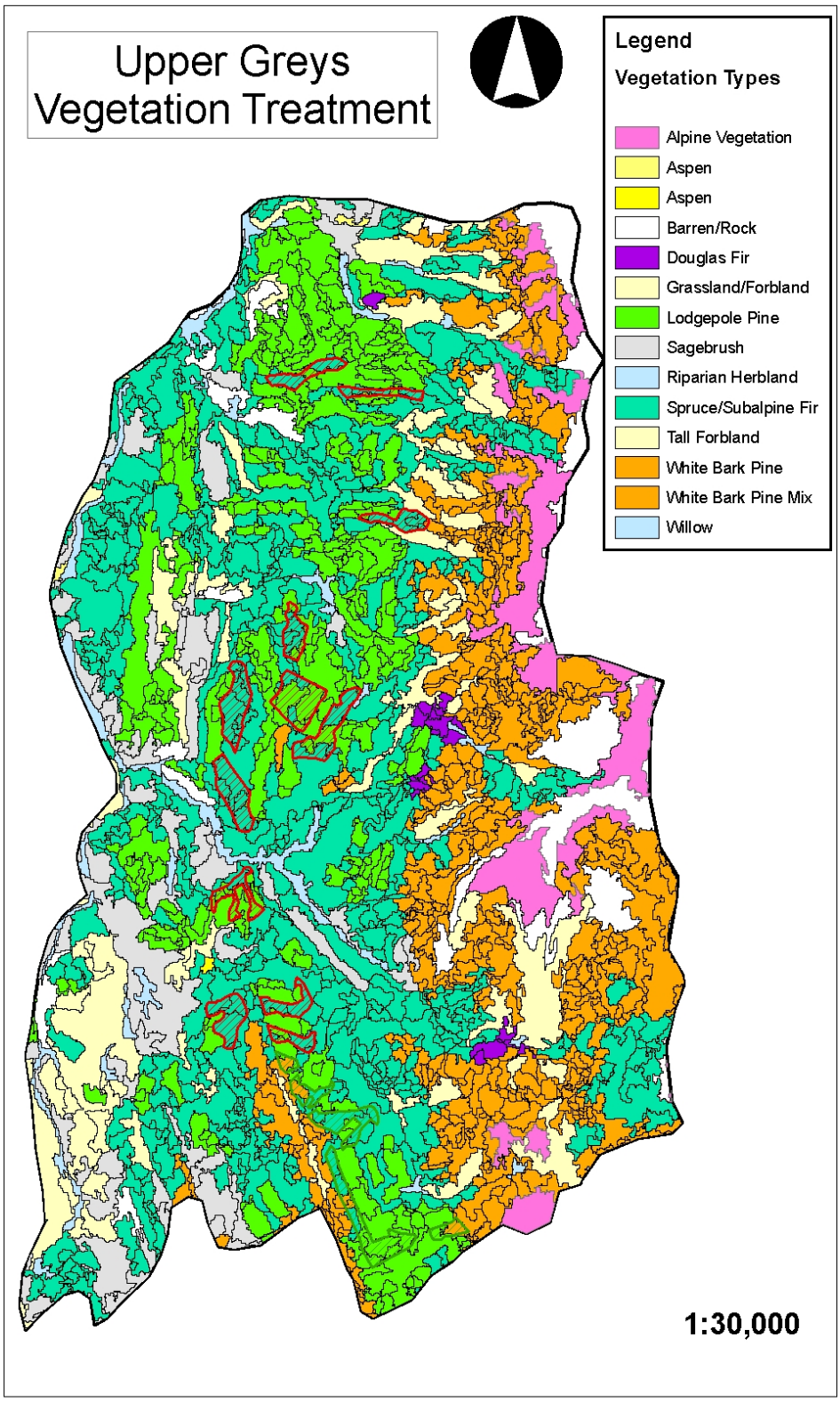
Vegetation Type	Acres by Tree Size Class			
	< 5" DBH	5" to 9.9" DBH	10" to 19.9" DBH	20" to 29.9" DBH
Aspen	3	4	7	0
Douglas-fir	0	37	23	0
Lodgepole pine	17	1,261	671	0
Whitebark pine	6	1,116	1,074	4
Subalpine fir	0	2,605	1,408	20
TOTAL	**26**	**5,023**	**3,183**	**24**

The treatment units in this project are all in the mature to old forest age class. Stand ages vary from 116 years old to 296 years old. All treatment units fall within the 10 inch to 19 inch tree size class. Although not all trees are this size, it merely represents the average diameters within the unit. Most of these stands have severely reduced tree growth, accelerated tree mortality, a variety of insect and disease problems, and high fuel loading because of dead and down trees. Whitebark pine stands are not proposed for treatments.

Table 3-4: Stand Ages and Tree Size

Unit	Acres	Stand Age	Age Class	Average Tree Size (DBH) inches
1.3	18	182	Old	12”
1.5	12	176	Old	13”
1.14	16	175	Old	14”
2.6	33	173	Old	11”
2.9	32	231	Old	11”
2.12	33	220	Old	11”
2.13	38	247	Old	12”
2.15	18	296	Old	13”
3.1	18	165	Old	12”
3.3	25	197	Old	15”
3.4	15	160	Old	10”
3.5	12	192	Old	10”
3.12	5	116	Mature	11”
3.13	11	179	Old	12”
3.14	25	232	Old	13”
3.16	42	150	Mature	11”
3.18	9	185	Old	14”

Figure 3-1: Vegetation Layer



Forest Health

Lodgepole pine dwarf mistletoe (*Arceuthobium americanum*) is a native, parasitic, seed plant that occurs throughout the range of lodgepole pine in North America. Witches brooms, cankers, and swellings on the stems and branches indicate the presence of dwarf mistletoe. It is the most damaging disease agent in lodgepole pine, causing severe growth loss, decreased seed production, decreased wood quality, predisposition to other insects and diseases, decreased recreation and aesthetic values, and increased tree mortality. Dwarf mistletoe is common throughout the analysis area. Dwarf mistletoe ratings average 3 to 4 on a scale of 0 to 6. Existing mature stands of lodgepole pine show reduced tree vigor as a result.

The mountain pine beetle (*Dendroctonus ponderosae*) is the most severe insect pest of lodgepole pine trees (Lotan and Critchfield 1990), causing high levels of tree mortality in western North America. Adult beetles fly and attack mature pine trees in the middle to late summer. Blue stain fungi, carried by the beetle, are introduced to the host tree during gallery excavation. The combination of pheromone-induced mass attack and fungal growth quickly kills the tree.

Mountain pine beetle has caused significant mortality in portions of the area. Outbreaks in the early 1960's and late 1970's affected the analysis area, with evident damage occurring in lodgepole pine, whitebark pine and limber pine. Results of the *Aerial Insect and Disease Detection Surveys* in 2002 indicated that populations of mountain pine beetle had once again concentrated in the Bridger-Teton National Forest. The *2003 Forest Health Highlights–Wyoming* (Wyoming State Forestry Division and USFS 2003) states "Bark beetle outbreaks continue to be a major concern for forest managers throughout Wyoming. Populations of mountain pine beetle, spruce beetle, Douglas-fir beetle, and Western balsam bark beetle were high and even near epidemic levels in various forests in Wyoming." It further states that "Mountain pine beetle populations in Sublette and Lincoln Counties also increased causing tree mortality."

As of 2008, 380,588 acres on the Bridger-Teton National Forest had tree mortality caused by mountain pine beetle. In lodgepole pine, 292,894 acres were affected with 1,030,507 trees mapped as dead within the recorded acreage. Over 87,600 acres of whitebark pine mortality was mapped within the Forest with 369,492 dead whitebark pine recorded within the polygons of tree mortality. (Wyoming 2008: *Bark Beetles Conditions in the Intermountain Region*, Steve Munson).

Aerial Insect and Disease Detection Surveys from 1998 to 2007 show that the number of acres of mountain pine beetle mortality has increased exponentially. (See Figures 3-2 and 3-3).

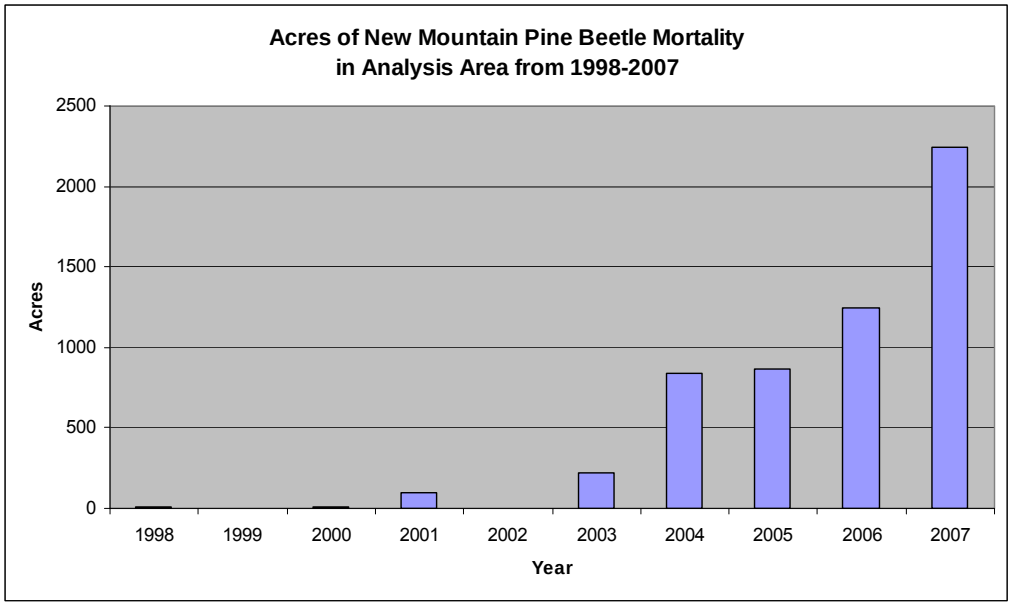


Figure 3-2: Acres Affected by Pine Beetle

The following table and map show the insect/disease activity surveyed in the treatment units.

Table 3-5: Insect and Disease Activity

Unit	Damaging Agent	Species Affected	% of Trees Affected	Severity
1.3	mountain pine beetle dwarf mistletoe	lodgepole pine lodgepole pine	24% 67%	4-topkill 6-heavy infection
1.5	dwarf mistletoe	lodgepole pine	58%	4-medium infection
1.14	mountain pine beetle fir broom rust	lodgepole pine subalpine fir	9% 19%	2-strip attack 1-minor
2.6	mountain pine beetle dwarf mistletoe fir broom rust	lodgepole pine lodgepole pine subalpine fir	9% 61% 52%	4-topkill 3-medium infection 1-minor
2.9	dwarf mistletoe	lodgepole pine	13%	2-light infection
2.12	dwarf mistletoe	lodgepole pine	80%	3-medium infection
2.13	mountain pine beetle dwarf mistletoe	lodgepole pine lodgepole pine	44% 73%	5-successful attack last year 4-medium infection
2.15	dwarf mistletoe	lodgepole pine	13%	3-medium infection
3.1	mountain pine beetle	lodgepole pine	36%	1-unsussessful attack
3.3	dwarf mistletoe fir broom rust	lodgepole pine subalpine fir	100% 100%	3-medium infection 1-minor
3.4	dwarf mistletoe	lodgepole pine	100%	3-medium infection
3.5	dwarf mistletoe	lodgepole pine	38%	2-light infection
3.12	dwarf mistletoe	lodgepole pine	100%	2-light infection
3.14	dwarf mistletoe	lodgepole pine	37%	4-medium infection
3.16	mountain pine beetle mountain pine beetle	lodgepole pine whitebark pine	100% 71%	5-successful attack last year 5-successful attack last year

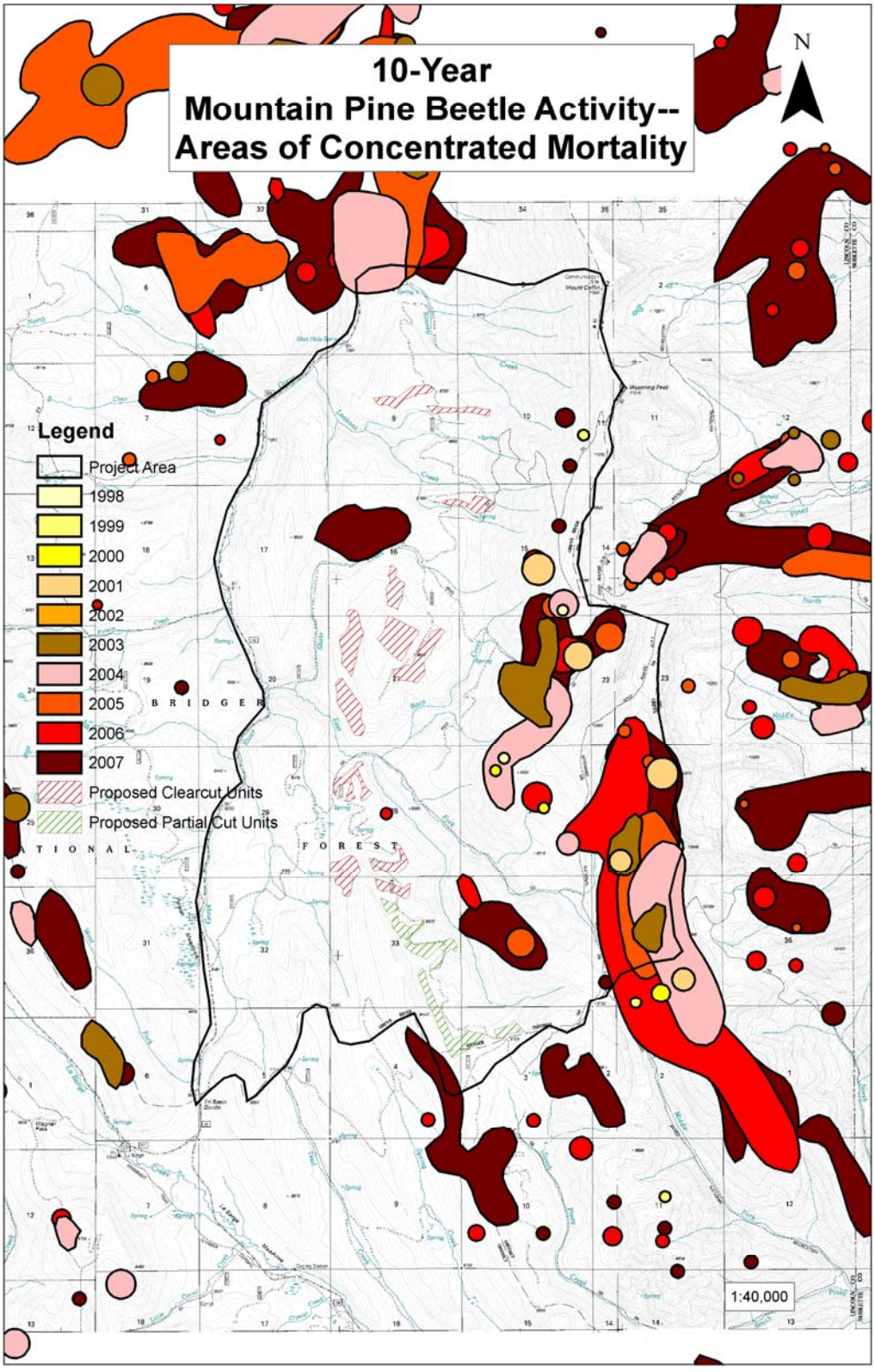


Figure 3-3: Mountain Pine Beetle Mortality

Comandra blister rust is also present in the overstory of lodgepole pine stands. It is responsible for top killing lodgepole pine and total kill of some individual trees in the project area. Subalpine fir has suffered mortality in the past from a complex of damaging agents including western balsam bark beetle, drought, old age, root diseases and decay fungi. Fir broom rust is common. Some spruce beetle activity in mature Engelmann spruce has caused scattered mortality. Hazard for future outbreaks is moderate where concentrations of mature spruce occur, such as in treatment area 3 in the south end of the analysis area.

Stand Productivity

Stand productivity refers to the changes in total volume of all trees in a stand. Factors that influence this include species, soil, moisture, nutrients, and climate. Growth rates of the treatment units have slowed down due to age, insects, and disease; and stand productivity is declining.

Table 3-6: Current Net Productivity of each Unit and Productivity Class

Unit	Growth (ft^2/ac/year)	Productivity Class*
1.3	9.6	Very Low
1.5	18.2	Very Low
1.14	24.7	Low
2.6	6.4	Very Low
2.9	8.6	Very Low
2.12	10.1	Very Low
2.13	6.6	Very Low
2.15	7.0	Very Low
3.1	24.2	Low
3.3	13.8	Very Low
3.4	14.9	Very Low
3.5	21.5	Low
3.12	11.7	Very Low
3.13	15.1	Very Low
3.14	9.2	Very Low
3.16	9.4	Very Low
3.18	14.9	Very Low

*Very Low = 0-20 ft^2/acre/year Low = 20-50 ft^2/acre/year Moderate = 50-85 ft^2/acre/year

High = 85- 120 ft^2/acre/year Very High = 120+ ft^2/acre/year

Old Growth Forest

Old and mature forest comprises 87% of the forested area within the Upper Greys analysis area. Old and mature forest may or may not be considered "old growth". The *Bridger-Teton National Forest Land and Resource Management Plan* (USFS 1990, p.11) defines old growth as:

> Old-growth stands composed of Douglas-fir and Engelmann spruce will be Douglas-fir, spruce, and fir multi-storied stands having two or more well-developed canopies of trees. The oldest overstory trees should be 140 to 240 years of age and be greater than 18 inches diameter at breast height. Understory trees will normally be composed of many age and size classes.

> Small openings may exist in the canopy where older trees have fallen. Snags should be present in the stand and average 24 snags per acre. Large-diameter downed logs will be a component of the forest floor.

The Forest Plan Old-Growth Standard (USFS 1990, p.129) states:

> Only silvicultural practices which achieve desired old-growth attributes will be used in stands managed as old-growth. Twelve percent or more of existing old-growth Douglas-fir and spruce forest will not be harvested in order to provide for viable populations of old-growth dependent species. Designated old growth stands will be at least 200 acres contiguous patches, generally spaced 1 to 2 miles apart, but attached by stringers of forested riparian areas or mature timber.

As defined, no treatment areas are in designated old growth (see Figure 3-4). There is no potential to manage any of the treatment areas as old growth.

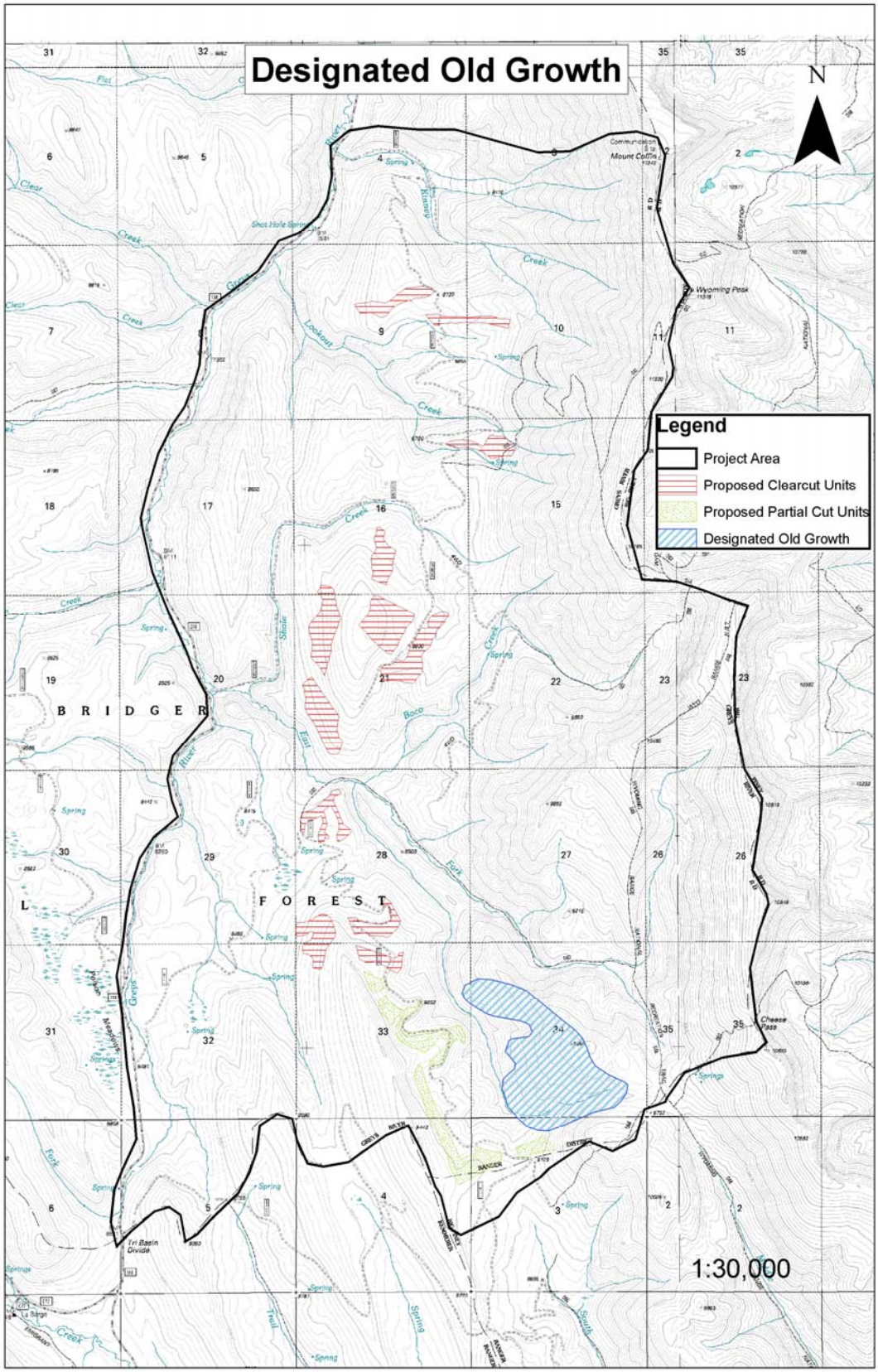


Figure 3-4: Old Growth

Additional Stand Data

Additional stand data is available in the project record, including vegetation specialist's report, stand data, stand tables and Forest Vegetation Simulator runs.

Past Disturbance

In the analysis area, 1,374 acres have previously been harvested: 1,107 acres of clear-cut and 267 acres of partial-cuts. The clear-cut areas were harvested from 1966 through 1979 and are now reforested with trees aged from 30 to 43 years old. All clear-cut areas have regenerated sufficient trees to no longer be considered a created opening and to provide wildlife hiding cover. Past clear-cut units adjacent to proposed treatment units have a range of 520 to 1,170 trees per acre, with lodgepole pine dominating. Average height of the overstory group of regenerating trees is 27 feet. Some of these areas have been pre-commercially thinned in the past and many have subalpine fir beginning to seed in under the lodgepole.

The partial-cut areas were harvested in 1966 and 1994. In 1966, 5 acres was cut via a sanitation cut, which removed only dead and dying trees. The partial-cuts from 1994 were from the Lookout-Boco timber sale, which was the last active harvest in the analysis area. These stands are forested with trees of varying ages.

Large fires have not occurred in the analysis area within the last 120 years. There are three recorded small fires from 1964 to 1986, ranging in size from 0.1 acres to 4 acres. Two were lightning caused; one was human caused.

However, fire has been the dominant natural disturbance regime in the past affecting patterns, composition, and structure of the forest. Stand replacing fire frequencies occur in the range of 100 to 150 years. Prior to 1988, few large fires had burned on the Greys River Ranger District for many years. The 1988 Corral Creek Fire, about 2 miles north of the analysis area, burned approximately 2,700 acres. Other large fires occurring in the Greys River drainage since 1988 include: Aspen Hollow in 1996 (2780 acres); Blind Trail in 2000 (9800 acres); Deer Creek (145 acres) and Fawn (88 acres) in 2001; East Table (3,600 acres) in 2003; and Middle in 2007 (2,700 acres). The 1988 Corral Creek Fire and these other recent fires in the Greys River drainage are representative of the size of fires that can occur in the drainage under the proper conditions. Current stand conditions in the project area are similar to that in the 1988 burned areas.

Desired Conditions

Desired Future Condition (DFC) 1B applies to the Upper Greys Vegetation Management Project. The DFC timber prescriptions for vegetation are summarized below. For a full description of these DFCs, refer to the *Bridger-Teton National Forest Land and Resource Management Plan* (USFS 1990).

Vegetation: Timber Prescription - A full range of biologically appropriate silvicultural practices is used to emphasize production and use of sawtimber and other wood by-products. Timber harvest is scheduled.

The purpose of the proposed action is to improve the health and vigor of selected mature timber stands, attain desired vegetation conditions including increased diversity of tree age and size classes, and reduce the risk of catastrophic fire through timber harvest that meets Forest Plan goals. The Forest Plan (pp.156 and A12) and the 2004 Greys River Landscape Scale Assessment (LSA) have identified opportunities for vegetation treatments to help improve resource conditions. The LSA found that the forested vegetation in the Greys River area falls outside the range of properly functioning condition (LSA, p. 161) and identified an opportunity to treat over 7,000 acres of lodgepole and over 9,500 acres of spruce and fir stands by 2015 (LSA, pp.161 and 170-172). In the Upper Greys analysis area, conditions are also outside the range of properly functioning condition, reflecting the LSA finding.

The proposed treatment areas are mapped in the *Bridger-Teton National Forest Land and Resource Management Plan* as Desired Future Condition 1B, which is an area managed for timber harvest, oil and gas and other commercial activities with many roads and moderate to occasionally substantial emphasis on other resources. In these areas, the forest is described as being a mosaic of tree groups of different ages and heights. Yet older, taller trees dominate the landscape. Some recently cut areas show tree stumps, slash and disturbed soil. Other recently cut areas still have a partial canopy of older trees. Older cut areas show tree saplings, poles or young trees up to 45 feet tall and have a less-disturbed appearing forest floor. Scattered dead trees are seen in openings and in older tree stands. (Forest Service 1990, pp 153-154)

More specific desired conditions were identified in the Greys River LSA (LSA, p.143). A desired state of forest health is a condition where biotic and abiotic influences on the forest (i.e. insects, diseases, fire, atmospheric deposition, silvicultural treatments) do not threaten management objectives for a given forest or analysis area (USFS 1993). A forest in good health is a fully functioning community of plants and animals and their physical environment (Monning and Byler 1992). In the broadest sense, a healthy forest is a description of a productive, resilient and diverse forest ecosystem: a forest with a future (Wilson 1991).

For lodgepole pine and spruce/fir stands the balanced range of structure for properly functioning condition (as identified in the LSA) would include:

- Approximately 10% in grass/forb stage
- Approximately 10% in seedling/sapling stage
- Approximately 20% in young forest
- Approximately 20% in mid aged forest
- Approximately 20% in mature forest
- Approximately 20% in old forest

To meet the properly functioning condition criteria, the timber stand structural classes must be diverse or balanced for sustainability or recovery and insect populations and disease must remain at endemic levels. For lodgepole pine a maximum of 60% of stands should be over 150 years old and for spruce/fir stands a maximum of 50% should be over 175 years old. For lodgepole the stand densities should be less than 90 square feet of basal area and for spruce/fir stands basal area should be less than 150 square feet. For spruce/fir stands, at least 40% should have multiple canopies and older stands should be un-even aged.

The proposed action would treat 362 acres of conifer stands in the Kinney, Lookout, Shale, Boco and East Fork Creek drainages over the next 5 years to help meet Forest Plan goals and desired conditions and move toward desired and properly functioning forest conditions.

3.2.2 ENVIRONMENTAL EFFECTS

Issues and Indicators

Issue	Indicator
Effect on "Forest Health" **a**. Effect on vegetative vigor and productivity over the landscape **b.** Impacts of dwarf mistletoe **c.** Effect of treatments on insect Infestations **d.** Moving toward desired vegetation conditions **e.** Projects effect on long-term forest health and forest mosaic	**a.** What is the projected growth of residual and regenerated trees following treatments and what is expected mortality? **b.** What are the projected levels of dwarf mistletoe in future treated stands and in adjacent untreated stands? **c.** What is the effect of treatments on mountain pine beetle and other insect infestation risk? **d.** The extent to which the alternatives move vegetation toward desired age class distribution on the Greys River Ranger District. **e.** What is the projected effect of treatments over the next 50 years on vegetation and site productivity?

Alternative A – No Action

Direct and Indirect Effects

Under the No Action Alternative there would be no vegetative treatments in the area except for occasional removal of dead trees along roads for firewood under personal use permits. Older conifer stands would continue to change from lodgepole pine dominated stands toward forests dominated by subalpine fir with high fuel loadings. Insect and disease factors, particularly dwarf mistletoe and mountain pine beetle in lodgepole pine, bark beetles in subalpine fir, and spruce beetle in Engelmann spruce would continue to affect increasing number of trees resulting in increased mortality and reduced growth throughout the area. Natural and human caused fires would continue to be a periodic disturbance, eventually replacing portions of mature forest with lodgepole pine regeneration or non-forested openings. Fire severity would most likely increase**.**

Under this alternative the Forest Plan would not be implemented. The area would not be managed in accordance with Desired Future Condition 1B, which emphasizes commodity production and stands maintained in a condition of forest health that meets this objective. Opportunities under this proposal to utilize forest resources as wood products to benefit local communities and public consumers and to improve forest health by removing trees affected by insects and disease and replanting healthy trees would be foregone. Opportunities to reforest disturbed areas (both natural and human caused) and control stocking densities using revenue created from the proposed timber sale would also be forgone. Forest age structure would not change and wildlife habitat associated with stand initiation or young forest growing toward desired conditions would not develop, until such time as fire creates stand initiation stand structure.

The condition and health of the lodgepole pine component of the Forest would continue to decline. Dwarf mistletoe infection would increase in all stands causing increasing mortality of overstory trees and severely reducing growth of affected trees. The stressed trees would also be susceptible to other agents such as decay fungi. Subalpine fir currently in the understory will gradually fill in the overstory as lodgepole declines. Subalpine fir susceptibility to bark beetles and disease agents increases with drought or density related tree stress. With the decline in lodgepole pine and an associated increase in subalpine fir, as well as continued full fire suppression and limited management of forested vegetation, fuel loads will continue to increase and provide conditions prone to large and stand replacing wildfires.

Within the project area, few changes will occur for species composition of Engelmann spruce, Douglas fir, limber pine, or whitebark pine. Whitebark pine stands that have experienced severe beetle damage will slowly regenerate from the limited remaining live seed trees. Over the next 50 years, one could probably expect 33% (conservative estimate) of the lodgepole pine dominated stands to change to subalpine fir through succession.

The previous harvested areas will continue to advance into pole and post size stands and young forested condition. Many of these areas will continue to be susceptible to dwarf mistletoe infections from adjacent older stands.

Cumulative Effects

Under Alternative A (No Action) the levels of harvest planned in the current proposal would be zero and in other projects (see Cumulative Effects of Alternative B below) planned under the current 5 year vegetation plan for the Greys River Ranger District would be approximately 1.3 MMBF per year, less than ¼ of those allowed in the Forest Plan.

Alternative B – Proposed Action Revised

The proposed vegetation treatment project includes approximately 362 acres of cutting and removing trees in lodgepole pine and mixed conifer stands, within the 11,885 acre analysis area in the upper Greys River watershed. On the 11,523 acres that remain un-treated, effects will be similar as described in the No Action Alternative above. Most of the areas proposed for clear-cutting are in lodgepole pine stands and areas proposed for partial-cutting are in spruce/fir stands. In the partial-cut areas, approximately 40 to 50% of the healthiest overstory trees would remain following treatment, with Engelmann spruce and Douglas-fir

favored as leave trees. There are 17 units proposed for treatment, including 5 partial-cut units (92 acres) and 12 clear-cut units (262 acres). The average size for clear-cut areas is 22 acres, with a range of 12 to 38 acres. The average partial-cut size is 18 acres with a range of 5 to 42 acres.

The proposed action will re-open or create 3.15 miles of temporary roads, which will be closed and rehabilitated following use and include approximately 3 miles of existing road reconstruction.

Logging would be accomplished with ground-based skidding equipment, including track or rubber-tired skidders. To minimize damage to the residual stand, the preferred logging method would be tree-length or log-length skidding, where limbs and tops would be cut "at the stump", then the log skidded to the landing. Whole-tree yarding, where the limbs and tops would not be removed from the trees and the whole tree skidded to the landing, would be acceptable. Timber mitigation measures include logging methods to minimize wounding of residual trees in partial-cut areas.

Skid trails and landing locations would be pre-approved by the Forest Service and would meet mitigation measures and best management practices. Slash would be treated by a combination of methods including whole tree skidding, broadcast burning and machine piling and burning. Sale area improvement projects would include tree planting, surveys to ensure reforestation, site preparation for natural regeneration, girdling mistletoe infected leave trees, and noxious weed control.

Any effects from harvesting operations can be minimized using Wyoming Forestry Best Management Practices (BMPs) and BTNF Standards and Guidelines for timber harvest. These are incorporated into the design of timber sale units as well as timber sale contract provisions to carry out sale operations. See Appendix A for BTNF Standards and Guideline.

Direct and Indirect Effects

Stands harvested with clear-cutting methods will change mature and old forest to grass forb stage for up to 5 years before reforestation is completed and seedling saplings begin to dominate the sites. Partial-cut areas will remain in mature and old forest, but will have lower tree densities and fewer dead and dying trees on the site. The tables below show changes in forested vegetation stages (FVS) following treatments as well as representative FVS models of changes in stands over 50 years following harvest. All records of stand data and FVS runs are available at the Greys River Ranger District Office.

Stands that remain untreated will provide corridors of old and mature forest for various old-growth dependent wildlife species.

Table 3-7: Comparison for Forested Vegetation Stages (Percent of Forested Area within Analysis Area) by Alternative

Stand Structural Stage	Affected environment	Desired Condition	Alternative 1	Alternative 2
grass/forb stage	0%	10%	0%	3.3%
seedling/sapling stage	3%	10%	3%	3.4%
young forest	10%	20%	10%	10%
mid-aged forest	0%	20%	0%	0%
mature to old forest	87%	40%	87%	83.3%

Table 3-8: Diameter at Breast Height (DBH)

Tree Size Class	ExistingCondition	DesiredCondition	Alternative1	Alternative2
< 5" DBH	0.3%	25%	0.3%	3.6%
5" to 9.9" DBH	60.8%	25%	60.8%	60.8 %
10" to 19.9" DBH	38.6%	25%	38.6%	35.0%
20" to 29.9" DBH	0.3%	25%	0.3%	0.3%

The clear-cut treatment units would remove all dead trees, those infected with disease, and those with insect infestations. New seedlings, either planted or natural regeneration, would establish a new healthy stand.

The partial-cut treatment units would be thinned from below, retaining a forested appearance and habitat attributes. Residual trees, at a density of 25 to 50 trees per acre, would be the best, healthiest trees in the stand with live crown ratios >35%. Hazard from bark beetle attacks would be reduced. Engelmann spruce and Douglas-fir would be favored. Dead trees and trees with successful mountain pine beetle attacks would be removed. Trees with dwarf mistletoe Hawksworth ratings of 4 and higher would be removed, as would those with mechanical damage including forks, broken tops, crooks, conks, and other diseases (to the extent possible to meet 25-50 trees per acre). Trees removed would be utilized for wood products before deterioration occurs.

Table 3.9 shows current productivity (annual growth as measured in ft^2 per acre) for each proposed clear-cut unit. If these stands were left untreated, productivity would continue to decrease. These stands have reached an age where productivity would not respond well to partial cutting.

Stand productivity in the clear-cuts treatment units would increase after harvest and a new stand has been established. The following table depicts the estimated FVS modeled annual productivity of these stands (all stands were modeled to the following: clear-cut, broadcast burned, and planted to 400 trees per acre of lodgepole pine). All stands show an increase in productivity with treatment, until culmination, the point where growth rates peak. From that point on, productivity declines. The stands are still growing and accumulating volume, but at a slower rate. It takes these stands about 30 years to reach their pre-harvest volumes. The average net productivity for the clear-cut treated stands at culmination is 27.7 ft^2/ac/year. The average time it takes to reach culmination is 99 years.

Table 3-9: Long-term Productivity of Clear-cut Treatment Units

Unit	Current Net Productivity (ft^2/ac/year)	Net Productivity at Age 30 (ft^2/ac/year)	Culmination of Net Productivity (ft^2/ac/year)	Age of Culmination (years)
1.3	9.6	8.75	22.5	110
1.5	18.2	12.5	26.3	80
1.14	24.7	15.1	33.2	120
2.6	6.4	19.2	35.5	115
2.9	8.6	9.3	20.9	80
2.12	10.1	9.6	22.4	90
2.13	6.6	9.2	28.4	100
2.15	7.0	9.8	20.2	85
3.1	24.2	15.3	45.6	115
3.3	13.8	13.9	26.3	115
3.4	14.9	1.5	44.5	110
3.5	21.5	16.9	28.3	75
Average	**12.0**	**11.7**	**27.7**	**99**

Stand productivity in the partial-cut treatment units will increase in some stands and decrease in others, depending on existing conditions. FVS modeling shows that unit 3-12 would increase productivity, so that in 50 years, it would accrue more volume than the unharvested stands. Stands 3-13 and 3-18 may also have increased growth so that 50 years from now, they are very close in production. However, units 3-14 and 3-16 may decrease with treatment. This could be due to several factors, including the age of the stands (and being too old to respond to the thinning) and the inability of the understory trees to release.

Table 3-10: Long-Term Productivity of Partial-cut Units

Unit	Current Net Productivity (ft^2/ac/year)	Net Productivity in 50 years after Partial-cut (ft^2/ac/year)	Net Productivity in 50 years with No Harvest (ft^2/ac/year)
3.12	11.7	23.3	21.8
3.13	15.1	18.0	19.1
3.14	9.2	11.7	18.0
3.16	9.4	9.7	19.3
3.18	14.9	18.3	19.8
Average	**10.6**	**12.8**	**19.1**

FVS modeling was performed on representative stand data for each type of harvest proposed in the Upper Greys Vegetation Management Project. The FVS summary, presented in Table 3-11 displays effects on selected forest attributes for representative stands and proposed treatments.

Table 3-11: FVS Summary by Harvest Type

Attribute	Prior to Harvest	Retained	Removed
Clear-cut with Reserve (Unit 2-12 used as example)			
Overstory (trees/acre)	161	5	156
Basal Area/Acre (square feet)	105	12	93
Merchantable Volume/Acre (CCF)	22.2	8.7	13.5
Partial-cut (Unit 3.14 used as example)			
Overstory (trees/acre)	145	45	100
Basal Area/Acre (square feet)	151	75	76
Merchantable Volume/Acre (CCF)	38.7	25.8	12.9

Prescriptions implementing clear-cutting in dwarf mistletoe infested lodgepole pine will reduce the spread of the infection to younger stands. If partial cutting was done in these stands, which are predominantly older lodgepole pine infected with dwarf mistletoe, dwarf mistletoe spread would be promoted. Treatments will result in more vigorous forests across treated landscapes. Fuel loading in treated stands would be reduced and fuel breaks provided, modifying future fire behavior in these areas. The potential to spread and establish new populations of noxious weeds exists for any projects that involve ground disturbing activities. All projects that result in ground disturbance would include preventative and control actions for noxious weeds. Timber sale activities would include standard contract clauses to prevent and control noxious weeds. *Sale Area Improvement Plans* would identify the need to control any noxious weed infestations within the sale area boundaries. The existing *Cooperative*

Action Plan with Lincoln County Weed and Pest has been and would continue to be used as the tool to control any new noxious weed infestations.

Cumulative Effects

Cumulative effects may be associated with the planned harvest of timber and improvements to vegetation conditions with projects listed below. All planned harvest is within opportunity areas identified as part of the interdisciplinary Greys River Landscape Scale Assessment and within areas identified in the Forest Plan as suitable. Planned harvests would not exceed created opening standards nor allowable sale quantity harvest levels and would comply with Forest Plan standards and guidelines as well as Wyoming Best Management Practices.

Connected Actions, Past, Present, and Foreseeable Activities Relevant to Cumulative Effects Analysis

Past Fires: 21,813 acres on the Greys River Ranger District in last 30 years as described above.

Past Harvest: There have been 1,107 acres of clear-cuts in last 40 years and 267 acres of partial-cuts within analysis area. There have been 8,029 acres harvested using clear-cutting methods in the Greys River Watershed (LSA, p. 61), out of 211,075 forested acres, or 3.8% of forested stands. Most of these areas are no longer considered created openings. Of the forested stands in the watershed, 83.0% are greater than 100 years of age (LSA, p.60-61).

Existing Sold Timber Contracts on Greys River Ranger District with Harvest scheduled over next 3 years (Total acres: 478, Total Volume: 1.38 MMBF)

- No Bull: 40 acres: partial-cut, Removal of 0.25 MMBF. Located approximately 20 miles to the north.
- Campground Combo: 361 acres of commercial thinning for fuel reduction. Removal of 1.0 MMBF *(This project is in review due to court injunction and may not proceed.)* Located approximately 15 miles to the north.
- Cottonwood Cabins/Swift Creek: 35 acres of commercial thinning for fuel reduction. Removal of 0.08 MMBF. Located approximately 8 miles to the west.
- Lynx/Moose Campground Decks: Removal of 0.05 MMBF, after fuel reduction thinning of 42 acres. Located approximately 23 miles to the north.

Planned Harvest (Total acres: 1,075, Total Volume: 14.1 MMBF)**:**

- Upper Greys: (This Project) 270 acres clear-cutting and 92 acres partial-cutting, 2009, approximate removal of 5.0 MMBF
- Spring Creek: 250 acres, planned 2010, partial-cuts, approximate removal of 1.5 MMBF. Located approximately 1 ½ miles to the north.
- Firetrail: 70 acres, planned 2010, partial-cuts, approximate removal of 0.3 MMBF. Located approximately 35 miles to the north.
- Three Forks: 360 acres planned 2011 and 2,012, approximate removal of 2.2 MMBF. Located approximately 10 miles to the north.

- Little Greys: 125 acres planned 2011, approximate removal of 0.6 MMBF. Located approximately 35 miles to the north.

Current + Planned Harvest: 18.2 MMBF. If all of this happens over 5 years, annual harvest would be: 3.6 MMBF compared to 4.3-5.5MMBF allowed in the Forest Plan. The most likely scenario would be that the current plus planned harvest would occur over about 8 years, which would be an average harvest of 2.3 MMBF/yr, which is ½ of that allowed by the BTNF Land and Resource Management Plan EIS.

Prescribed Burns affecting Forested Vegetation:

- Bradley Mountain Prescribed Burn: 4,400 acres planned for 2009, approximately 68% (2992 acres) is forested vegetation. Located approximately 35 miles to the north.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans: The *Bridger-Teton National Forest Land and Resource Management Plan* was approved in 1990. The Forest Plan mapped the forest into Desired Future Condition (DFC) areas. The project is located within DFC 1B. The management emphasis for DFC 1B is scheduled wood fiber production and use, livestock production, and other commodity outputs. The Timber Prescription states that a full range of biologically appropriate silvicultural practices are used to emphasize production and use of sawtimber and other wood by-products. The Intermediate Treatment Guideline states that all methods are permitted. Those which most economically produce sawlog-sized trees of desired diameter at breast height at rotation age should be applied. Stands should be protected from wood-fiber-production losses caused by insect and diseases. See Appendix A for additional details concerning Forest Plan compliance.

The Forest Plan allowed for an allowable sale quantity of 43 MMBF on about 7,500 acres for the first decade (1990 to 2000) and 55 MMBF for the second decade (2000 to 2010) on about 6,550 acres, for the Greys River Area. The annual sale quantity was forecast to be approximately 4.3 MMBF for the first 10 years and 5.5 MMBF for the second 10 years. (Forest Plan EIS, pp 492-493) Actual harvest levels have been well below these figures allowed in the Forest Plan.

Under Alternative B (Proposed Action Revised) some wood fiber production and use would occur in accordance with DFC 1B and Forest Plan Goal 1.1a. The levels of harvest planned in the current proposal would be 2.5 to 3.5 MMBF. Using the higher figure and adding other projects planned under the current 5 year vegetation plan for the Greys River Ranger District, harvest levels would be approximately 2.0 MMBF per year, less than ½ of those allowed in the Forest Plan.

3.3 Forest Fuels and Fire

Information provided in this environmental impact statement about forest fuels and fire is excerpted from the *Forest Fuels and Fire Report for the Upper Greys River Vegetation Management Project* by Assistant Fire Management Officer Ben Banister. The full text of this report is incorporated by reference.

3.3.1 AFFECTED ENVIRONMENT

The affected environment within the proposed units consists of mature over-story combined with regeneration and heavy dead and down woody debris. These stands are best described as a Fuel Model 10 by visual description, however due to the amount of fuel loading within the unit; fire behavior would best be described using Fuel Model 11 (consisting of a partial-cut with slash). Existing fuel loadings within the units range from 13-45 tons per acre, averaging 26 tons per acres. In addition to the ground fuels, significant portions of the area have been attacked by mountain pine beetle, increasing the fuel load in the vertical plane. Added to that is the infestation of dwarf mistletoe throughout the stands. These factors add up to an increased chance of a stand replacing fire within these units.

Large fires have not occurred in the area within the last 120 years. Fire has been the dominant natural disturbance regime in the past affecting patterns, composition, and structure of the forest. Stand replacing fire frequencies occur in the range of 100 to 150 years. The 1988 Corral Creek Fire, about 2 miles north of the analysis area, burned approximately 2,700 acres. Current stand conditions in the project area are very similar to that of the burn in 1988. These stand conditions lead to and are conducive to large stand-replacing fires. The 1988 Corral Creek Fire is a reminder of the size of fires that can occur in the Greys River drainage.

Desired Condition

Approximately 46% of the Greys River planning area and 50% of the analysis area, is classified as "mid and low elevation subalpine forests." Lodgepole pine normally occurs in this type as seral species that may or may not burn before the stand moves towards Engelmann spruce/subalpine fir. The historical fire regime for this fire type is characterized by mixed severity fires every 50 - 80 years with stand-replacing fires every 100 to 300 years. The mixed severity fires likely ranged in size from 1/4 to 100 acres or greater and might smolder and creep for much of the summer. Stand-replacing fires would occur when a combination of favorable dry and windy fire weather combined with older aged stands that were receptive to a high severity fire.

Small areas of moist and wet subalpine fir grow in seasonally moist or wet conditions, often occurring adjacent to riparian vegetation as moist benches or as stands associated with late-melting snow banks. Fire frequency in this type is possibly as long as 300 to 400 years.

Douglas-fir occupies about three percent of the Greys River LSA plan area (but only 1% of the analysis area). Douglas fir fire regimes are separated into cool, dry Douglas fir, and moist

Douglas fir. In the cool, dry type, fires were normally low to moderate intensity and rarely killed mature Douglas-firs. Fire frequency was approximately 30 to 70 years. Fires in the moist group tended to be more variable in frequency and intensity; fire frequency in this type was likely 50 to 100 years, with stand-replacing fires occurring at 200 to 400 year intervals.

In aspen forest areas, which currently occupy 6 percent of the LSA plan area, but less than 1% of the analysis area, fires are extremely variable and fire frequency varies with the understory. It is likely that aspen historically occupied a greater area than currently defined. Fire frequency was also variable, ranging from 40 to 150 years.

The number of aspen stands established on the Greys River Ranger District during each fire episode suggests that 1869, 1889, 1910, 1919 were extensive fire episodes. Following 100 plus years of fire suppression, in combination with grazing, within the analysis area, the vegetative structure is getting out of its normal cycle of fire return interval and has lost or is losing the structural component that existed historically with these areas. By adding disturbance back into these areas, the Forest Service has the ability to control fire to produce beneficial effects while limiting the consequence of a large wildfire.

DFC 1B for fire protection includes using a full range of suppression techniques for maintaining fuels conditions that will permit fire suppression forces to meet fire protection objectives for the area under historic weather conditions. In DFC 1B, fire management emphasizes the preservation and enhancement of timber and range values scheduled for current use, the suppression of wildfires during the normal fire season, and the containment, confinement, or surveillance of wildfires during the pre- and post-fire seasons. In DFC 1B, prescribed fire should be used to favor reducing fuel loadings, improving livestock forage conditions on primary ranges, and improving site conditions to increase wood fiber production.

3.3.2 ENVIRONMENTAL EFFECTS

Issues and Indicators

Issue	Indicator
Effect on Forest Health	
Project's effect on long-term forest health and forest mosaic	Reduction in the amount of fuels

Spatial and Temporal Context for Effects Analysis

The only effect of this project is associated with a potential fire start which could be established within or adjacent to the units. Current fuel loadings would cause extreme fire behavior. The effects of fire on these units would be consistent for the short and long term effects. However, as the stands aged and more fuels are accumulated, fire behavior would

increase. The heavy accumulation of fuels within the project units would increase the duration of a fire and the cost of suppression activities.

Alternative A – No Action

Direct and Indirect Effects

Under the No Action Alternative, there would be no reduction in fuels loading and no reduction in resulting fire intensity. Fuel loadings would continue to build, increasing the future potential of large uncontrolled, high intensity wildfires within the project area. This will increase suppression cost and increase the exposure of firefighters to a hazardous condition.

Under this alternative, the Forest Plan would not be implemented. The area would no longer be managed under Desired Future Condition 1B, which states that fire management emphasizes preservation and enhancement of timber and range values scheduled for current use. If left untreated uncontrolled fire starts could destroy the current and future timber base within this project area.

In addition, fire would not be used as a tool to accomplish resource objectives while protecting identified values within acceptable levels of risk. Within the guidelines identified in the Forest Plan, prescribed fire may be used to accomplish management objectives which include: insect and disease suppression, reducing fuel loading to acceptable levels, achieving other desired vegetation conditions to meet management objectives, and maintaining fire-dependent animal or plant species. These objectives would not be met under the No Action Alternative.

Alternative B – Proposed Action Revised

Proposed treatments are described in the Forested Vegetation section above. These treatments would reduce forest fuels, along with promoting growth rates and the health of leave trees.

Resulting fuels objectives are to treat the harvest units with a broadcast burn. Piling is not an option in many areas due to concerns with soil sterilization. Pile burning will mainly occur on landing piles. The area would be managed under Desired Future Condition 1B for fuels reduction and fire protection. By meeting the guideline that prescribed fire should be used to favor reducing fuel loading, improving livestock forage conditions on primary ranges, and improving site conditions to increase wood fiber production.

Fireline intensities resulting from activity fuels will not exceed 400 British thermal units (BTU) per second per foot on 90 percent of the days during the regular fire season.

Direct and Indirect Effects

Direct effects associated with this project will be the reduction in fuel loading within the stands, which will directly affect the surrounding stands by creating a break in fuels densities,

thereby reducing suppression cost, minimizing risk to firefighters and reducing disease and insect infestations.

Indirect effects would be the negative effect on wildlife species that rely on mature age structure and heavy dead and down material within the stands.

Cumulative Effects

There have been no large fires within the project area within the last 30 years; a total of 21,813 acres have burned on the Greys River Ranger District in that time period. One hundred years of fire suppression has given rise to large areas of older forests with heavy fuel loadings that will allow for large fire growth, increased cost of suppression and increased risk for firefighters.

3.4 Wildlife Resources

Information provided in this environmental impact statement about wildlife resources is excerpted from the *Biological Assessment and the Biological Evaluation on Wildlife for the Upper Greys River Vegetation Management Project* by Wildlife Biologist Don Delong. The full texts of these reports are incorporated by reference.

This is an extensive section which covers a variety of wildlife species and habitats including Threatened, Endangered and Sensitive (TES) species, Management Indicator Species (MIS), migratory birds and other species. Included are sections on: issues affecting wildlife; desired conditions; affected environment; and environmental effects. The affected environment and environmental effects are discussed under headings for each habitat condition and group of wildlife species. These headings are:

Habitat – General
Mix of Seral Stages and Fragmentation in Conifer Forestland
Stand Characteristics
Roads and Motorized Trails
Noxious Weeds
Management Indicator Species, Sensitive Species and Migratory Birds
Common Loons, Trumpeter Swans and Harlequin Ducks (Sensitive)
Spotted Frogs (Sensitive), Boreal toads and Boreal Chorus Frog (MIS)
Brewer's Sparrow (MIS) and Greater Sage Grouse (Sensitive)
Elk (MIS)
Mule Deer (MIS)
Moose (MIS)
Aspen (MIS)
Pine Marten (MIS), and Fishers, Northern Goshawk, Great Grey Owl, Boreal Owl, and Three Toed Woodpecker (Sensitive), Grizzly Bears, Wolverine, Peregrine Falcon, Spotted Bat, and Western Big-Eared Bat (Sensitive)
Sensitive Plant Species
Migratory Birds
Threatened, Endangered, Experimental, and Candidate Species

Canada Lynx
Wolf
Yellow Billed Cuckoo

Applicable laws and regulations are discussed as they affect specific wildlife species. Laws and regulations are also discussed in Chapter 1 and in Appendix A, as relates to the *Bridger-Teton National Forest Land and Resource Management Plan*.

For all species and species groups addressed in this report, potential direct and indirect effects of Alternatives A and B were evaluated against existing conditions and cumulative effects were evaluated against properly functioning conditions (or, desired conditions). For species/groups associated with late-seral conifer forestland, potential direct and indirect effects were also compared against properly functioning conditions.

ISSUE AND INDICATORS

There are many issues dealing with wildlife habitat and vegetation management. The primary issue is listed in Chapter 1.9 (Issue # 1) and detailed below with indicators. This primary issue incorporates many aspects of wildlife habitat. Addressing elk security cover and lynx habitat also addresses late seral and old-forest characteristics important to some sensitive, Management Indicator Species, and migratory bird species, as well as mule deer and moose. Canopy cover and tree density helps determine the suitability of a conifer forest for nesting and foraging. There is also discussion of this issue, particularly item 1d, diversity of structural stages and ages, in the Forested Vegetation section.

Issues	Indicators
Effect on Wildlife habitat **a.** Lynx habitat	**a.** Canopy cover and density of mature conifer trees — Late seral and old-forest characteristics. Amount of disturbed habitat in LAU.
b. Elk hiding and security	**b.** Change in the relative proportion of conifer forestlands in late succession. • Change in the relative proportion of conifer forestlands in early succession. • Changes in the density (and locations) of roads designated as open to the public. • Changes in the extent to which motorized vehicle use off of designated (open) roads and trails has the potential to increase. • Changes in the timing and intensity of mechanized activity and associated human disturbance in any given area. • Changes in the timing and intensity

c. Habitat fragmentation and Connectivity **d.** Diversity of structural stages and ages	of motorized vehicle use along major road **c.** Are forested corridors available for a variety of species of wildlife? **d.** What is the distribution of tree species structural and age classes for each alternative in the analysis area and on the Greys River Ranger District?

Other Issues Considered in Analysis: Several other issues and indicators, which depend on the species being assessed, were used in the assessment of potential effects, the design of the project and in determining mitigation measures needed. Addressing many of these issues are required by law or regulation, or encompassed by relevant Forest Plan standards, prescriptions, and guidelines such as Management Indicator Species, sensitive species, and migratory birds. These issues are listed below also.

Roads, motorized trails, and associated off-road motorized use reduces the amount of habitat available to some species and can contribute to reduced water quality, noxious weed spread, and increased mortality, among other effects, which can adversely affect wildlife.

The introduction and spread of noxious weeds and other nonnative invasive plant species has the potential to have major adverse impact on wildlife habitat, particularly by increasing sediment runoff and reducing desired native forage availability (Lacey et al. 1989; Duncan 1997).

Density and distribution of snags are important to a variety of sensitive and migratory bird species associated with late-seral conifer forests.

Relative production and prevalence of deciduous shrubs and herbaceous vegetation are important for forage for ungulates and other herbivores.

Amount of wetland and riparian habitat lost or damaged.

Density, spacing, and quality of cover (micro-sites) in upland types, including course woody debris retained and relative changes in the canopy cover of grasses, shrubs, and young trees.

DESIRED CONDITIONS – WILDLIFE

The entire analysis area is within Desired Future Condition (DFC) Class 1B. The theme of DFC Class 1B is "An area managed for timber harvest, oil and gas, and other commercial activities with many roads and moderate to occasional substantial emphasis on other resources".

Natural and human-induced disturbance regimes produce habitat in varying successional stages distributed across the assessment area. Desired conditions provide sufficient suitable habitat to support sustainable populations of all native wildlife species, including federally

listed species that could potentially utilize or reestablish populations within the assessment area. Forest-wide resource management goals, prescriptions, standards, and guidelines established in the *Bridger-Teton National Forest Land and Resource Management Plan* to meet wildlife needs are implemented. (Greys River LSA, pp148-151)

Maintain or enhance habitat conditions to support populations of all designated big and trophy game species within population objectives established by the WGFD and agreed to by the BTNF.

Adequate amounts (> 30%) of security cover are provided and distributed throughout the assessment area.

HABITAT — GENERAL

Affected Environment

Mix of Seral Stages and Fragmentation in Conifer Forestland

Several conservation assessments of sensitive species associated with conifer forestlands have recognized the role of historic fire regimes and implications of reducing the frequency and extent of fires in forests. For example, The *Canada Lynx Conservation Assessment and Strategy* (Ruediger et al. 2000) discussed impacts from aging forests and the importance of restoring historical succession and disturbance regimes.

More than 100 years of human-related actions and activities (e.g., effects of fire suppression) have led to two substantial alterations to wildlife habitat in conifer zones in the Greys River watershed:

- The proportion of forestland types currently in late succession, compared to the proportions in early and mid succession, is far larger than what had existed prior to Euro-American settlement (Table 3-12; see also USFS 2004; USFS 2005).
- The size and acreage of non-forested communities (e.g., big sagebrush, mountain shrubland, tall forb, grassland, meadow, willow) and aspen communities are lower than what had existed prior to Euro-American settlement due to unabated conifer encroachment (Gruell 1975, Gruell 1980a,b, USFS 1997, USFS 2004, USFS 2005).

Table 3-12: Breakdown of existing mix of seral stages in forestland at each of several geographical scales, from the area immediately surrounding the harvest units up to the Greys River watershed below 9,700 feet. (HUC = hydrologic unit code). These figures were based on information in USFS (2004) and Laub and Whitlach (2009).

Geographic Scope	Total Acres of Area	Total Forestland (acres)	Stage of Succession[A]		
			Early	Mid	Late
Vicinity of Harvest Units	7,000	4,500	6%	18%	76%
Analysis Area	11,885	8,256	3%	10%	87%
Greys River-Spring and Corral Creeks (two 6th-order HUCs below 9,700 ft.)	56,349	40,906	7%[B]	5%	88%
Greys River watershed below 9,700 ft.	272,650	186,600	6%	3%	91%
Desired Conditions at landscape scales	—	—	20%	40%	40%

[A] Early succession, for the purposes of this report, is comprised of forestlands that are ≤40 years old, mid-seral forests are 41-100 years old, and late-seral forests are >100 years old.

[B] There was an estimated 7% of conifer forestland in early succession and an estimated 5% in mid succession in 2003 (USFS 2004). The amount in early succession may be somewhat less now (and more in mid succession).

While there has been overall reduction the amount and quality of habitat for species associated with early- and mid-seral conifer forestlands there has been a benefit to species associated with late-seral conifer forestlands by greatly increasing the overall amount of available habitat, as well as the size of habitat blocks and connectivity.

The Greys River watershed has a high level of inherent heterogeneity of vegetation types across the landscape. "Stream dissection is generally high, as evidenced by narrow floodplains and oversteepened valley walls. A combination of topography, geology, aspect, slope, soils, and climate provide for an ecologically diverse mosaic of vegetation patterns and communities" (USFS 2004a:9). Topography is less steep and dissected in the vicinity of the harvest units. There are several relatively large contiguous patches of forestland (approximately 2,500-4,000 acres) in the Greys River watershed within which unforested areas are uncommon. The fire-return interval in the watershed has also increased during the last century (Gruell 1975; Gruell 1980ab; USFS 1997; USFS 2004), resulting in reductions of early-seral and mid-seral forestland that historically added to the heterogeneity. This high level of fragmentation of conifer forestland in the watershed is an underlying characteristic of wildlife habitat at the landscape scale.

Environmental Effects

Alternative A – Direct and Indirect Effects

In the short term under Alternative A, there would likely be no changes in the mix of seral stages in the analysis area and the upper Greys River watershed. Over time, however, the percent of forestland in late succession would continue to increase in the absence of fire.

Alternative B – Direct and Indirect Effects

Under this alternative, the amount of forestland in early succession would increase by 6-8% (in the vicinity of the harvest units), 4-5% (analysis area), 2.5-3% (upper Greys River watershed above Crow Creek), and 0.1-0.2% (Greys River watershed). At the scales of multiple sub-watersheds (e.g., Corral and Spring Creek 6th-Order HUCs) an increase of 1.3-1.7% in early-seral forestland will help restore a desired mix of age classes, but only to a small extent. Most of the existing acreage in early succession in this part of the upper Greys River watershed outside of the Corral Creek fire will transition into mid succession within 5-8 years (all existing clear-cuts are 30 years and older). The early-seral communities to be produced as a result of Alternative B would occur in an area that already has early and mid seral age classes. The amount of conifer forestland in late succession/old-age would decline by the same percentages under this alternative, resulting in a reduction in benefits in the upper Greys River watershed (Figure 3-5– reduction from 85% to 83-84%). Where ranges are presented in this paragraph, the lower end of the range represents the effects of clear-cutting 270 acres and the uppermost end assumes the unlikely affect that partial-cutting would result in early-seral conditions.

Table 3-13: Mix of seral stages in forested areas anticipated at the conclusion of implementing Alternative B — in several geographical scales. See Figure 3-5 for additional information.

Geographic Scope	Total Acres of Area	Stage of Succession[A]			Total Forest-land (acres)
		Early	Mid	Late	
Vicinity of Harvest Units	7,000	12-14% [B]	18%	68-70%	4,500
Analysis Area	11,855	7-8%	10%	82-83%	8,256
Greys River-Spring and Corral Creeks (two 6th-order HUCs below 9,700 ft.)	55,795	10-11%	6%	83-84%	21,300
Greys River watershed below 9,700 ft.	272,650	6%	3%	91%	186,600
Desired Conditions at landscape scales	—	20%	40%	40%	—

[A] Early succession, for the purposes of this report, is comprised of forestlands that are ≤40 years old, mid-seral forests are 41-100 years old, and late-seral forests are >100 years old.

[B] Ranges in percentages reflect an increase in early-seral communities by 270 acres (clear-cuts only) and 362 acres (clear-cuts and partial-cuts). Partial-cuts may not, by definition, constitute early succession, but many of the partial-cuts will have so few mature trees remaining that conditions will more closely approximate early succession than late succession.

New clear-cuts under Alternative B would increase the amount of grass cover temporarily, similar to clear-cuts that occurred 30-50 years ago. Grass cover may increase slightly in the partial-cuts with only half the overstory trees removed and most young trees and shrubs remaining. The amount of course woody debris may decline considerably.

Harvesting under Alternative B is planned in an area that already has a patchwork of old clear-cuts. Proposed clear-cuts would be small (12-38 acres) and many located adjacent to older clear-cuts. Some of the narrow bands of late-seral forestland would remain. The result would be a fairly tight patchwork of early-, mid-, and late-seral communities. Medium-size and large blocks of late-seral forestland would remain under Alternative B.

Cumulative Effects

Multiple factors over decades have reduced the frequency and extent of fires which have incrementally resulted in a much larger proportion of late-seral conifer forestland in the Greys River watershed than had exited prior to Euro-American settlement. Fire suppression activities have likely played the most prominent role in the imbalance of successional stages in the Greys River watershed, along with other factors such as livestock grazing and road construction (Gruell 1975; Gruell 1980a,b; USFS 1983; USFS 1997; USFS 2004). According to USFS 2004:10, "Active fire suppression began during the early 1900s and continues today with some modification..." Until 2004, all unplanned ignitions were suppressed in the analysis area using the 'least cost plus loss principle.' Only 9 fires have burned beyond 500 acres since 1910 (USFS 2004, plus the Middle Fire of 2007).

Past logging on the Greys River Ranger District, primarily through clear-cut methods, has slowed the increase in the amount of late-seral conifer forestland. Timber harvest ranged from about 5 million board-feet (MMBF) per year in 1962 to 15 MMBF per year during 1963-1970, and down to 3-4 MMBF per year during 1971-1979, most of this occurring in the Greys River watershed (USFS 2004). In total, nearly 10,000 acres were clear-cut on the district (approximately 8,029 in the watershed) and about 1,800 acres were selectively cut, resulting in early seral forestland on 4-5% of the more than 200,000 acres of conifer forestland on the district, with reduced tree stocking along with some early seral forest on an additional 1%.

Several factors currently limit the amount of additional late-seral conifer forestland that will be converted to early-seral communities by logging and other mechanical means, including steep and rugged terrain, past harvest areas, and Inventoried Roadless Areas (approximately 86% of the Greys River Ranger District and 80% of the Greys River watershed). Logging is now further limited by the *Northern Rockies Lynx Management Direction* (USFS 2007b), particularly Standard VEG S6 (See Canada Lynx section (p.3-75 for more detailed description). In this project, as an example, of the 591 acres originally proposed for harvest 229 acres were dropped because of conflicts with Standard VEG S6. It is likely that less than about 5% of conifer/aspen forestland on the district and Greys River watershed has potential

to be logged. Prescribed burning has also played a limited role in managing succession in conifer forestlands, and this may continue into the future given the heavy fuel loading. These factors will continue to skew habitat conditions toward providing habitat for wildlife associated with late-seral conifer forestland, at the expense of species associated with early seral conditions.

There are several factors that may somewhat offset the continuing increase in late-seral conifer forestland in the upper Greys River watershed and other parts of the Greys River Ranger District, including an increase in wildland fire use and wildfires as well as increasing insect outbreaks. The Spring Clean-up Salvage Project, which is another timber sale currently being planned within the upper Greys River watershed just north of the analysis area, would result in the density of mature trees being reduced on about 219 acres of conifer forestland, but it would not convert these acres to early succession. There are no other foreseeable mechanical treatments, in the upper Greys River watershed that would affect the amount of conifer forestland that is in late succession.

Each small-scale action (e.g., Upper Greys River Vegetation Treatment Project) that creates early seral communities only slightly reduces the large benefits that have accrued for wildlife species associated with late-seral conifer forestland (Figure 3-5). The gap between existing and desired conditions, currently benefits species associated with late-seral conifer forest. The slight reduction of 1-2% in late seral forest from Alternative B will not constitute a negative effect on wildlife populations. Adverse impacts on populations would not occur unless the proportion of forestland in late succession begins to decline on a large scale below the amount that existed prior to Euro-American settlement, taking into account the natural range of variability and fragmentation begins to increase beyond levels that existed prior to Euro-American settlement.

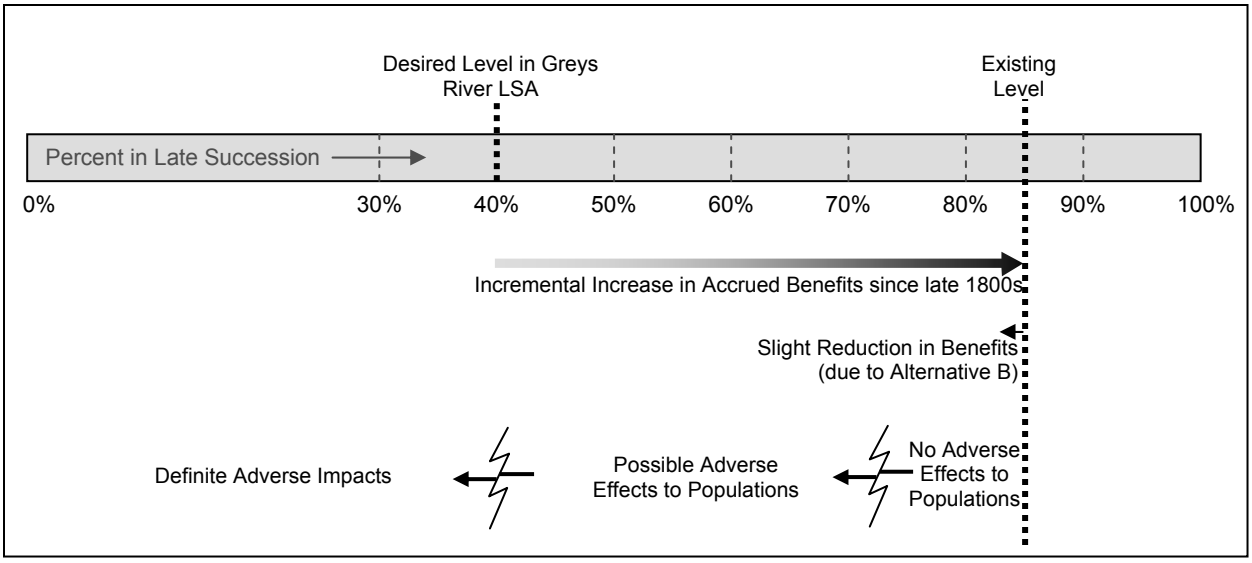


Figure 3-5: Percent of conifer forestland in the upper Greys River watershed currently in late succession, the desired level of late succession, cumulative benefits to late-seral conifer forestland species and reduction in these accrued benefits that would result from Alternative B. The darker the shading in the arrow corresponds to higher levels of accrued benefits to late-seral species beyond the natural range of variability. The increasing lightness at the left end of the arrow (phasing out) indicates the uncertainty about the exact proportion of late-seral communities just prior to Euro-American settlement. The bottom of the figure illustrates relative effects on populations of wildlife associated with late-seral conifer forestland. The figure illustrates the general concept.

Determination of Effects

The net effect of past cumulative effects and Alternative A would be a continuation of benefits to late-seral conifer forestland habitat and ongoing detriments to early-seral and mid-seral habitats in the analysis area and upper Greys River watershed.

The net effect of past cumulative effects and Alternative B would be a slight reduction in benefits to late-seral conifer forestland habitat and ongoing detriments to early-seral and mid-seral habitats in the analysis area and upper Greys River watershed.

STAND CHARACTERISTICS

Affected Environment

Table 3-14 summarizes key parameters characterizing existing vegetative structure in the harvest units of Alternative B. There is a range of conditions from open to dense canopies and low to moderate understory densities. Stands with multi-level canopies and high densities in the understory were dropped from the original proposal due to lynx/snowshoe habitat values.

Additional information on stand characteristics can be found in the Forested Vegetation section (3.1).

Table 3-14: Summary of stand characteristics for each harvest unit for Alternative B, based on stand exams (Whitlach 2009) and information collected by McEachern and Brick (2008).

Unit[A]	Trees[B]		Trees/acre, by DBH class				CC[C]	BA[D] (ft^2/ac.)	Horiz. Cov.[E]		Course-Woody[F]		Structure[G]
	Dominant	Other	>8"	5-8"	0.1-5"	<0.1"			Range	Ave.	Range	Char.	
1.3 / cc	LP	SAF, WB	87	0	100	0	20%	74	18-52	39	2-5	M-H	DAC
1.5 / cc	LP	SAF, WB	117	0	0	0	12%	107	8-53	34	2-3	M	CD
1.14 / cc	SAF	LP, ES, WB	121	0	100	2,300	51%	162	26-30	37	2-3	M	CF
2.6 / cc	LP, SAF	DF, ES	47	30	75	150	21%	59	8-14	45	3	M-H	DC
2.9 / cc	LP	SAF	110	0	100	100	27%	93	15-21	43	3-6	H	DCE
2.12 / cc	LP	SAF	161	0	75	0	24%	105	1-7	42	2-5	M-H	DB
2.13 / cc	LP	SAF, ES, WB	97	0	1,400	1,700	50%	109	22-26	48	2-3	M	CD
2.15 / cc	LP	SAF, ES, WB	103	0	700	0	28%	108	27-34	22	2-3	L-M	BD
3.1 / cc	LP	SAF, ES	152	0	900	3,200	55%	166	18-24	44	2-3	M	DC
3.3 / cc	DF	mix	85	0	400	1,200	48%	108	25-29	41	2-4	M-H	DCE
3.4 / cc	LP	SAF, ES, WB	199	0	600	3,800	66%	171	30-34	38	2-3	L-M	CD
3.5 / cc	LP	SAF, ES, WB	199	0	600	3,800	35%	171	35-39	40	2-3	M	CD
3.12 / pc	ES	LP, SAF	96	0	900	1,300	66%	110	45-48	40	1-3	L-M	C
3.13 / pc	ES	LP, SAF, WB	132	0	1,500	1,900	81%	197	49-53	35	2-3	M	CD
3.14 / pc	SAF	LP, ES, WB	145	0	700	5,000	47%	151	54-58	44	2-3	L-M	CD
3.16 / pc	SAF	LP, ES, WB	76	0	150	150	26%	71	64-72	47	1-7	L-H	DCE
3.18 / pc	ES	LP, SAF, WB	54	0	900	1,700	44%	127	73-77	45	1-3	L-M	DC

[A] Harvest unit number and harvest technique (cc = clear-cut, pc = partial-cut).

[B] Trees — LP = lodgepole pine, SAF = subalpine fir, ES = Englemann spruce, DF = Douglas fir, WB = white-bark pine, mix = all spp.

[C] Canopy cover.

[D] Basal area.

[E] Horizontal cover, based on methods described by Bertram and Claar (2008), Squires and DeCeare (2008), and DeLong (2008).

[F] Indices for course woody debris. Range: .Numbers indicate the largest number of logs stacked on top of each other at the sample site. One (1) generally indicates a low density of logs and little contribution to structural complexity. Two (2) generally indicates that most logs are isolated from each other (not stacked), with an occasional one stacked on another (still fairly low complexity). When a maximum number of 3-4 logs stacked on one another, this generally indicates a fairly high density of logs and moderate contribution to complexity. When a maximum number of 5-7 logs are stacked, this indicates a high density of logs and high contribution to structural diversity. Characterization: L = low density of logs, M = moderate density of logs, H = high density of logs.

[G] The over-story and mid-story structure of the forest was indexed according to illustrations in USFS (2007). A = top of page 146, B = bottom of page 146, C = top of page 147, D = bottom of page 147, E = top of page 148, F = bottom of page 148.

Amounts of course woody debris range from low densities to high densities. When moderate to high densities of logs combine with moderate to high densities of snags and moderate to high densities of young trees, structural diversity can be quite high.

Most old clear-cuts that adjoin harvest units of Alternative B are dominated by lodgepole pine, 15-30 feet tall, at densities high enough and with crowns low enough to provide a high amount of visual obstruction (Table 3-15). Ninety-percent of an elk would be obstructed within 200 feet throughout most parts of most old clear-cuts. Tree diversity on many is low, but some old clear-cuts have compositions nearly equally split between lodgepole pine and subalpine fir with smaller amounts of Englemann spruce and whitebark pine.

Table 3-15: General descriptions of old clear-cuts (OCs) and characterization of the level of elk security cover they provide. Only those clear-cuts that are adjacent to harvest units proposed under Alternative B, Upper Greys Vegetation Treatment Project, are included.

Old Clear-cut Number	Juxtaposition to Proposed Harvest Unit	General Description	How much of the OC Meets Definition of Elk Security Cover?	
			Proportion of Area	Distances
I-3	N side of 1.14	LP, mostly 15-30' tall, with crowns within 1-5' of ground (mostly <3').	Most	75-100'
			Some	up to 125'
I-7	S of 1.5, but not adjacent	LP, mostly 15-25' tall, with crowns within 1-5' of ground. Three openings at ~40 x 100'.	Most/all	<150-180
I-8	S side of 1.5	LP, mostly 15-25' tall and fairly dense. Crowns within 6-15' of ground (mostly 6-10').	Most/all	150-180'
I-9	N side of 1.5 & S side of 1.3	LP, mostly 15-25' tall and fairly dense, with some openings. Understory is mostly grass/forb, with grouseberry in places.	Most/all	<150-180'
I-11	N side of 1.3	LP, mostly 15-25'		did not assess
II-1	SW side of 2.12	Mostly LP at 15-20' tall, west-facing slope (10%) with good grass/sedge cover. A few clearings.	Most	100-150'
			Uncommon	>200'
II-2	NE of S end of 2.9, N to 2.15	Mostly LP at 15-30' tall, fairly dense. Very little course woody debris. Very few shrubs, but good grass cover.	Most/all	75-125'
II-3	S of 2.6	Mostly LP at 20-25' tall. Some trees with low live branches, other crowns had lifted to ~10'	Most/all	75-150'
II-4	E side of 2.6	Mostly LP at 20-30' tall. Crowns are mostly 1-3' above the ground, some are up to 6'. Some clearings are about 30 x 50-60'. Good grass cover, some grouseberry.	Most	<200'
			Some	>200'
II-5	E of 2.13 and 2.15	Similar to II-4, above.	Most/all	<200'
III-3	N side of 3.4	Variable, mostly filling in with LP, with SAF comprising 20% of composition. (WBP minor). Trees generally 15-25 ft. tall. One opening by the road (about 1 acre) had trees as small as <1 ft. and up to about 6 ft. tall.	All, except 1-ac near road	90-187', with narrow lanes of 200-284'
III-4	Between 3.4 and 3.5	95% of canopy is LP (SAF & WBP minor), mostly 20-35 ft. tall. It was thinned (2-5" dia. stems).	All	112-186', and found one lane with 237'
III-5	Between 3.5 and 3.12	>1/2 of trees are LP, but almost as many SAF (ES & WBP minor)	All	75-125', nothing is >200'
III-6	E of 3.5 & 3.12, and E of road	N/NW end = 10-25' LP and SAF; fairly widely spaced and regular, small clearings.	All (1/2)	<200'
		S end = Mostly LP, denser than north end.	All (1/2)	<200'

Environmental Effects

Alternative A – Direct and Indirect Effects

Stand characteristics would remain unchanged in the short term. In the longer term, changes would continue as a result of aging and dying mature trees and aging young and mid-age trees.

Alternative B – Direct and Indirect Effects

In clear-cut units, structural diversity would decline. All mature trees and snags would be removed, except up to about 10 whitebark pine trees per acre, and all understory and mid-story trees would be slashed. Canopy cover on all units would decline to about 5% or less.

In partial-cuts, the amount of structural diversity provided by upright and leaning snags and course woody debris would decline somewhat, compared to existing conditions, but much of the structure closer to the ground would be retained. Standing and leaning snags as well as some course woody debris would be harvested or dropped. Aside from the creation of temporary roads and skid trails, most course woody debris would be left on site.

Cumulative Effects

The cumulative effects discussion under "Habitat – General" for mix of seral stages and fragmentation in conifer forestland, above, applies to forest stand characteristics as well. The aging forest, in combination with the recent insect epidemic, are resulting in an increasing density of dead trees, which over time is (1) reducing canopy cover of live trees, (2) increasing prevalence of young trees, (3) increasing availability of snags, and (4) increasing the density of leaning trees and course woody debris. In the absence of mechanical treatment and fire, all of these will continue to increase the structural diversity of stands until the point at which canopy cover of live trees diminishes to where the stand no longer functions as a late-seral forest.

The Spring Clean-up Salvage Project, currently being planned within the Upper Greys River watershed just north of the analysis area, would (if implemented) reduce density of mature trees, eliminate snags, and greatly reduce the density of understory trees and course woody debris on about 219 acres, thereby greatly simplifying the structural diversity on these acres. This would have a minor effect within the upper Greys River watershed, given the current overrepresentation of late-seral forestland and aging forest.

Alternative B, in combination with the Spring Clean-up Salvage Project, would only reduce the cumulative benefits to late-seral wildlife species associated with high structural diversity by a minor degree within the analysis area as well as the upper Greys River watershed.

Determination of Effects

The net effect of past cumulative effects and Alternative A would be a continuation of benefits to late-seral conifer forestland habitat (including high structural diversity) and

ongoing detriments to early-seral and mid-seral habitats in the analysis area and upper Greys River watershed.

The net effect of past cumulative effects and Alternative B would be a slight reduction in benefits to late-seral conifer forestland habitat and ongoing detriments to early-seral and mid-seral habitats in the analysis area and upper Greys River watershed.

ROADS AND MOTORIZED TRAILS

Affected Environment

Existing densities of approved and open roads within the analysis area and within the immediate vicinity of the harvest units exceeds 1.5 miles/square mile, but this may not exceed the Road Management Standard for DFC 1B areas (Table 3-16). While road density at the "vicinity of harvest units" scale provides valuable information, this is a smaller scale than what the standard was meant to apply.

Table 3-16: Existing road mileage, road densities, and estimated reductions in elk use at two different geographic scales.

Geographic Scope	Square Miles	Greys River Road	Interior Roads	*Minimum*[A] Total		Estimated Reduction in Elk Use[B]	Mot. Trails	Adjusted Total (miles)
				miles	mi/mi^2			
Vicinity of Harvest Units	10.9	7	26.5	33.5	3.1 (**2.3** [B])	55-60%	0.5	34
Analysis Area	18.5	7	26.5	33.5	1.8 (**1.4** [B])	45-50%	3.5	37

[A] These figures reflect the miles of road and motorized trails that are designated and approved on the BTNF travel map, and do not recognize the miles of roads and motorized trails that are actually used by vehicles, ATVs, and motorcycles. In other words, the actual density of roads and motorized trails is higher than what is shown in this table and, therefore, reductions in elk use is greater than what is shown.

[B] Based on Lyons 1983, and as summarized on page 109 of the Forest Plan. For the purposes of estimating reductions in elk use of habitat, interior road mileage was multiplied by 0.7, as a mid-point between 0.5 (hiding cover) and 0.9 (open) (see page 109). This reduced the interior mileage of 26.5 miles to 18.5 miles and the total from 33.5 to 25.5 miles, which consequently reduced density from 3.1 mi/mi^2 to 2.3 mi/mi^2 and from 1.8 mi/mi^2 to 1.4 mi/mi^2.

Environmental Effects

Alternative A – Direct and Indirect Effects

Alternative A would not change road density and would not contribute to any expansions in user-created roads and trails.

Alternative B – Direct and Indirect Effects

Under Alternative B, road density would temporarily increase from about 1.8 miles of road per square mile of land in the analysis area to about 2.0 miles per square mile. Factoring the multiplier from page 109 of the Forest Plan, the adjusted road density would temporarily increase from about 1.4 miles of road per square mile to about 1.5 miles of road per square

mile of land. Even if road density increased above 1.5 miles per square mile, it would not exceed the Road Management Standard because road density can temporarily increase to 1.75 miles of road per square mile of land. In the vicinity of the harvest units, road length would temporarily increase by nearly 10% and road density would temporarily increase from about 3.1 miles of road per square mile to about 3.4 miles per square mile. Incorporating the multiplier on page 109 of the Forest Plan, road density in the vicinity of harvest units would temporarily increase from about 2.3 miles of road per square mile to about 2.5 miles per square mile.

It is possible that timber harvest activities, particularly clear-cutting and skid trails, would result in an expansion of user-created roads and motorized trails. If temporary roads and skid trails were to be obliterated and barricaded throughout their length in partial-cuts, there is a reasonable likelihood they would not be used by motorists. However, even with mitigation to obliterate temporary roads and skid trails associated with clear-cuts, the clear-cuts themselves would likely be open enough to allow the creation of some user-created roads and motorized trails.

Cumulative Effects

Cumulative effects are addressed in individual wildlife sections.

Determination of Effects

No changes would occur as a consequence of Alternative A.

Under Alternative B, road length in the vicinity of the harvest units would temporarily increase by nearly 10% and *effective* road density would increase from about 2.3 miles of road per square mile to about 2.5 miles per square mile. Some user-created roads and trails may indirectly result.

NOXIOUS WEEDS

Affected Environment

Potential effects of noxious weed introduction and spread on wildlife are summarized in the "Indicators" sub-section, above. The only noxious weed species currently known to exist in the analysis area are musk thistle and Canada thistle. Along the haul route — including the Greys River Road south of Slate Creek, upper LaBarge Creek Road, and Smiths Fork Road — infestations of several species have been identified, including Dyer's woad, musk thistle, Canada thistle, hounds tongue, henbande, and leafy spurge. Spotted knapweed is not known to occur along these roads, but it exists nearby on Salt Pass (Highway 89).

Environmental Effects

Alternative A - Direct and Indirect Effects

Under this alternative, the rate of introduction and spread of noxious weeds would continue as it has in the past 5-10 years.

Alternative B – Direct and Indirect Effects

The potential for noxious weed introduction and spread would increase as a consequence of timber harvest activities in the harvest units due to moving equipment and logging trucks along roads. Transport of weed seeds on vehicles and heavy equipment is well documented (e.g., USFS 1986; Westbrooks 1998; Forman 2003). If noxious weeds were introduced or spread as a result of Alternative B, this would have the potential to adversely affect habitat for a wide range of wildlife species. Mitigation measures will be included to prevent and reduce noxious weeds.

Cumulative Effects

Cumulative effects may come from livestock as well as other Forest users and the Spring Creek Salvage sale.

SPECIES DESCRIPTIONS AND ANALYSIS OF POTENTIAL EFFECTS

The species and groups of species identified in the following section are generally listed according to the habitats with which they are most closely associated. After discussing direct, indirect, and cumulative effects, effects determinations are made for:

- Potential effects on R4 sensitive species (Biological Evaluation portion of this analysis). Table 3-20 summarizes the Biological Evaluation determinations.

- Potential effects on the ability to fulfill applicable Forest Plan goals, objectives, standards, prescriptions, and guidelines, and requirements of Executive Order 13186 with respect to R4 sensitive species, Management Indicator Species, and migratory birds.

Management Indicator Species: The *National Forest Management Act* provides direction for selecting Management Indicator Species. These species were selected "because their population changes are believed to indicate the effects of management activities" (36 CFR 219.19). Management indicators are "any species, group of species, or species habitat element selected to focus management attention for the purpose of resource production, population recovery, maintenance of population viability, or ecosystem diversity" (FSM 2605).

The BTNF Forest Plan included elk, mule deer, moose, bighorn sheep, and pronghorn (harvested wildlife species); grizzly bears, bald eagles, and peregrine falcons (threatened and endangered species); pine marten (ecological indicator for old growth habitat); and Brewer's sparrow (ecological indicator for sagebrush habitat) as Management Indicator Species (MIS). The MIS list was recently supplemented with several additional ecological indicator species: Boreal toad and boreal chorus frog (wetland habitat) and aspen (aspen habitat); the role of bighorn sheep was expanded to include representation of mountain meadow habitat; and the role of cutthroat trout was expanded to include representation of riparian habitat). Bighorn sheep and pronghorn do not occur in or adjacent to the analysis area and, therefore, are not discussed further. Grizzly bears, bald eagles, and peregrine falcons (previously listed as threatened species) are addressed as sensitive species in this report. Cutthroat trout are addressed in the Fisheries section.

COMMON LOONS, BALD EAGLES, TRUMPETER SWANS, AND HARLEQUIN DUCKS (SENSITIVE)

Affected Environment

Species Occurrence, Habitat Availability, and Population Trends: Common loons breed on some of the high elevation lakes in northwestern Wyoming (Wyoming Partners in Flight 2003), but no lakes with suitable characteristics exist in or near the analysis area or below the analysis area in the Greys River drainage. Therefore, common loons are not addressed in the effects analysis.

Bald eagles forage in low numbers along the upper Greys River and some of its tributaries, and on some of the lakes in the Greys River drainage. They also occasionally feed on carrion in upland areas in the Greys River drainage, although it is not known whether they have fed on carrion in the project area. Only one bald eagle nest is known to exist in the Greys River District (mouth of Blind Bull Creek, about 23 miles south of the project area), but other nests exist in Star Valley (15 miles west of the project area) and along the Snake River (>40 miles north of the project area). Major water features with substantive fish resources are limited on the district, which will continue to limit bald eagle nesting activity.

There are no recent records or observations (for at least 8 years) of trumpeter swans inhabiting the Greys River watershed, upper LaBarge Creek, or Smith's Fork, although they winter (and nest) in nearby valleys, including Star Valley, Greys Lake, Bear River Valley, Jackson Hole, and the Upper Green River basin. No extensive marsh vegetation for nesting exists in or adjacent to the analysis area. Because trumpeter swans do not presently occur in the Greys River watershed, and because the proposed project would be completed within 2-4 years (during summer months), trumpeter swans are not addressed in the effects analysis.

Harlequin ducks have been reported on the district in past years (Gruell 1975; USFS 2004), but there are no recent reports (at least 8 years), including no records in the Wyoming Natural Diversity Database for the Greys River watershed, upper LaBarge Creek, or Smith's Fork (as of January 6, 2006). The upper Greys River and lower East Fork appear however, to

provide suitable habitat for this species. Harlequin duck habitat does not exist within any of the proposed harvest units, though. Due to suitable habitat in the analysis area, harlequin ducks are addressed further.

Environmental Effects

Alternative A - Direct and Indirect Effects

There would be no direct, indirect or cumulative effects to common loons, bald eagles, trumpeter swans, and harlequin ducks due to the No Action Alternative because harvest activities would not take place.

Alternative B - Direct and Indirect Effects

While bald eagles may use trees along the west side of the analysis area (slopes above the Greys River), the immediate vicinity of harvest units provides only incidental habitat. Therefore, timber harvest activities would not affect bald eagles, and limited clear-cuts and partial-cuts would not affect their use of the area.

Because none of the harvest units contain suitable habitat for harlequin ducks, timber harvest activities would not directly affect harlequin ducks. Potential effects of the proposed timber harvest on water quality in the upper Greys River would not be measurable to the extent Forest Plan standards are met (Simon 2009) and any effects would be of short duration. Road maintenance and reconstruction activities would reduce sedimentation, thereby possibly improving water quality to a small degree (Simon 2009).

Harlequin ducks are highly sensitive to human disturbance (Wallen 1989; Spahr et al. 1991; Anthony et al. 1995; Hamann et al. 1999). Logging trucks on roads near riparian areas have the potential to disturb harlequin ducks. However, no documentations of harlequin ducks have been recorded in the Greys River watershed since 1995 (USFS 2004), and none are reported for LaBarge Creek or Smith's Fork. Because migration takes place earlier in the season than timber harvest activities, there would be no possibility of disturbance to migrating harlequin ducks.

Cumulative Effects

Because bald eagles and harlequin ducks are sensitive to human disturbance, motorized vehicle use, fishing, kayaking, and other recreational activities along water courses likely are important factors affecting bald eagle use and Harlequin duck nesting in the Greys River corridor, as well as upper LaBarge Creek and Smiths Fork, including streams in the analysis area. Recreational activities generally begin in the upper Greys River about the time that harlequin ducks would normally begin nesting. However, forage resources may not be capable of supporting more than a low density of nesting bald eagles. The addition of logging trucks, which would not begin until harlequin ducks normally have laid their eggs, would add minimally to the relatively high level of human activity along the stream and river. Similarly, the addition of logging trucks would have minimal additive effects on bald eagles, even when

combined with activities associated with the Spring Clean-up Project, which currently is being planned/analyzed for lower Spring Creek.

Other uses such as livestock grazing, un-surfaced roads, and trail networks that may affect water quality may have negligible effects on the use of the Greys River by bald eagles and harlequin ducks. This effect is likely secondary to potential human disturbance effects.

Determination of Effects (Biological Evaluation)

Alternatives A and B would have **no impact** on common loons and trumpeter swans due to the absence of these species in the analysis area and nearby watersheds.

Alternative A would have **no impact** on bald eagles and harlequin ducks because no action would occur under this alternative.

Alternative B would have **no impact** on harlequin ducks because (1) no suitable nesting or migration habitat exists within harvest units, (2) water quality would not be measurably affected, (3) logging truck activity along major roads would not occur during the harlequin duck migration period or nest-initiation period and would only negligibly add to human activity (4) there is a very low probability of harlequin ducks attempting to nest along the upper Greys River and nearby watersheds

Alternative B, including mitigation measures, **may impact** individual bald eagles or minor parts of their habitat, but would likely not contribute to a trend toward federal listing or loss of viability because (1) suitability of harvest units for nesting is low; (2) upland foraging habitat is of minor consequence to bald eagles and is only used opportunistically; (3) the chance of human activity within harvest units displacing a bald eagle is very low; (4) water quality would not be measurably affected; and (5) logging truck activity along major roads may displace a bald eagle if one were perched near a road when a truck drove by it, but the chances of this would be low, and this effect would only add to the overall effect of vehicle disturbance by a minor amount.

SPOTTED FROG (SENSITIVE), BOREAL TOAD AND BOREAL CHORUS FROG (MANAGEMENT INDICATOR SPECIES)

Affected Environment

Species Occurrence, Habitat Availability, and Population Trends: Within the zone of the main population (central and north Idaho, western Montana, and northwestern Wyoming) spotted frogs are generally believed to be widespread and/or common, with only localized declines (Patla 2000, p.5). It is suspected that the boreal toad population in the Greater Yellowstone Ecosystem is declining, which is consistent with documented declines in other parts of the western U.S., including southeastern Idaho (Patla 2000). It is a species of concern in Wyoming. Boreal toad populations appear to be in a state of severe decline (WGFD 2005:438). Numerous factors may be contributing to these declines. Boreal chorus frogs are

the most common and widespread amphibian species on the BTNF. Although they appear to be common, sufficient information does not exist to assess regional trends (WGFD 20005).

All four species of amphibians present on the Greys River Ranger District (boreal toads, chorus frogs, and tiger salamanders) inhabit the analysis area (McEachern et al. 2006; McEachern and Brick 2008). Spotted frogs were documented 1.25 miles north of the analysis area at about 8,000 feet in elevation, and therefore likely occur within the analysis area (McEachern et al. 2006). Spotted frogs are a Region 4 sensitive species, and boreal toads and chorus frogs are ecological indicator species. Trend data are not available for these species because they became a Management Indicator Species in 2005 through a Forest Plan amendment. The only observations of amphibians within harvest units were a chorus frog and several tiger salamanders in a pond southeast of the road at the edge of unit 2-6 (McEachern and Brick 2008). A small wetland with apparently capable habitat was observed at the south end of unit 2-15, and several small streams meander between several of the units.

Spotted frogs, chorus frogs, and boreal toads breed in shallow waters of ponds, marshes, slow streams, river backwater channels, and along lake edges (Patla 2000; Keith and McGee 2005; Patla and Keinath 2005). Very little breeding habitat exists in harvest units (e.g., units 2-6 and 2-15). In most areas, breeding occurs between mid-May and mid-July. Hatching occurs 10-14 days after eggs are laid. Metamorphosis typically happens from late July to late September. After breeding, adult spotted frogs and chorus frogs inhabit marshes, streams and riparian areas, moist/seasonally-wet meadows and forests, and adult boreal toads inhabit a large variety of habitats, but tend to remain near wet habitats, supporting sedges and/or willows. Frogs and toads may travel through harvest units between summer and winter habitats. Toads may inhabit forested areas for longer periods so long as adequate microsites are available. Young toads move away from aquatic habitat and use moist terrestrial habitats where part of their time is spent under the shelter of moist woody debris and underground cavities.

Environmental Effects

Direct effects include: mortality of eggs, larva, and metamorphosing amphibians due to activity in breeding wetlands; mortality of adults and metamorphosed frogs and toads in harvest units due to heavy equipment; and mortality of adults and metamorphosed frogs and toads during migration and other movements (due to logging trucks and other vehicles on roads).

Alternative A – Direct and Indirect Effects

The No Action Alternative would have no effects on amphibians.

Alternative B – Direct and Indirect Effects

Potential effects of timber harvest on spotted frogs, chorus frogs, and boreal toads depends on the timing, harvest method, and size and configuration of harvested areas relative to the location of seasonal frog and toad habitat and the density of frogs and toads in this habit (Keinath and McGee 2005; Patla and Keinath 2005).

The chance of individual frogs or toads being killed by heavy equipment during temporary road-building, site preparation, and logging activity, and by logging trucks along hauling routes is low. Potential breeding and feeding pools were observed in units 2-6 and 2-15. No timber harvest activities would occur within 100 feet of streams and, therefore, impacts would not occur within these zones. It is also possible for individual adult and juvenile frogs or toads to be killed by log trucks along haul routes. It is estimated that approximately 700 trips by log trucks would be made along the haul route and this is small compared to the number of other vehicles that drive these roads. It is likely that very few, if any, frogs and toads would be killed by log trucks and other vehicles associated with Alternative B.

Alterations to vegetative habitat that would have the potential to affect frogs and toads include: reductions in canopy cover of mature trees, young trees, and shrubs; short-term reductions in cover provided by herbaceous vegetation; reductions in course woody debris (short term and long term); and increases in the amount of herbaceous vegetation in harvested units. So long as sufficient microsites remain in clear-cut units, including widely scattered course woody debris, shrubs and young trees, and herbaceous vegetation, adverse impacts to frogs and toads should be no more than negligible. In the partial-cut units, it is anticipated that 80% or more of the understory trees and shrubs would be retained and, if sufficient course woody debris is retained (e.g., 10-15 tons, widely scattered), this should provide for the micro-site needs of frogs and toads.

Construction of temporary roads would reduce the amount of habitat available to amphibians (e.g., migration habitat). However, impacts would be no more than negligible because affected habitat is upland habitat and there is an abundance of this for these species. No roads would be constructed in riparian zones or buffers.

Timber harvest activities, including road building and decommission, have the potential to increase erosion and sedimentation, reducing water quality in amphibian breeding pools and other waters used by frogs and toads (Keinath and McGee 2005). However, timber harvest, road improvements, and road building activities would be carried out in ways that minimize erosion and sedimentation. There are no known breeding pools immediately below harvest units. Temporary roads (up to a maximum of about 3.15 miles) may increase sedimentation, but any effects would be short term and within acceptable levels. Any increases in sedimentation from haul routes due to increased traffic (e.g., log trucks) under most circumstances would be no more than negligible, but could be higher if hauling were to occur when road conditions are wet.

Cumulative Effects

There are a number of factors, which in combination, may cumulatively impact frog and toad populations (Patla 2000), including roads and trails in riparian zones, road-kill from motorized vehicles (fairly low on the upper Greys River Road, upper La Barge Creek Road, and Smiths Fork Road), spread of disease (transported on vehicles, boots, equipment, livestock, pets), changes and trampling in wetland vegetation due to livestock grazing, possible reductions in water quality and sedimentation, fish stocking, historic over-trapping of beavers, and relocation of beavers (Patla 2000, USFS 2004a, Keinath and McGee 2005, Patla and Keinath 2005).

The Spring Clean-up Salvage Project, which is currently being planned and analyzed, would contribute negligible adverse impacts to amphibians in the Upper Greys River watershed. Potential effects of this project are similar to the Upper Greys Vegetation Treatment Project. In combination, the Upper Greys Vegetation Treatment Project, Spring Clean-up Salvage Project, and mitigation measures identified for each project would have no more than a negligible level of adverse impacts on amphibians.

Determination of Effects (Biological Evaluation)

Alternative A would have **no impact** on spotted frogs because no action would occur under this alternative. Alternative A would not conflict with Forest Plan direction with respect to frogs and toads, nor would it contribute to their achievement. Existing effects from other projects would continue.

Alternative B, including the identified mitigation measures, **may impact** individual spotted frogs or minor parts of their habitat, but would likely not contribute to a trend toward federal listing or loss of viability due to (1) the low probability of frogs being run over by equipment or vehicles; (2) changes in forestland vegetation structure would likely not affect spotted frogs so long as sufficient microsites remain during migrations (in the limited areas where this occurs); (3) no temporary roads or skid trails being created in or immediately adjacent to wetlands and riparian areas; (4) absence of harvest activities in wetlands and riparian areas; and (5) erosion being kept in check according to Forest Plan standards and project mitigation measures.

Alternative B, in combination with recommended mitigation measures, would not have more than a negligible adverse effect on achieving Objective 3.3(a), Sensitive Species Management Standard, and Fisheries and Wildlife Management Prescriptions with respect to spotted frogs, chorus frogs, and boreal toads. Mitigation measures would supplement design criteria of Alternative B to minimize impacts to these amphibians.

Because the project would be conducted in a DFC 1B area, conflicts between meeting Forest Plan objectives for timber harvest and those for frogs/toads are to be resolved in favor of timber harvest objectives, so long as the project would not contribute to a loss in viability in these species (USFS 1990a: 93, 145, 149).

BREWER'S SPARROW (MANAGEMENT INDICATOR SPECIES) AND GREATER SAGE GROUSE (SENSITIVE)

Affected Environment

Species Occurrence, Habitat Availability, and Population Trends: Brewer's sparrows and greater sage grouse are sagebrush-obligate species (Wyoming Partners in Flight 2003; Braun et al. 2005; Holmes and Johnson 2005). Sage grouse do not inhabit the Greys River watershed or the Tri-Basin area. Therefore, greater sage grouse are not addressed in the effects analysis.

Brewer's sparrows inhabit the larger tracts of big sagebrush in the analysis area (e.g., Tri-Basin area, those near the East Fork), and they inhabit big sagebrush habitat south of the analysis area. Harvest activities would not affect Brewer's sparrows because big sagebrush habitat does not exist within or immediately adjacent to harvest units. The status and trend of Brewer's sparrows is summarized in USFS (2009).

Environmental Effects

Alternative A – Direct and Indirect Effects

The No Action Alternative would have no additional effects on Brewer's sparrows, compared to existing conditions. It is possible that the potential for fire spread would be higher than in Alternative B, which has the potential to result in more acres of big sagebrush burned than would occur under Alternative B. See fire and fuels discussion.

Alternative – Direct and Indirect Effects

There are small potential effects on Brewer's sparrows from: disturbance effects of trucks hauling logs and equipment along roads; and potential effects of timber harvest in reducing the amount of fuel loading and the potential for wild fire spread in this part of the Greys River watershed. Truck traffic may slightly reduce density of Brewer's sparrows within 100 feet of roads, while reducing fire spread has a slight potential to benefit individual Brewer's sparrows. The proposed action would not hinder the achievement of Objective 3.3(a) or Fisheries and Wildlife Prescription with respect to Brewer's sparrows and greater sage grouse.

Cumulative Effects

Because any potential effects of the proposed action on Brewer's sparrows are so slight and unlikely and given the large cumulative habitat benefits that have accrued during the last century a cumulative effects analysis is not necessary.

Determination of Effects (Biological Evaluation)

The proposed project would have **no impact** on greater sage grouse due to the species not being present in or near the analysis area. The proposed action may impact individual Brewer's sparrows or small parts of their habitat, but will likely not contribute to a loss of viability of populations or the species. This is a conservative call and it is more likely that the proposed project would not impact individual Brewer's sparrows or their habitat, and would not contribute to a loss of viability of populations or the species.

ELK (MANAGEMENT INDICATOR SPECIES)

Affected Environment

Species Occurrence, Habitat Availability, and Population Trends: The analysis area is within a broad geographic area used by elk for spring/summer/fall and migration (WGFD 2007a). Although elk calving is not designated for this part of the upper Greys River, it is likely that some calving occurs in the analysis area (G. Fralick, WGFD, pers. comm.). The analysis area contains a wide range of elk habitat, including forest openings and rangelands, mid seral conifer forestland, mature and old-age conifer forestland, riparian meadows, and riparian willow communities. The analysis area does not contain any winter habitat. No elk wallow complexes were observed in any of the harvest units.

Habitat in the analysis area and upper Greys River watershed currently are in less-than-satisfactory condition for elk due primarily to the under-representation of early and mid seral plant communities and decline in condition of aspen habitat, as discussed in the "Mix of Seral Stages and Fragmentation in Conifer Forestland" section. Table 3-12 summarizes this information.

All of the old clear-cuts adjoining the harvest units proposed under Alternative B are currently providing security cover for elk, based on the Forest Plan definition (page 95) of being able to hide >90% of an elk at 200 feet, although three units have small areas (minor) where the distance is over 200 feet. None of the clear-cuts provide thermal cover, as defined in the Forest Plan. There are no specific requirements in DFC 1B areas for retaining security and thermal cover for elk, as there are for DFC 10 and 12 areas (pages 235 and 243).

The density of roads in the analysis area currently is about 1.4 miles/square mile of land. Adding the 3.5 miles of temporary road would not increase the density beyond 1.5 miles/square mile which is the Forest Plan standard. Existing densities of approved and open roads in the immediate vicinity of the harvest units exceeds the 1.5 miles/square mile figure (Table 3-16). These are minimum estimates because motor vehicle use currently is more extensive than roads and motorized trails designated for use by the public. The public is using some of the old logging roads and user-created roads and trails exist within the analysis area.

The Afton elk herd continues to remain at or above the population objective (Fralick 2004). They have fluctuated above and below (and near) 2,000 animals since 2003. In the winter of 2006-2007, 1,827 elk were counted. This is "at the objective" of 2,200 since it is within 10% of the herd objective (i.e., 1,980-2,420 elk) and because the count of 1,827 does not account for animals not seen during the aerial survey.

Environmental Effects

Alternative A – Direct and Indirect Effects

The No Action Alternative would have no additional effects on elk, compared to existing conditions. Alternative A - specifically, a decision to not move forward on logging the units

identified in Alternative B would contribute to the ongoing overrepresentation of late-seral conifer forestland in the analysis area, upper Greys River watershed, and larger geographic scales. Alternative A would not affect road/motorized trail density or noxious weed introduction and spread. It would not conflict with Forest Plan direction with respect to elk, but it would also not contribute to their achievement.

Alternative B – Direct and Indirect Effects

Harvest activities in Alternative B (3% of the analysis area) would have negligible effects on elk use of the upper Greys River watershed and the population size of the Afton elk herd unit.

The proposed harvest units currently provide low-quality security cover for elk. Reducing the density of mature and understory trees and the amount of canopy cover would reduce the quality of hiding cover, which has the potential to deter elk use in the area. This minimal reduction of forests with dense, late-seral conditions would only slightly reduce the large benefits to elk security cover that have accrued over many decades of fire suppression. There may be a slight increase in forage production, for a negligible benefit to elk.

Elk are sensitive to motorized vehicle activity and other human disturbance (Lyons 1983; Canfield 1999; Wisdom et al. 2005a). Activities associated with logging would likely reduce or eliminate elk use of the immediate vicinity of harvest units and road areas during harvest activities. Timber harvest activities in the analysis area could range from high intensity over several weeks in one summer to low intensity over the course of 1-3 summers, depending on the operator. Some of the roads receive relatively high use during mule deer and elk hunting seasons. After completion of the project, including effective road barriers and obliteration, elk use patterns would quickly shift back to pre-project levels.

If timber harvest activity were initiated prior to June 15, potential would exist to affect individual calving elk. Potential also exists for timber harvest activities to displace individual elk during portions of the hunting seasons. Logging trucks on the haul roads would have negligible additional disturbance effects as compared to existing traffic and types of vehicles using the roads. Elk use due to temporary roads would not decline further.

Alternative B would contribute in a small way to achieving Forest Plan Objective 2.1(a) and the Fisheries and Wildlife Prescription and would not conflict with the Land Resource Management Standards and Guidelines. However, in the worst case where motorists do drive on temporary roads prior to their obliteration and measures to obliterate and barricade these roads and skid trails were unsuccessful, elk use in the immediate area would only be reduced by 1-2%, which is immeasurable. Road density would increase, but likely not above 1.5 miles per square mile at the analysis area level.

To the extent that harvest activities, reductions in security cover, and possible increase in road/trail density adversely affect elk, these effects would be at least partially offset by benefits associated with creation of early-seral communities. Furthermore, the project would be conducted in a DFC 1B area, for which adverse effects of timber harvest on big game were disclosed in the Forest Plan EIS (USFS 1990b: 283). The effects of this project are well within the range of impacts identified in the EIS. Potential conflicts between Forest Plan objectives for timber harvest and those for elk management are to be resolved in favor of

timber objectives in DFC 1B areas, so long as the project would not contribute to a loss in viability of elk (USFS 1990a: 93, 145, 149).

Cumulative Effects

There have been and continue to be a variety of cumulative factors that affect elk distribution and abundance in the Afton herd. However, elk numbers are either at (within 10% of) or just below the herd objective and numbers appear to be fairly stable.

The two human-related factors that likely have had the most substantial effect on elk habitat and use of this habitat in the analysis area and throughout the Greys River watershed are fire suppression and motorized vehicle activity. Fire suppression has dramatically altered the mix of age-classes in most of the major vegetation types and has allowed conifer to expand into a variety of types. This has led to an overrepresentation of security cover for elk. Conversely, the amount and quality of foraging habitat for elk (early seral communities) has declined and continues to decline. Alternative B would offset the reduction in early-seral communities to a small extent.

As the density of open roads increases in an area, elk use of the area declines (Lyons 1983; Canfield 1999; Skovlin et al. 2002). Based on Lyons (1983; see page 109 of the Forest Plan, USFS 1990a), elk use in the analysis area may already be 45-60% lower than potential.

Other factors that affect or have the potential to affect elk distribution and abundance in the analysis area and Upper Greys River watershed, and the Afton elk herd unit area include livestock use, predation, weather, diseases, and the potential introduction and spread of non-endemic infectious diseases (Wisdom and Thomas 1996; USFS 2004; Raedeke et al. 2002). The analysis area lies within the Mink Creek sheep allotment and cattle graze in the north end of the analysis area.

The Spring Clean-up Salvage Project would, if implemented, not have any measurable effects on elk (DeLong 2009). Although it would not contribute to offsetting the deficit of early- and mid-seral plant communities, it would also not have any measurable adverse effects on elk. In combination, the Upper Greys Project, Spring Clean-up Salvage Project, and mitigation measures identified for each project would have no more than a negligible effect on elk.

Determination of Effects

Alternative A would not impact elk, except that inaction would allow the amount and proportion of late-seral conifer forestland to continue increasing.

Alternative B, in combination with mitigation measures identified above, may impact individual elk or small parts of their habitat, but would likely not contribute to a loss of viability of populations or the species.

MULE DEER (MANAGEMENT INDICATOR SPECIES)

Affected Environment

Species Occurrence, Habitat Availability, and Population Trends: The analysis area is within a broad geographic area used by mule deer for spring/summer/fall and migration (WGFD 2007a). Although mule deer fawning is not designated for this part of the upper Greys River, it is likely that some fawning occurs in the analysis area. The analysis area contains a wide range of deer habitat, including forest openings and rangelands, mid-seral conifer forestland, mature and old-age conifer forestland, riparian meadows, and riparian willow communities.

Mule deer habitat in the analysis area and upper Greys River watershed is currently in less-than-satisfactory condition due primarily to the under-representation and decline of early and mid seral plant communities including aspen, as discussed in the "Mix of Seral Stages and Fragmentation in Conifer Forestland" section. Table 3-12 summarizes this information. Mule deer are also adversely affected to some extent by road density and noxious weeds.

Mule deer in the Wyoming Range herd unit are currently approximately 66% below the herd unit objective of 50,000 (2007) and have been below objective since the early 1990s (WGFD job completion reports). One of the contributing factors to low numbers is the low doe to fawn ratio.

Environmental Effects

Alternative A – Direct and Indirect Effects

The No Action Alternative would not add to the effects on mule deer that are already occurring. No action would contribute to the ongoing overrepresentation of late-seral conifer forestland in the analysis area, and larger geographic scales, limiting a potentially important food resource for mule deer. There would also be no affect on road/motorized trail density, nor noxious weed introduction and spread. There would be no conflict with Forest Plan direction with respect to mule deer, but it would not contribute to their achievement.

Alternative B – Direct and Indirect Effects

The net effect of habitat changes resulting from the proposed project would be positive for mule deer, but it would likely have no more than a negligible effect on mule deer in the upper Greys River watershed, given the small size of the project, among other factors. The increase in the amount of habitat in early succession would be beneficial to mule deer. However, the potential for harvest units to produce forbs and shrubs favored by mule deer appears limited. Given the large amount of late-seral conifer forestland in the analysis area, reduction in canopy cover of conifers (i.e., security cover) would not adversely affect mule deer.

The activities associated with logging and logging truck traffic would temporarily displace mule deer. This would be of short duration, would affect no more than a small number of

deer, and would have no affect on the population. The temporary roads would have no more than negligible effects on mule deer. Potential introduction of noxious weeds could have some minor detrimental effects on mule deer.

On balance, and assuming that user-created roads and trails are not established as an unintended consequence, Alternative B would contribute in a small way to achieving Objective 2.1(a) and the Fisheries and Wildlife Prescription. To the extent that the project activities adversely affect mule deer, these effects would be more than offset by benefits associated with creation of early-seral communities. Furthermore, the project would be conducted in a DFC 1B area, for which adverse effects of timber harvest on big game species were disclosed in the Forest Plan EIS (USFS 1990b: 283). The effects of this project are well within the range of impacts identified in the EIS.

Cumulative Effects

There are a large number of factors that may be contributing to lower mule deer numbers, chief among them are the relatively poor condition of their winter range, many miles from the analysis area. Given depleted winter range conditions, it is becoming increasingly important for mule deer to enter the winter in good physical condition, for which the condition of summer and transition range is important.

Other factors that affect or have the potential to affect mule deer populations include hunting, proliferation in motorized recreation, livestock grazing, and predation (Trammell and Butler 1995; Canfield et al. 1999; Kie and Czeck 2000; Forman et al. 2003; WGFD 2007b). To the extent elk use of habitat within ½-mile or more of open roads is reduced due to motorized vehicle activity it is possible this could 'free up' habitat for mule deer since mule deer tend to select areas closer to roads (Wisdom et al. 2005b). It is possible for the potential increase in forb production in clear-cuts to be negated by sheep grazing within the Mink Creek sheep allotment. The improvement in mule deer habitat conditions in the analysis area would only contribute negligibly toward offsetting these existing cumulative factors.

The Spring Clean-up Salvage Project would, if implemented, not have any measurable adverse effects on mule deer, and may provide a small amount of benefits (DeLong 2009) with an increase in shrub production. In combination, the Upper Greys Vegetation Treatment Project, Spring Clean-up Salvage Project, and mitigation measures identified for each project would have a small benefit to mule deer.

Determination of Effects

Alternative A would not impact mule deer, except that inaction would allow the amount and proportion of late-seral conifer forestland to continue increasing in the analysis area and upper Greys River watershed, which has cumulatively been negatively affecting mule deer.

Alternative B, in combination with mitigation measures, may impact individual mule deer (due to short-term displacement) or small parts of their habitat (during timber harvest activities), but will likely not contribute to a loss of viability of populations or the species. Changes in habitat conditions would benefit mule deer. Net effects of the proposed project would be positive for mule deer, but these potential benefits would have very little effect on

the Wyoming Range mule deer herd due to the small size of the project and low potential for producing forage favored by mule deer, combined with the adverse impacts occurring on their winter range.

MOOSE (MANAGEMENT INDICATOR SPECIES)

Affected Environment

Species Occurrence, Habitat Availability, and Population Trends: The analysis area is within a broad geographic area used by moose during spring, summer, and fall, including seasonal migrations (WGFD 2007a). The analysis area contains a range of moose habitat, including riparian willow, spruce-fir forests, aspen, big sagebrush, and forbland communities. Moose sign was common throughout the vicinity of the harvest units in mature spruce-fir and lodge-pole mix during 2006-2008 and to a lesser extent in old clear-cuts.

Moose generally benefit from timber harvest since they favor early-seral forestland (Peek 1997; Thompson and Stewart 1997; Franzmann 2000). Habitat in the analysis area and upper Greys River watershed currently are in less-than-satisfactory condition for moose due primarily to the under-representation of early and mid seral plant communities and decline in condition of aspen habitat. Table 3-12 summarizes this information.

Moose numbers in the Sublette moose herd are far below objective (estimated 50% below), and moose numbers in the Greys River reflect this. Wintering moose numbers in the Greys River watershed have declined since the early 1990s. WGFD does not survey moose in the upper Greys River watershed above Corral Creek (5 miles north of the analysis area.), as only a small number of moose winter there.

Environmental Effects

Alternative A – Direct and Indirect Effects

The No Action Alternative would not add to the effects on moose that are already occurring. Inaction under Alternative A would contribute to the ongoing overrepresentation of late-seral conifer forestland in the analysis area and larger geographic scales. This would continue to limit a potentially important food resource for moose. There would be no affect on road/motorized trail density, and no affect on noxious weed introduction and spread. Alternative A would not conflict with Forest Plan direction with respect to moose, but it would not contribute to their achievement.

Alternative B – Diirect and Indirect Effects

The net effect of habitat changes resulting from Alternative B would be positive for moose, but it would likely have no more than a negligible effect in the upper Greys River watershed, given the small size of the project, among other factors.

The increase in early-seral forestland (clear-cuts) and reducing the density of mature conifer trees (partial-cuts) in the analysis area would increase the amount of available forage (shrubs and forbs) in some harvest units. Fat reserves are built up during summer months, which play an important role in winter survival (Renecker 1997). Habitat quality and its effects on the physical condition, survival, and reproductive success of adult female moose appeared to be the primary factor limiting population growth (Becker 2008). Since harvest units are small and would be intermixed with mid-seral and late-seral forestland, forage would be provided in close proximity to security and thermal cover. Thermal cover is especially important during the hottest months of summer (Renecker and Schwartz 1997).

Moose do not appear to be as sensitive to motorized vehicles and other human disturbances as elk (Canfield et al. 1999). However, it is likely that the small number of moose inhabiting the immediate vicinity of the harvest units would be temporarily displaced. The temporary roads would eliminate some habitat in the short term (up to about 12 acres), and reduce productivity for moose, but this would be negligible overall. Potential introduction of noxious weeds may have minor detrimental affect on moose habitat.

Assuming that user-created roads and trails are not established as an unintended consequence of this project, Alternative B would contribute in a small way to achieving Objective 2.1(a) and the Fisheries and Wildlife Prescription. The minor adverse affects on moose would be more than offset by benefits associated with creation of early-seral communities. The project would be conducted in a DFC 1B area, for which adverse effects of timber harvest on big game species were disclosed in the Forest Plan EIS (USFS 1990b: 283). The effects of this project are well within the range of impacts identified in the EIS.

Cumulative Effects

Moose population fluctuations are the norm (Franzmann 2000). Recently, moose numbers throughout the surrounding areas have declined. The harvest quota for moose in the Greys River watershed has also been declining during the last several years, which has helped the population to stabilize. Possible factors contributing to the decline in moose numbers include declines in habitat conditions, predation, disturbance during winter (mainly snowmobilng), sheep grazing and disease. Habitat quality and its effects on the physical condition, survival, and reproductive success of adult female moose appeared to be the primary factor limiting population growth (Becker 2008). The low proportion of forestland in early and mid succession may currently limit summer and fall forage resources for moose in the upper Greys River watershed.

For many years to come, moose will benefit from ecological processes and management actions in the Greys River watershed that increase the amount and distribution of early seral habitat that are now dominated by conifer trees. These ecological processes and management activities include: wildland fire and fire use; several recently approved or planned prescribed burns; insect outbreaks; potential future mechanical treatments. Due to a variety of constraints, progress toward increasing the proportion of early and mid seral conifer forestland communities will likely be slow.

The Spring Clean-up Salvage Project would, if implemented, not have any measurable adverse effects on moose, and may provide a small amount of benefits (DeLong 2009), by

increasing shrub production. In combination, the Upper Greys Vegetation Treatment Project, Spring Clean-up Salvage Project, and project mitigation measures would have a small benefit to moose.

Determination of Effects

Alternative A would not impact moose, except that inaction would allow the amount and proportion of late-seral conifer forestland to continue increasing in the analysis area and upper Greys River watershed, which has been cumulatively negatively affecting moose.

Alternative B may impact individual moose (due to short-term displacement) or small parts of their habitat (during timber harvest activities), but will likely not contribute to a loss of viability of populations or the species. Changes in habitat conditions would benefit moose. Net effects of the proposed project would be positive for moose, but these potential benefits would have very little effect on the moose herd due to the small size of the project and minimal scope of benefits.

ASPEN (MANAGEMENT INDICATOR SPECIES)

Species Occurrence, Habitat Availability, and Population Trends: Aspen was identified as an ecological indicator species in a Forest Plan update, June 2005. It is well distributed on the Bridger-Teton National Forest, with an estimated 145,746 acres of aspen cover type on the forest. There is a readily apparent downward trend in the acreage and condition of aspen stands on the district (Gruell 1975; USFS 1997; USFS 1983; USFS 2004). The condition of aspen communities in the Greys River watershed range from fairly healthy to deteriorated and/or declining, mainly due to an imbalanced age structure and encroachment by conifer trees.

The distribution and abundance of aspen stands is limited in the analysis area. The vegetation map, which identifies aspen stands in which aspen still comprise at least 10% of the canopy, only designates 14 acres (approximately 0.1% of the analysis area). Some aspen stands at risk of being lost are not mapped to any large extent. There are no aspen stands in harvest units of Alternative B and few aspen trees.

Environmental Effects and Management Indicator Species Determination

Alternatives A and B

Aspen would not be treated under either alternative and, in the limited areas it occurs in the analysis area, it would likely continue to decline in prevalence. Neither alternative would contribute to the restoration and sustainability of aspen in the upper Greys River watershed. These alternatives would not result in any adverse impacts on aspen.

Fire suppression is probably the most influential factor that diminished ecological conditions of aspen stands in the Greys River watershed (Gruell 1975; Gruell 1980a,b; USFS 2004). An estimated 95% of the aspen type in the Greys River drainage is currently in a late or disclimax stage of succession, in contrast to a desired condition of 40% (USFS 2004). The project would not contribute to cumulative impacts.

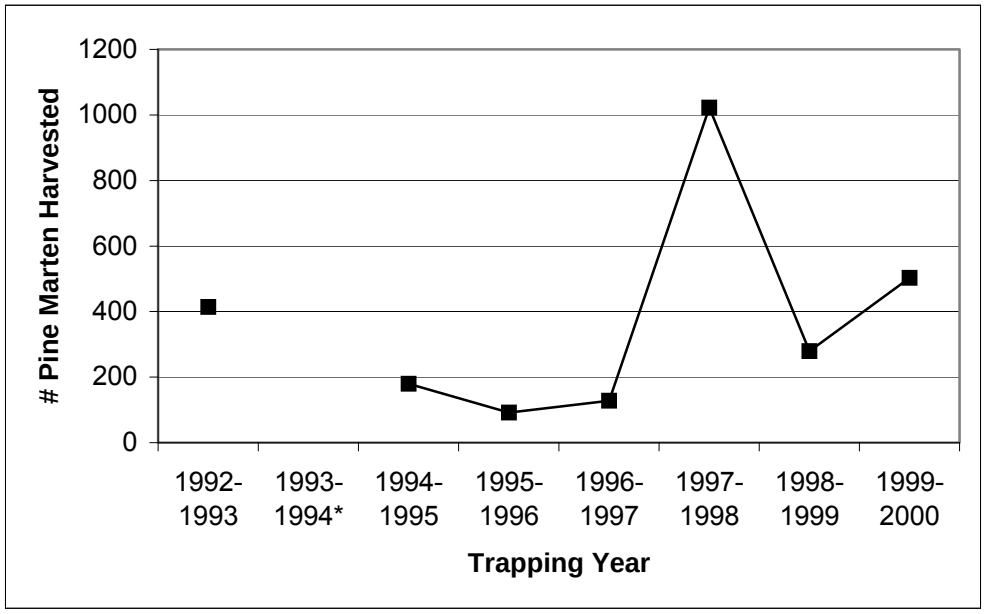
PINE MARTEN (MANAGEMENT INDICATOR SPECIES) AND FISHERS, NORTHERN GOSHAWK, GREAT GRAY OWL, BOREAL OWL, AND THREE-TOED WOODPECKER (SENSITIVE)

Affected Environment

Species Occurrence, Habitat Availability, and Population Trends: All of the species in this section are primarily associated with mature conifer forestlands, typically with a component of old trees, snags, and course woody debris on the ground.

Pine marten and fishers depend on structural diversity associated with late succession and mature conifer forests, especially those with complex physical structure near the ground (e.g., logs, root wads, young trees and bushes), and both species avoid forest openings (Buskirk and Ruggiero 1994; Powell and Zielinski 1994). Pine marten are closely associated with forest interiors and tend to avoid edges and openings (Koehler and Hornocker 1977, as cited by Hillis and Lockman 2003). They appear to prefer spruce-fir forests, but also use lodgepole pine forests. The most important element of structure near the ground is course woody debris. Pine marten inhabit the analysis area, including the vicinity of the harvest units, where mature and old-age conifer forestland occurs. Structural complexity near the ground ranges from low to high in the harvest units and vicinity.

Harvest rates of pine marten in Wyoming fluctuated between 1992 and 2000 (Figure 3-6). Trapping figures are not available for recent years (2001-2008) because reporting of trapping harvest in the state has been reduced. No concerns with respect to trends are apparent from harvest data.



* - data for 1993-1994 were missing.

Figure 3-6: Harvest of Pine Marten in Wyoming, 1992-2000

There is no documentation of fishers occurring in the Greys River District and its status is unknown. The Wyoming Natural Diversity Database does not contain any records of this species in the district (as of January 6, 2006). Therefore, fishers are not addressed in the effects analysis.

Northern goshawks inhabit mixed conifer forests (Wyoming Partners in Flight 2003; Anderson et al. 2004), particularly stands with higher canopy closure, larger tree size, and greater numbers of trees (Greenwald et al. 2005). The stands should also include snags and downed logs. Goshawk foraging habitat is optimized in forests with relatively open understories and large trees (Reynolds 1992). These are generally late-succession forests with relatively dense canopy cover, but open habitats such as sagebrush may also be used (Anderson et al. 2004). Foraging areas and post fledgling-family areas should compose a mix of forest composition: 20% in early succession, 40% in mid-succession, and 40% in late succession (Reynolds et al. 1992). Goshawks feed on small to moderately large birds and mammals (Anderson et al. 2004) and prefer to nest in Douglas-fir, lodgepole pine, and aspen forests, particularly in dense old-growth conifers (Wyoming Partners in Flight 2003; Anderson et al. 2004). At least six nest areas of 30 acres should be available for every 5,400 acres of foraging habitat (Reynolds et al. 1992).

Approximately 67% of the area within the immediate vicinity of the harvest units and 72% of the upper Greys watershed is forested. Nesting and foraging habitat abounds in the Greys River watershed, including upper Greys. The immediate vicinity of the harvest units contains at least one foraging area (5,400 acres, Reynolds et al. 1992), for a nesting pair. Currently, an estimated 6% of the forestland in the vicinity of harvest units is in early succession and an estimated 18% is in mid succession, both of which are less than recommended. An estimated 76% of the forestland in the immediate vicinity of harvest units (85% for the upper Greys River watershed and 91% for the Greys River watershed) is currently in late succession, higher than recommended. In the rest of the analysis area, there is only a minor amount of goshawk habitat.

There are more than 20 sites of 30 acres or larger that have characteristics suitable for goshawk nesting scattered throughout the 7,000-acre area in the vicinity of the proposed harvest units. No goshawk nests were located in or near the analysis area, nor were adults observed or heard during surveys conducted during the summer of 2006. Two goshawk nests were located in the vicinity of the harvest units in 2007. One was active through the summer of 2007 (southeast corner of harvest unit 2.15 – not included in revised proposal), but the nest was heavily damaged in the winter of 2007-08. In 2008, no nest and no sign of nesting adults were found there. A new nest appeared to be established in the spring/summer of 2008 approximately 2 miles to the north in harvest unit 1.3.

Table 3-17 shows the breakdown of vegetation for the entire analysis area. Most of the grass/forb communities are higher elevation, above the areas used by goshawks.

Table 3-17: Breakdown of vegetation types within the analysis area, and acreage that would be treated within each type, Upper Greys Vegetation Treatment Project.

	Total Acres	Within Harvest Units		Proportion of Veg. Type in Units
		Clear-cut	Partial-cut	
Subalpine fir (and spruce-fir)	4,033	49	92	*3.5%*
Whitebark pine	2,200	0	0	*0%*
Lodgepole pine	1,949	196	0	*10%*
Douglas-fir	60	25	0	*42%*
Aspen	14	0	0	*0%*
Riparian	504	0	0	*0%*
Big sagebrush	1,206	0	0	*0%*
Grass/forb	1,462	0	0	*0%*
Rock/barren	457	0	0	*0%*
TOTAL	11,885	270	92	*3%*
All Forested	*8,256*	270	92	*4.4%*

Great gray owls inhabit mid to late seral conifer forests interspersed with forest openings up to about 9,200 feet elevation in the southern parts of their range, including northwestern Wyoming (Duncan and Hayward 1994). More than 90% of sightings of this species were in the lodgepole pine/Douglas-fir/aspen zone (Franklin 1987, as cited by Duncan and Hayward 1994: 164) in which the analysis area is located. Canopy cover exceeded 60% at most nest sites in Oregon (Bull and Henjum 1990, as cited by Duncan and Hayward 1994). Forest openings are a critical part of great gray owl habitat. Great gray owls often hunt from perches, both dead and live trees, but avoid hunting in heavily timbered stands (Duncan and Hayward 1994). Course woody debris is an important component of foraging habitat. Winter habitat is similar to nesting habitat. Great gray owls are uncommon throughout their range, and the Greys River drainage is approaching the southern extremity of this distribution.

Boreal owls primarily inhabit high elevation mature and older conifer forests dominated by subalpine fir and Englemann spruce (Hayward 1994), and to a lesser extent, lodgepole pine, mixed conifer, Douglas-fir and other types (Survey of Forest Service biologists, cited in Hayward 1994). At 6,800-7,200 feet elevation, the analysis area is near the lower elevational range of spruce-fir habitat, less than optimal conditions. Boreal owls tend to nest in "complex" forests with higher basal area, more large trees, and less understory. Stands used

for nesting supported an average of about 23 snags greater than 15 inches in diameter per acre (Hayward et al. 1993). Boreal owls avoid forest openings, restricting all aspects of their year-round life history to forest interiors and edges. Boreal owls occur at low densities where they occur in the Rocky Mountains and this is true also of the Greys River District.

Flammulated owls are primarily associated with mature ponderosa pine, which is not found on the Bridger-Teton National Forest. While uncommon to rare, they have been observed in the Greys River drainage (USFS 2004). The Wyoming Natural Diversity Database does not contain any records of this species in the Greys River watershed (as of January 6, 2006). The analysis area does not contain suitable habitat and, therefore, flammulated owls are not addressed in the effects analysis.

Northern three-toed woodpeckers prefer mature, unlogged conifer forests of lodgepole pine, Douglas-fir, Englemann spruce, subalpine fir, and especially mixed stands (Wyoming Partners in Flight 2003; Wiggins 2004). Snags, particularly trees that have recently died, are critical parts of their foraging habitat (Wiggins 2004). Recently disturbed forestland, including burns, drought-affected communities, and wind-throw provide ideal conditions (Wiggins 2004). Densities of three-toed woodpeckers on the Greys River District are low and the Wyoming Natural Diversity Database does not contain any records of this species in the upper Greys River watershed (as of January 6, 2006). However, northern three-toed woodpeckers have been observed in the vicinity of harvest units and in harvest units (DeLong 2009). While the analysis area does not provide any recently burned conifer forestland, it does provide other critical habitat components.

Environmental Effects

Alternative A - Direct and Indirect Effects

Of the two alternatives, this alternative would be most beneficial to pine marten, goshawks, great gray owls, boreal owls, and three-toed woodpeckers, at least in the short term, because it would allow the beneficial late-seral species to continue accruing.

Indirect beneficial effects of Alternative A include advancing succession and a higher level of dying trees due to insects and disease (beneficial to a point, then detrimental). An indirect negative effect of Alternative A for great gray owls and goshawks includes ongoing reductions in the amount and distribution of early- and mid-seral communities.

Many of the harvest units of Alternative B are bordered by old clear-cuts, forest openings, and larger rangeland areas. Therefore, benefits of Alternative A, as compared to Alternative B, are not directly proportional to the number of acres within harvest units because several species (e.g., pine marten, boreal owls) are forest interior species.

Alternative B – Direct and Indirect Effects

Clear-cutting of harvest units (270 acres) under Alternative B would convert late-seral conifer forestland into early seral communities, reducing late-seral habitat from about 85% of conifer forestland to about 84% in the upper Greys River watershed, with a 0.2% reduction

from the existing 91% in the Greys River watershed. Harvest sites currently being used by pine marten, goshawks, great gray owls, boreal owls, and three-toed woodpeckers would no longer be used by these species, except for perching (retention trees) and foraging habitat for goshawks and great gray owls. The existing complexity of forest structure would be nearly eliminated in clear-cut units.

Many of the harvest units currently provide less-than satisfactory habitat for pine marten, goshawks, and boreal owls. Partial-cutting would reduce canopy cover, density of snags, and understory complexity, reducing or eliminating use for some species, depending on the extent of reduction in canopy cover. In most cases, partial-cutting would remove enough trees and snags that stands would no longer function as late-seral forestland. This could reduce the amount of late-seral conifer forestland in the upper Greys River watershed to almost 83%. Some buffers between openings/rangelands and effective forest interiors would also shrink.

Goshawk habitat in the post fledgling-family area and foraging area for the nest in unit 1.3 would benefit from Alternative B due to increases in early-seral habitat. Early-seral forestland would increase from an estimated 6% of forestland in the immediate vicinity of harvest units to an estimated 12% (Table 3-12), which is closer to desired condition of 20% for goshawk. However, most of the clear-cuts created by Alternative B, except possibly unit 3.1, would be too large to be fully used by goshawks. There would still be a net improvement over existing conditions because Alternative B would move the area closer to the desired mix of early, mid, and late succession for goshawks. Because more than 5 trees would be retained per acre in partial-cuts, these treatments would improve foraging habitat for goshawks.

Clear-cutting of unit 1.3 would likely result in nest failure if logging occurred during the nesting season and could result in future non-use of the nest, but if this unit is eliminated from Alternative B there would be no effect on goshawk nesting. Reynolds et al. (1992) recommended retaining 30 acres in the vicinity of goshawk nests. Retaining 30 acres of uncut forest around goshawk nests would apply to any additional nests that may be found prior to or during project implementation.

Clear-cutting and partial-cutting would reduce the amount of habitat available to northern three-toed woodpeckers. However, the amount of remaining late-successional habitat would continue to be more than that available than would exist within the natural range of variability.

Of all the species in this group, great gray owls would likely be affected the least. They can nest in close proximity to clear-cuts and are known to use clear-cuts for foraging. All of the old clear-cuts in the analysis area have succeeded beyond the age used by this species as "open" foraging habitat, and an abundance of late-seral forestland would remain throughout the analysis area and beyond. Opening stands with partial-cutting may also improve foraging habitat for this species.

Human activity associated with logging operations, logging truck traffic and with the construction and obliteration of up to 3.15 miles of temporary road could potentially have short-term adverse effects on a small number of individual pine martens, goshawks, great gray owls, boreal owls, and/or northern three-toed woodpeckers. These human disturbance effects, if they occurred, would be negligible at most, and would not have any lasting effects.

The temporary roads, if constructed, would have no more than negligible effects on these species.

Alternative B would harvest some snags used by these species, but much of the un-harvested area contains high densities of snags. Far more than 60 acres of forestland per section would continue to meet criteria for wildlife snag patches in the analysis area.

Because the project would be conducted in a DFC 1B area, conflicts between meeting Forest Plan objectives for timber harvest and those for pine marten are to be resolved in favor of timber harvest objectives, so long as the project would not contribute to a loss in viability in pine marten (USFS 1990a: 93, 145, 149). Far fewer acres of timber are being harvested on the BTNF than anticipated in the Forest Plan EIS (USFS 1990b).

Cumulative Effects

Cumulative effects pertinent to wildlife species associated with late-seral conifer forestland are outlined in the cumulative effects analysis of the "Mix of Seral Stages and Fragmentation in Conifer Forestland", above. Currently, approximately 85% of conifer forestlands in the upper Greys River watershed are in late succession, in contrast to a desired condition of 40%.

The net effect of past cumulative effects and Alternative A would be little change in the near future and either increases or decreases in the late-seral forestland in the longer term. Increases would occur as a result of advancing succession uninterrupted by fire and logging. Decreases could potentially occur as a result of insect and disease epidemics reducing the amount of late-seral stands to less than 40% of the conifer forestland in the analysis area. As more trees die in an area, more openings would be created which is beneficial to great gray owls and goshawks and more trees are available as foraging substrate for woodpeckers. Dead trees also contribute to course woody debris, which is beneficial to all of the species in this group.

The net effect of past cumulative effects and Alternative B would be a slight reduction in benefits to pine marten, goshawks, great gray and boreal owls, and three-toed woodpeckers in the upper Greys River watershed. An exception may be if there were a wildfire in the vicinity of the harvest units under Alternative B, at which time the clear-cuts created by the alternative may contribute to a large amount of late-seral forestland being maintained than would be retained without the clear-cuts. This was identified as a benefit of timber harvest in the Forest Plan EIS (USFS 1990b:283). While northern three-toed woodpeckers have benefited in several ways from the cumulative effects that have resulted in such a large surplus of late-seral conifer forestland, there have been fewer recently burned areas preferred by three-toed woodpeckers.

If populations of pine martens, goshawks, great gray owls, boreal owls, and/or northern three-toed woodpeckers are affected in the Greys River watershed, it is not due to any processes that have converted late-seral conifer forestland to early-seral communities. It is highly unlikely that these past activities and processes, in combination with effects of Alternative B, would adversely affect any of these species relative to the amount of habitat historically available to them.

The Spring Clean-up Salvage Project would, if implemented, have similar effects on these species as the partial-cuts in the Upper Greys Vegetation Management Project (DeLong 2009). In combination, the Upper Greys Vegetation Treatment Project, Spring Clean-up Salvage Project, and mitigation measures identified for each project would have no more than negligible adverse effects on this group of species compared to existing conditions, and slightly reduce benefits that have accrued to late-seral species during the last century. Both projects combined would only reduce favorable habitat for this group of species by as much as 591 acres, which is far less than the amount by which late-seral forestland is overrepresented in the upper Greys River watershed.

Determination of Effects

Biological Evaluation Determination

Alternatives A and B would have **no impact** on fishers and flammulated owls due to these species not being present in or near the analysis area and either no measurable effect on their habitat (flammulated owls) or at most negligible effects on potential habitat (fishers).

Alternative A would have **no impact** on northern goshawks, great gray owls, boreal owls, and northern three-toed woodpeckers.

Alternative B **may impact** individual goshawks, great gray owls, boreal owls, and three-toed woodpeckers or minor parts of their habitat, but would likely not contribute to a trend toward federal listing or loss of viability if identified mitigation measures are implemented. This assessment is based on (1) the small size of harvest units and total area to be treated (362 acres) compared to available habitat at various spatial scales; (2) some possible neutral or positive effects on (foraging habitat for goshawks and great gray owls); (3 temporary roads would have no more than negligible or minor short-term effects on these species; (4) logging activities and hauling logs would affect no more than a few individual animals and would have no lasting effects. The net effect on goshawks may be positive, given the desired conditions outlined in Reynolds et al. (1992) and the movement toward these conditions resulting from Alternative B.

Management Indicator Species Determination

Alternative A would have **no impact** on pine martens.

Alternative B may impact individual pine marten or a small part of their habitat, but will likely not contribute to a loss of viability of populations or the species if identified mitigation measures are implemented. This is based on assessing changes resulting from Alternative B relative to existing conditions. (In the context of the natural ecology of the area and cumulative effects over the last century, Alternative B would have no impact on pine martens.)

GRIZZLY BEAR, WOLVERINE, PEREGRINE FALCON, SPOTTED BAT, AND WESTERN BIG-EARED BAT (SENSITIVE)

Affected Environment

Species Occurrence, Habitat Availability, and Population Trends: Grizzly bears were listed as a threatened species in 1975, and were de-listed on March 29, 2007, at which time their population management shifted to the responsibility of the Wyoming Game and Fish Department. They range over large areas and inhabit a large variety of habitat types. The analysis area contains suitable grizzly bear habitat (e.g., USFS 2004c: Figure 27), and open motorized route density and general human presence in the analysis area is low enough for grizzlies to be present. The analysis area is outside the primary conservation area and is not within an area to be managed for grizzly bear occupancy. There have been no verified grizzly bear occurrences in the analysis area and only one verified grizzly bear approximately 25 miles north of the analysis area. The population has grown to an estimated 400-600 bears in the Greater Yellowstone ecosystem, and the population appears to be increasing at about 4-6% per year (WGFD 2005b). The Bridger-Teton National Forest encompasses approximately 13% of the occupied grizzly bear range in the Yellowstone Grizzly Bear Ecosystem. This increasing population is expected to cause more grizzly bears to venture outside of their existing range into other areas of suitable habitat, including into the Salt River and Wyoming Ranges.

Roots and other vegetation form a large part of grizzly bear diets, along with insects and small mammals. These food sources can be affected by changes in forest conditions, including benefits associated with early-seral communities. Grizzly bears also seasonally feed on carrion and other meat sources (e.g., elk calves). However, because the project area is outside of the grizzly bear recovery zone, potential effects on grizzly bear habitat are only of minimal concern.

Wolverines range over large areas and a variety of habitat types. Wolverine habitat is probably best defined in terms of adequate year-round food supplies in large, sparsely inhabited wilderness areas, rather than in terms of particular types of topography or plant associations (Banci 1994: 114; Kelsall 1981). The Wyoming Natural Diversity Database contains several occurrences of wolverines in the Greys River watershed and the Greys River District between 1998 and 2003.

Peregrine falcons are also a species of very low density in the Greys River watershed. An active nest exists about 30 miles north (west of the Salt River Range) of the analysis area. No nests are known to exist within the Greys River watershed. There are no records in the Wyoming Natural Diversity Database for this species in the Greys River watershed (as of January 6, 2006). It is possible that individual birds occasionally travel through the upper Greys River watershed, but the possibility of birds using the analysis area is remote. Therefore, peregrine falcons are not addressed in the effects analysis.

Spotted bats and western big-eared bats use a variety of habitats for foraging, including open conifer forests, shrublands, and meadows (USFS 2004). Narrow crevices high on limestone and sandstone cliffs appear to be needed as roosting habitat for spotted bats, and these types of formations do not exist in or near the analysis area. Spotted bats and western big-eared

bats are believed to be present in the Greys River watershed (Garber 1991), but there are no reports of these species occurring in the watershed, including no records in Wyoming Natural Diversity Database (as of January 6, 2006). Because the analysis area does not provide suitable habitat and because it is unlikely the bats use the analysis area, spotted bats and western big-eared bats are not addressed in the effects analysis.

Environmental Effects

Alternative A – Direct and Indirect Effects

This alternative would have no apparent effects on grizzly bears and wolverines.

Alternative B – Direct and Indirect Effects

This alternative would have no more than negligible effects on grizzly bears and wolverines.

It is highly unlikely that timber harvest activities would cause displacement or disturbance of grizzly bears in the vicinity of the harvest units, analysis area, and along haul routes mainly because the likelihood would be very low of grizzly bears inhabiting or traveling through the vicinity of harvest units, analysis area, or haul routes during the period of timber harvest activities: (1) the harvest units are small and do not have any particular features or characteristics that would attract grizzly bears; (2) grizzly bears are rare in the Greys River watershed and are wide ranging; (3) timber harvest activities would be of short duration; and (4) current human activity in the vicinity of the harvest units and haul routes (e.g., upper Greys River Road, upper LaBarge Creek Road, and Smiths Fork Road) are regular occurrences during summer months. The additional human activity associated with timber harvest for a period of several weeks or months for 1-3 summers would have limited if any additional potential for displacing or otherwise disturbing grizzly bears. Any displacement effects would be short term.

Changes in habitat conditions resulting from timber harvest activities would have no more than negligible effects on grizzly bears due to (1) the analysis area being well outside the primary conservation area, (2) small size of harvest units, (3) the very low density of grizzly bears (if they exist at all), (4) wide ranging nature of grizzly bears, (5) wide ranging habitat use by grizzly bears, and (6) possible negligible benefits to whitebark pine (Laub and Whitlach 2009). The harvest units are very small compared to the size of the Greys River watershed and surrounding areas, which may not support any grizzly bears and at most supports no more than a few grizzly bears.

Banci (1994) identified and described the range of factors affecting wolverine populations, and presented mixed results of studies showing some possible effects of logged areas to no apparent effects on habitat use and movements. She assessed that wolverines are most affected by activities that fragment and supplant habitat, including extensive logging. The small size of harvest units under this alternative and low total acreage of forestland to be logged would have no more than negligible to minor effects on wolverines, particularly given (1) the low density of wolverines on the district, including the upper Greys River watershed; and (2) very low chance of wolverines using forestland in the vicinity of the harvest units.

Banci (1994) did not discuss effects of roads on wolverines. Copeland et al. (2006) found that wolverines were located further from roads than would be expected by chance. However, they found that wolverines were located at higher elevations than would be expected by chance (i.e., they prefer higher altitudes). It is not clear whether wolverines are selecting against roaded areas, resulting in habitation of higher elevations where roads are uncommon or rare, or whether they are selecting for higher elevations, which draws them away from roads. If roads and vehicle traffic on roads causes wolverines to move to other areas, Alternative B would likely have minimal effects on wolverines because (1) all of the roads involved in project implementation, except temporary roads, are already being used by vehicles; and (2) use of roads would not markedly increase due to logging trucks, movement of heavy equipment, and other vehicle use.

Mortality due to being hit by vehicles is thought to be relatively low due to habitat use that typically is far from roads. Furthermore, the speed limit on the district is 35 miles per hour, which should give drivers sufficient time to avoid any wolverines crossing roads.

Cumulative Effects

Because the potential direct and indirect effects of Alternative B are so slight, a cumulative effects analysis is not warranted.

Determination of Effects (Biological Evaluation)

Alternatives A and B would have **no impact** on peregrine falcons, spotted bats, and western big-eared bats due to the species not being present in the analysis area.

Alternative A would have **no impact** on grizzly bears and wolverines due to no action being taken and no adverse impacts of aging forestlands.

Alternative B **may impact** individual grizzly bears or wolverines or minor parts of their habitat, but would likely not contribute to a trend toward federal listing or loss of viability due to (1) overabundance of late succession conifer forests in the upper Greys River watershed and all larger spatial scales up to that of the Bridger-Teton National Forest and larger; (2) small size of each harvest unit and total acreage that would be treated; (3) the low density of wolverines; (4) low density or non-existence of grizzly bears; (5) the effects of temporary roads, if constructed, would be negligible and would be short-term; and (6) potential human disturbance effects from logging activities and hauling logs would likely not affect any individual grizzly bears or wolverines, but if they did, it would affect no more than 1 or 2 individuals and this would have no lasting effects.

SENSITIVE PLANT SPECIES

Affected Environment

Species Occurrence, Habitat Availability, and Population Trends: There are no records of sensitive plant species occurring in the vicinity of the harvest units, including none in

Wyoming Natural Diversity Database, as of July 3, 2008. The only record of sensitive plants in the analysis area is one small population of creeping twinpod located on a west-facing sagebrush slope near the road along lower Shale Creek. Creeping twinpod usually occurs in barren, rocky, calcareous hills and slopes. It has very low palatability to domestic sheep (Fertig et al. 1994). Similarly, Payson's bladderpod is associated with rocky, sparsely-vegetated slopes (Fertig 2000a). Therefore, neither creeping twinpod or Payson's bladderpod would be expected within proposed harvest units and, because soil disturbance from roadwork outside the harvest units would not extend beyond what already occurs with road maintenance, these species would not be affected by the proposed action. No threatened or endangered plant species are known to exist in or near the project area. Therefore, sensitive, threatened, and endangered plant species — except for Payson's milkvetch — are not addressed in the effects analysis.

Payson's milkvetch primarily occurs in disturbed areas such as burns, clear cuts and road cut banks with loose soils, and it requires periodic disturbance to create new habitat and to limit competition from other species (Fertig 2000b), but none are known to exist in the project area. The closest known location of a Payson's milkvetch population is about 3 miles north of the analysis area (mouth of Box Canyon).

Environmental Effects

Alternative A - Direct and Indirect Effects

This alternative would not result in any direct adverse impacts to Payson's milkvetch, but it also would forego an opportunity to possibly offset a long period of low level of disturbances (e.g., fire) in the upper Greys River, which may historically have sustained larger numbers of this species.

Alternative B - Direct and Indirect Effects

Payson's milkvetch benefit from periodic disturbances, including timber harvest activities (Fertig 200b). Therefore, if any plants exist in the harvest units or if there is a seed bank, it is possible that the proposed action would benefit this species. To adversely impact any individual plants, skid trails, temporary roads, and other forms of direct, mechanical impacts would need to directly impact the plants. The likelihood of this is low given the absence of any records of occurrence in the project area, the very low density of plants in the upper Greys River drainage, the small size of the harvest units, and the very small part of each harvest unit that would receive sufficient mechanical impact to kill plants.

Cumulative Effects

A detailed cumulative effects analysis is not needed because of the very low probability of adverse impacts. It is possible that the suppression of fires during the last century has adversely affected Payson's milkvetch by reducing the level of disturbances that otherwise may have sustained larger numbers of this species. Alternative A would continue this trend. Alternative B, along with the proposed Spring Clean-up Sanitation project, has the potential

to offset these effects by a small extent, thereby providing a possible net benefit to this species.

Determination of Effects

Biological Evaluation Determination: While there are no records of Payson's milkvetch in the project area and while the proposed project, with mitigation measures, may benefit Payson's milkvetch, a conservative determination is that the proposed project **may impact** individual Payson's milkvetch plants or their habitat, but would likely not contribute to a trend toward federal listing or loss of viability due to (1) absence of any records of occurrence in the project area, (2) the very low density of plants in the upper Greys River drainage, (3) the small size of the harvest units, (4) the very small part of each harvest unit that would receive sufficient mechanical impact to kill plants, (5) benefits of ground disturbing activities to this species, and (6) benefits of opening up the overstory canopy.

MIGRATORY BIRDS (E.O. 13186)

Executive Order 13186 and USFS and USFWS (2008) require that migratory bird conservation be addressed in the planning of timber harvest operations. A list for the Greys River Ranger District (migratory birds) is included in the project record.

Late-Seral Conifer Forestland Associated Species and Habitat Availability

The analysis area provides habitat for many birds associated with late-seral mixed conifer forestland. There are major differences in bird diversity (species richness and abundance) between the late-seral forestland in/near harvest units and adjoining 30-40 year old clear-cuts (represented by pole size trees). The largest number of species was observed in multi-story late-seral conifer forestland where snags were prevalent and there were large accumulations of course woody debris, even where canopies were fairly open. Very few birds were observed or heard in the old clear-cuts.

Environmental Effects

Alternative A – Direct and Indirect Effects

Under this alternative, there would be no immediate change in habitat conditions for bird species associated with late-seral conifer forestland. Over a longer period of time, the amount of late-seral conifer forestland would continue to increase, along with associated benefits.

Alternative B – Direct and Indirect Effects

Direct and indirect effects of Alternative B on migratory birds associated with late-seral conifer forestland would be similar to those described in the 'Pine Marten (Management

Indicator Species) and Fishers, Northern Goshawk, Great Gray Owl, Boreal Owl, and Three-toed Woodpecker (Sensitive)' section, above. Compared to existing conditions, use of partial-cut units (92 acres) would likely decline for many of the bird species associated with late-seral conifer forestland, and use would be eliminated in clear-cut units (270 acres). Alternative B would reduce bird diversity in this limited area compared to existing conditions. At the scale of the analysis area, bird diversity would only be reduced by a minor amount compared to existing conditions. At the scale of the upper Greys River, this effect would be no more than negligible. This effect would persist for at least 40-50 years.

Periodic reductions in bird diversity due to disturbances that convert late-seral stands to early succession is a natural process and it is occurring less often than it did prior to Euro-American settlement. The amount of habitat available to this group of birds is in excess than what had occurred historically or is at the very upper end of the natural range of variability. Therefore, the effects identified in the previous paragraph are not considered "adverse."

Early and Mid-Seral Conifer Forestland Associated Species and Habitat Availability

A large variety of bird species — many of which nest and roost in mature conifer forestland — forage in forest openings.

Environmental Effects

Alternative A – Direct and Indirect Effects

Bird species associated with early and mid-seral forestland would continue to be underrepresented in the analysis area, upper Greys River watershed, and Greys River watershed as a whole.

Alternative B – Direct and Indirect Effects

With a small increase in early-seral plant communities, this alternative would contribute to a slight restoration in bird species associated with or that use these communities.

One difference between clear-cuts and clearings created by fire is the retention of snags for several years after an area is burned. Because few snags would be retained in clear-cut units, bark-gleaners and cavity nesting species would not be part of the bird communities. Therefore, the project's contribution to restoring early-seral communities would not contribute to the restoration of this element of early-seral wildlife communities.

Cumulative Effects

Cumulative effects applicable to migratory bird species associated with late-succession conifer forestlands were addressed in cumulative effects in two sections: (1) 'Pine Marten (Management Indicator Species) and Fishers, Northern Goshawk, Great Gray Owl, Boreal

Owl, and Three-toed Woodpecker (Sensitive)' and (2)' Mix of Seral Stages and Fragmentation in Conifer Forestland.' Alternative A would contribute to the ongoing aging of forestland in the analysis area and upper Greys River watershed. Alternative B would slightly reduce the culmination of benefits to late-seral species that have been accruing for many decades.

Cumulative effects on migratory birds associated with early-mid seral conifer forestland are driven by effects on the mix of age classes, which was addressed in the 'Mix of Seral Stages and Fragmentation in Conifer Forestland.' Alternative A would not result in any curtailment of the ongoing reduction in early-mid seral communities. Alternative B would benefit bird species associated with early-mid seral communities.

Determination of Effects

Alternative A would continue to benefit late-seral bird species and would not result in any restoration of early-mid seral bird communities.

Alternative B may impact individual migratory birds or parts of their habitat, but will likely not contribute to a loss of viability of populations of any species. Alternative B would slightly reduce the accumulation of benefits to late-seral bird species that have accrued over the last century, and it would contribute (in a small way) to the restoration of bird communities associated with early- mid-seral plant communities in forested areas.

THREATENED, ENDANGERED EXPERIMENTAL, AND CANDIDATE SPECIES

The current list of species (ES-61411/W.19/WY080283 U.S. Fish and Wildlife Service – 2008) includes three species to consider for this analysis.

Table 3-18: Endangered, Threatened, Proposed, and Experimental-population Species and Designated Critical Habitat on the Bridger-Teton National Forest, with Reference to Expected Occurrence in Wyoming (3/21/05).

Species or Critical Habitat	Status	Expected Occurrence
Canada Lynx	Threatened	Montane forests in the Greater Yellowstone Ecosystem
Gray Wolf	Experimental	A variety of habitats in the Greater Yellowstone Ecosystem
Yellow-billed Cuckoo	Proposed	Riparian areas west of the Continental Divide

CANADA LYNX (*LYNX CANADENSIS*)

Affected Environment

Population Status and Distribution: The Canada lynx population in the contiguous United States was listed as Threatened under the *Endangered Species Act* on March 24, 2000. Critical habitat has not been designated for this species.

The historical range of Canada lynx in the Greater Yellowstone Area includes Idaho, Montana, and Wyoming (USFWS 1998a and b). In Wyoming, Canada lynx has been protected as a non-game species with no open season (for trapping) since 1973. The southernmost natural population of Canada lynx in North America is found in the Wyoming and Salt River Mountain Ranges. Lynx are suspected of being present on the Greys River Ranger District based on historical records, past radio telemetry studies, and snow tracking. Most records of lynx from 2004-2008 in the Wyoming and Salt River Ranges have been from the east side of the Wyoming Range. As recently as the early 1970s, trappers commonly caught Canada lynx in that same area, but since that time the number of animals has declined. There was a radio collared lynx that inhabited the upper Greys River watershed and parts of the eastern side of the Wyoming Range for a time. Some of the lynx that were radio-collared and relocated to Colorado temporarily inhabited the upper Greys River watershed, as well as a few other parts of the Greys River Ranger District. The current population density is unknown and is most likely very low.

Habitat Conditions: The Greys River South Lynx Analysis Unit (LAU) is 66,543 acres and ranges in elevation from about 7,100 feet along the Greys River at the north end of the LAU to 11,378 in the Wyoming Range. Of the total acreage, 33,744 acres are designated as "lynx habitat." This analysis only considers forested habitat below 9,700 feet. A combination of topography, geology, aspect, slope, soils, and climate provide for an ecologically diverse mosaic of vegetation patterns and communities (USFS 2004a: 9). Forested areas are naturally fragmented by big sagebrush and other rangelands, riparian zones, meadows, talus slopes, and rock bands, but fragmentation is less than it is in other parts of the Greys River Ranger District (although it is higher than the east slope of the Wyoming Range). Old clear-cuts and the Spring Creek fire add to this diversity. Discontinuous conifer forests may not provide adequate habitat for dispersing hares to survive, and fragmented forestland habitat is generally of lesser suitability to lynx (Ruediger et al. 2000; USFS 2007c).

Approximately 73% of the Greys River South LAU below 9,700 feet is forested and nearly 90% is in a late stage of succession (Table 3-19). An estimated 82% of the forestlands in this LAU are designated as lynx habitat. Much of the conifer forestland has old forest characteristics, including accumulations of course woody debris. Early- and mid-seral forestland is a product of the 1988 Corral Creek fire and clear-cuts that are now 30-40 years old. Lodgepole pine communities, a seral stage of subalpine fir and Englemann spruce types, are succeeding into spruce-fir forests.

Table 3-19: Breakdown of existing age classes of conifer and aspen forest types in the middle Greys River watershed area (USFS 2005), which roughly corresponds to the Greys River Middle LAU[A].

	Estim'd Acres[A]	Stages of Succession[B]		
		Early	Mid	Late and Disclimax
Spruce-Fir and Subalpine Fir	23,552	9%	3%	88%
Lodgepole Pine	9,800			
Douglas-fir	1,738			
Whitebark Pine and mix	5,143	2%	9%	89%
Aspen and mix	672	18%	0%	82%
Total	**40,906**	**7%**	**5%**	**88%**
Properly Functioning Condition[B]	—	*20%*	*40%*	*40%*

[A] Based on 2007 BTNF Vegetation Mapping Effort.

[B] Based on estimates in the Greys River LSA (USFS 2004).

[C] The Greys River Middle LAU has the same boundaries as the middle Greys River watershed assessment area except that the LAU does not encompass the Moose Creek, Deadman Creek, Pearson, and Henderson Creek drainages.

Slopes greater than 20-30º are regular occurrences in forested areas in many parts of the Greys River South LAU although to a lesser degree in the project area. The highly variable terrain and inherent fragmentation of forested habitat may explain the low abundance of lynx on the Greys River Ranger District.

Under the proposed action, about 362 acres of conifer forestland would be clear-cut (270 acres) or partial-cut (90 acres) within a project area of about 7,000 acres. Proposed harvest units range in elevation from about 8,500 to 9,300 feet, and the project area ranges in elevation from about 7,900 feet to 9,700 feet. Most of the proposed harvest units are dominated by lodgepole pine, but subalpine fir is also common in the canopies, with subalpine fir dominating the understory. Many spruce-fir stands also occur. Proposed harvest units range from open canopies (12-25% canopy cover) to closed canopies (60-80% canopy cover) (Laub and Whitlach 2009). The density of young trees (<5-inch diameter at breast height) ranges from less than 100 per acre to 4,000 or more per acre.

Amounts of course-woody material range from low densities to high densities When moderate to high densities of logs combine with moderate to high densities snags (e.g., >20 per acre) and moderate to high densities of young trees (e.g., >2,500 trees of ≤5 inch diameter per acre; USFS 2007a: 150), structural diversity can be quite high. Vegetation characteristics of denning habitat do not appear to be limited in the Greys River South LAU.

Most old clear-cuts that adjoin harvest units of Alternative B are dominated by lodgepole pine, 15-30 feet tall, at densities high enough and with crowns low enough to provide foraging habitat for snowshoe hares. Crowns of trees in many of the old clear-cuts are within 1-5 feet of the ground, indicating availability of lower branches to snowshoe hares during

winter months. Tree diversity on many old clear-cuts is low. Trees are mostly lodgepole pine, but subalpine fir also is present, along with smaller amounts of Englemann spruce and whitebark pine.

Prey Base: Snowshoe hares are the preferred prey of lynx (Ruediger et al. 2000), and habitat in the project area appears to be generally favorable to snowshoe hares. Snowshoe hares tend to prefer younger lodgepole pine stands, as well as mature conifer stands with dense understories (Hodges 2000; Ruediger et al. 2000). Mature forests typically have a moderate to high density of young conifer trees, although density of these trees in some areas is fairly low. Snowshoe hare sign was present in many of the old clear-cuts. Red squirrels and grouse are also relatively abundant in some areas.

Based on local telemetry data (Laurion and Oakleaf 2000) and studies of Canada lynx and snowshoe hare relationships in other areas, it appears that the heterogeneity of topography and vegetation and relatively low densities of snowshoe hares could be maintaining relatively low lynx densities in the Wyoming and Salt River Ranges (Ruediger et al. 2000: 1-3, 7-4). Snowshoe hares do not appear to exhibit regular, dramatic population cycles as they do in the northern regions. Lynx home ranges in western Wyoming are large (Squires and Laurion 2000).

Environmental Effects

The objectives, standards, and guidelines in the *Northern Rockies Lynx Conservation Management Direction* (USFS 2007a), as included in the Bridger-Teton Forest Plan by amendment (USFS 2007b), provide management direction for minimizing adverse impacts to lynx on the Bridger-Teton National Forest and other National Forests. Projects that implement this amendment are generally not expected to have adverse effects on lynx, and implementation of these measures across the range of lynx is expected to lead to conservation of the species.

Permanent Lynx Analysis Units (LAUs) have been delineated across the BTNF and provide the fundamental scale with which to evaluate and monitor effects of management actions on lynx habitat. LAU's encompass lynx habitat for denning or foraging habitat as well as non-lynx habitat. The project area is within the Greys River South LAU.

Direct Effects

Direct effects are caused directly by timber harvest activities such as displacement of lynx and vehicle collisions. These potential direct effects are short duration. The direct effects of the proposed action will not conflict with any of the standards or guidelines because none of them address human disturbance caused by timber harvest activities. The analysis did not identify this as a risk factor (USFS 2007c), nor did the *Canada Lynx Conservation Assessment and Strategy* (Ruediger et al. 2000).

The proposed action will likely not result in any measurable increases in displacement and disturbance to Canada lynx due to timber harvest activities, as compared to existing conditions, because:

- The likelihood of Canada lynx inhabiting the project area or its vicinity during the time timber harvest activities occur would be very low because lynx are, at most, rare in the upper Greys River watershed. It is possible that no lynx currently inhabit this area.
- Roads in the project area are open to the public and motorized activity already exists, particularly where proposed harvest units are located. Temporary roads constructed for this project would not be open to the public, and would be obliterated, re-vegetated, and barricaded prior to completion of the project.
- Human activity associated with the proposed action, which could potentially affect Canada lynx would (a) be localized and short term and (b) have no lasting effects.

Short-Term and Long-Term Indirect Effects

Anticipated indirect effects of the proposed action would not conflict with applicable objectives, standards, and guidelines in the *Northern Rockies Lynx Management Direction*.

ALL MANAGEMENT PRACTICES AND ACTIVITIES (ALL)

Objective ALL O1 — Maintain or restore lynx habitat connectivity in and between LAUs, and in linkage areas.

Standard ALL S1 — New or expanded development and vegetation management projects must maintain habitat connectivity in an LAU and/or linkage area.

Assessment — Connectivity within and between LAUs will not be affected because (1) connectivity within and between LAUs is dictated primarily by topography and naturally high fragmentation and mix of forested and non-forested habitat, (2) the harvest units are small (5-42 acres, comprising about 1% of designated lynx habitat in the LAU) (3) the project area is centrally located in the LAU and cannot affect connectivity among LAUs, and (4) forested corridors will remain throughout the LAU after the project. While lynx generally avoid crossing large openings, they will use conifer forests as travel corridors so long as canopy cover exists (Ruediger et al. 2000).

VEGETATION MANAGEMENT ACTIVITIES AND PRACTICES (VEG)

Objective VEG O1 — Manage vegetation to mimic or approximate natural succession and disturbance processes while maintaining habitat components necessary for the conservation of lynx.

Assessment — The proposed action will contribute toward the accomplishment of this objective by a minor amount. The objective currently is not being met on the Greys River South LAU because fire has not played its natural role for many decades and because very little vegetation is being managed in the LAU, which has resulted in an overrepresentation of late-seral forestland. The proposed action would bring the mix of forest age classes slightly more into line with what had naturally occurred.

Objective VEG O2 — Provide a mosaic of habitat conditions through time that support dense horizontal cover, and high densities of snowshoe hare. Provide winter snowshoe hare

habitat in both the stand initiation structural stage and in mature, multi-story conifer vegetation.

Assessment — This objective currently is being exceeded on the Greys River South LAU, and the proposed action would not conflict with the objective.

Objective VEG O4 — Focus vegetation management in areas that have potential to improve winter snowshoe hare habitat but presently have poorly developed understories that lack dense horizontal cover.

Assessment — This objective is not applicable to the Greys River South LAU because late-seral conifer forestland with well-developed understories is over-represented.

Standard VEG S1 — If no more than 30 percent of the lynx habitat in an LAU is currently in a stand initiation structural stage that does not yet provide winter snowshoe hare habitat, no additional habitat may be regenerated by vegetation management projects.

Assessment — This standard currently is being met on the Greys River South LAU, Only about 9% of the forestland in the LAU is in a stand initiation stage (Table 3-19), and much of this will be succeeding out of the stand initiation stage within the next few years. The proposed action will increase the amount of lynx habitat in the stand initiation stage by about 1%.

Standard VEG S2 — Timber management projects shall not regenerate more than 15 percent of lynx habitat on National Forest System lands within an LAU in a ten-year period.

Assessment — The proposed project will regenerate an estimated 0.8% of lynx habitat in the Greys River South LAU, and there are no other timber management projects that have regenerated lynx habitat in the LAU within the last 10 years (i.e., 270 acres regenerated out of a total of 33,744 acres of lynx habitat).

Standard VEG S6 — Vegetation management projects that reduce snowshoe hare habitat in multi-story mature or late successional forests may occur only:

- Within 200 feet of administrative sites, dwellings, outbuildings, recreation sites, and special use permit improvements, including infrastructure within permitted ski areas; or

- For research studies or genetic tree tests evaluating genetically improved reforestation stock; or

- For incidental removal during salvage harvest (e.g., removal due to location of skid trails).

Assessment — The proposed project is consistent with this standard. Horizontal cover is used to indicate the quality of winter snowshoe hare habitat (Bertram and Claar 2008). Latest approved scientific methods were used for assessing horizontal cover to determine whether vegetation standard VEG S6 was applicable to potential harvest units (Bertram and Claar 2008; Squires 2008). The originally proposed harvest units (see scoping letter of March 9, 2007) were examined (See Wildlife Specialist Report, DeLong 2009, for

details on methods) to ascertain if harvesting of trees would be inconsistent with Standard VEG S6;

In total, 14 potential harvest units (1.6, 1.7, 1.9, 1.10, 1.11, 1.12, 1.15, 1.17, 2.2, 2.5, 3,6, 3.7, 3.8, and 3.10) were dropped from consideration due to high amounts of horizontal cover in the understory which reduced the size of the original proposed action of March 9, 2007 by 193 acres (33%). Two other units were dropped for other reasons, bringing the proposed action down to its current size of 362 acres.

The remaining 17 units had cover board readings of <48% (project files), as summarized in Table 3-20. Partial-cuts (e.g., units 3.12, 3.13, 3.14, 3.16, and 3.18) will retain a sparse overstory of conifer trees and will retain most of the understory, which will retain potential for snowshoe hare habitat in these units.

Table 3-20: Summary of horizontal cover board readings within each of the potential harvest units of the Upper Greys Vegetation Treatment Project. Percentages shown for each plot were derived from averaging four cover board readings for each plot, and the "Ave." percentage was derived by averaging all of the plots for each potential harvest unit.

Unit Number	Acres	Horizontal Cover Board Readings									
		Plot Numbers									
		1	2	3	4	5	6	7	8	9	Ave.
1.3	18	42.8	34.9	44.4	51.9	17.8					**38.4**
1.5	12	8.1	40.0	53.1	35.6	30.9					**33.6**
1.14	16	60.3	9.1	33.4	22.8	58.4					**36.8**
2.6	33	40.3	14.4	59.1	66.8	26.3	48.8	56.3			**44.5**
2.9	32	34.6	49.4	33.9	78.1	30.4	47.0	26.9			**42.9**
2.12	33	54.1	56.6	22.2	25.6	49.6					**41.6**
2.13	18	47.8	47.2	16.3	52.8	75.3					**47.9**
2.15	38	13.4	40.0	25.0	4.4	37.2	15.9	22.5			**21.6**
3.1	18	54.1	46.6	47.5	23.4	43.4	60.0	34.4			**44.2**
3.3	25	47.8	57.2	50.6	8.8	42.4					**41.4**
3.4	22	69.4	38.4	39.9	9.8	30.5					**37.6**
3.5	18	29.8	63.1	13.2	49.5	45.0					**40.1**
3.12(PC)	5	25.8	37.3	53.0	49.9						**40.2**
3.13(PC)	12	24.4	16.4	31.3	57.7	45.3					**35.0**
3.14(PC)	25	62.7	25.6	38.4	54.1	39.4					**44.0**

3.16(PC)	42	48.8	65.7	47.2	59.6	56.6	62.7	29.1	29.6	27.8	**47.4**
3.18(PC)	9	71.6	41.9	59.3	20.8	31.3					**44.9**

Guideline VEG G1 — Vegetation management projects should be planned to recruit a high density of conifers, hardwoods, and shrubs where such habitat is scarce or not available. Priority for treatment should be given to stem-exclusion, closed-canopy structural stage stands to enhance habitat conditions for lynx or their prey (e.g., mesic, monotypic lodgepole stands). Winter snowshoe hare habitat should be near denning habitat.

Assessment —Late-seral conifer forestland with high density of [young] conifer appears to be likely overrepresented in the LAU. Early-seral conifer and aspen forestlands are under-represented in the LAU. The proposed project will contribute to an increase in early-seral conifer forestland, which typically produces high densities of young conifer trees.

Guideline VEG G5 — Habitat for alternate prey species, primarily red squirrel, should be provided in each LAU.

Assessment — This guideline is over-exceeded on the Greys River South LAU because conifer forestland favorable to red squirrels is over-represented compared to properly functioning conditions (Table 3-19). The proposed action will only reduce the amount of late-seral conifer forestland by less than 1%, and the remaining amount of conifer forestland will remain well above natural levels.

Guideline VEG G11 — Denning habitat should be distributed in each LAU in the form of pockets of large amounts of large woody debris, either down logs or root wads, or large piles of small wind thrown trees ("jack-strawed" piles). If denning habitat appears to be lacking in the LAU, then projects should be designed to retain some coarse woody debris, piles, or residual trees to provide denning habitat in the future.

Assessment — Approximately 88% of conifer forestland in the Greys River South LAU is in late succession (mature and old forests) and much of this contains accumulations of course woody debris. There is considerably more than "pockets of large amounts of large woody debris" in the LAU. Denning habitat is not lacking in the LAU.

Cumulative Effects

The distribution and abundance of Canada lynx in the Greys River watershed is influenced by the area's biogeographic characteristics, combined with the culmination of a variety of past and present human activities and management decisions. These include a long history of fire suppression, timber harvest during the mid-1900s through the 1970s (with dwindling harvest rates through the 1990s), improved road conditions, trapping up through the early 1970s, increasing amount and distribution of snowmobile activity, and increasing summer recreational use. It is not expected that mortality due to accidental trapping or shooting is having a substantial effect on lynx numbers in the Greys River watershed and Wyoming Range. Direct mortality from vehicle collisions is likely a minor factor in survival rates.

Cumulative effect factors were addressed in assessing conservation objectives, standards, and guidelines, above.

Determination of Effects

Due to the incidental occurrence of Canada lynx in the Wyoming and Salt River Ranges and because the proposed action would not have more than negligible effects on lynx habitat, the potential for effect is low. However, in recognition of there being some potential for negligible effects on snowshoe hare habitat in the LAU and potential for incidental displacement of individual lynx during timber harvest activities, the determination of effect for Canada lynx is **"May Affect – Not Likely to Adversely Affect".**

GRAY WOLF (*CANIS LUPUS*)

Affected Environment

Description of Population and Habitat Status: Any wolves that may occur in this area in the future would likely be part of the "nonessential/experimental" population traced to the Yellowstone Park reintroduction in the mid-1990s. Wolves are habitat generalists that prefer large areas isolated from human disturbance that have an ungulate prey base. Historically, wolves were found throughout Wyoming. Since 2002, there have been reports of sightings of wolves and wolf tracks at various locations in and around the Greys River District. At the present time, there is no evidence of pack formation and establishment of a home range in the vicinity of the project area. The vicinity of the project area provides travel-ways for wolves moving south from population centers north of Jackson. There is adequate evidence to assume wolves are either present, or likely to be present, in the Wyoming and Salt River Ranges. Overall, ungulate numbers are adequate to support wolves.

Environmental Effects

Direct Effects and Indirect Effects

It is highly unlikely that timber harvest activities would cause displacement or disturbance of wolves in the project area. The likelihood of wolves inhabiting or traveling through the project area or vicinity during the period of timber harvest activities would be very low. Wolves are rare in the Greys River watershed and wide ranging. Any displacement effects would be short term.

The proposed action would not result in alterations of habitat that would be unfavorable to gray wolves, nor would the project increase the amount of public roads. No effects are anticipated on wolves that may wander into the Greys River watershed.

Cumulative Effects

Cumulative effects of other past and present actions on habitat in the project area such as past fire suppression activities and past timber sales, would have negligible effects on gray wolves

because the size and distribution of large ungulate populations are already sufficient to support a small wolf population.

Determination of Effects

There are no effects from the proposed project that would be detectable at the population level. Potential for incidental positive or negative effects on individuals are too slight to assess. Due to the very limited exposure to risk, the determination of effect for the gray wolf is **"Not Likely to Jeopardize".**

YELLOW-BILLED CUCKOO

Affected Environment

Status of the Yellow-billed Cuckoo within the Area-of-Effect of the Proposed Project: There is no documentation of yellow-billed cuckoos in the vicinity of the project area. Any yellow-billed cuckoo in the Greys River Ranger District would most likely be transient or nomadic individuals (Bennett 2004).

Factors Affecting Yellow-billed Cuckoo Habitat and Occurrence within the Area-of-Effect: The project area does not encompass any habitat that would be suitable for yellow-billed cuckoos. The types of habitats used by yellow-billed cuckoos are found in the general vicinity along rivers, but the potentially suitable cottonwood patches along these rivers are scattered and none are located within the project area.

Environmental Effects - Direct, Indirect, and Cumulative

There is no potential for the proposed action to affect yellow-billed cuckoos because suitable habitat does not exist within or near the project area. Migrant or transient individuals that might potentially be found at times in the vicinity of the project area would not be affected by timber harvest activities or logging trucks. There is no potential for incidental take.

SUMMARY – Environmental Effects - Wildlife

Table 3-20: Determination of impacts of the proposed Upper Greys Vegetation Treatment Project on R4 sensitive species, Management Indicator Species, and migratory birds, and the extent to which it would hinder or contribute to achieving Forest Plan Direction.

Species	Biological Evaluation Determination	MIS Determination	Migratory Bird Determination	Contribution Toward Achieving Forest Plan Direction
Sensitive Species				
Common Loon	NI*	-	-	NH*
Trumpeter Swan	NI*	-	-	NH*

Harlequin Duck	NI	-	-	NH
Bald Eagle	MIIH**	-	-	NH
Northern Goshawk	MIIH**	-	-	NH
American Peregrine Falcon	NI*	-	-	NH*
Greater Sage Grouse	NI*	-	-	NH*
Flammulated Owl	NI*	-	-	NH*
Great Gray Owl	MIIH**/BI	-	-	NH
Boreal Owl	MIIH**	-	-	NH
Northern Three-toed Woodpecker	MIIH**	-	-	NH
Grizzly Bear	MIIH**	-	-	NH
North American Wolverine	MIIH	-	-	NH
Fisher	NI	-	-	NH*
Spotted Bat	NI	-	-	NH*
Townsend's Big-Eared Bat	NI	-	-	NH*
Columbian Spotted Frog	NI*	-	-	NH*
Payson's Milkvetch	MIIH	-	-	NH/C-N
Management Indicator Species				
Rocky Mountain Elk	-	MIISPH	-	NH/C-N
Moose	-	MIISH/BI	-	C-N
Mule Deer	-	MIISH/BI	-	C-N
Bighorn Sheep	-	WNI	-	NH*
Pronghorn	-	WNI	-	NH*
Pine Marten	-	MIISH*	-	NH
Brewer's Sparrow	-	WNI	-	NH*
Boreal Toad	-	WNI*	-	NH*

Boreal Chorus Frog	-	WNI*	-	NH*
Quaking Aspen	-	BI	-	C-N
Migratory Birds				
Late-seral Conifer Species	-	-	MIISH	NH
Early- and Mid-seral Species	-		MIISH/BI	C-N

Sensitive Species

NI = No Impact

MIIH = May Impact Individuals or Habitat, but will not likely contribute to a trend toward federal listing or cause a loss of viability to the population or species.

WIFV = Will Impact Individuals or habitat with a consequence that the action may contribute to Federal listing or cause a loss of Viability to the population or species.

BI = Beneficial Impact.

MIS

WNI = Would Not Impact individuals or their habitat, and would not contribute to a loss of viability of populations or the species

MIISH = May Impact Individuals or Small Part of their Habitat, but would likely not contribute to a loss of viability of populations or the species

BI = Beneficial Impact.

Contrib. to Forest Plan Direction

NH = would Not Hinder.

H-N = would Hinder, but no more than to a Negligible extent.

H-S = would Hinder Substantively.

C-N = would/may Contribute, but no more than a Negligible extent.

C-S = would Contribute Substantively.

* = Due to the species and/or suitable habitat not being present in the analysis area.

** = Conservative assessment. Adverse impacts only when evaluated against existing conditions (and possibly due to displacement). When effects are evaluated against properly functioning conditions, there would be no impacts on habitat (e.g., due to an overabundance of late-seral forests).

Table 3-21 summarizes the effects of the proposed action on **threatened and endangered species, experimental populations, and candidate species.**

Table 3-21: Summary of Determination of Effects

Status of Species	Determination of Effect
Threatened and Endangered Species	
Canada lynx (*Lynx canadensis*)	may effect – not likely to adversely affect
Experimental Populations	
Gray wolf (*Canis Lupus*)	not likely to jeopardize cont'd existence
Candidate Species	
Yellow-billed cuckoo *(Coccyzus americanus)*	no effect

3.5 Soil Resources

Information provided in this environmental impact statement about soils is excerpted from the *Soils Report for the Upper Greys River Vegetation Management Project* by Soils Scientist Eric Winthers. The full text of this report is incorporated by reference.

The analysis area lies within the Wyoming Range Uplands and is characterized by high relief with long, linear mountain ridges, separated by equally linear valleys. Elevation ranges from 7,800 to 11,000 feet with all aspects, but mostly west. Slopes range from relatively flat benches to 70% inclines. All proposed treatments are on lower slopes of less than 40% grade. Rock formations in the area are dominated by limestone, sandstone, and shale. Fluvial[1] and colluvial[2] geomorphic processes dominate, with recent landslide activity evident including debris flows and mudflows.

This area is part of the Overthrust Belt of eastern Idaho, western Wyoming, and northern Utah and is an extremely complex layering of the various sedimentary rocks. The structural style of these mountains is quite unique in that they are remnants of large folds which have been forcibly pushed eastward upon fault planes that pass westward under the mountains at low angles. The Greys River flows from south to north along the western edge of the analysis area; tributary streams from the area enter mainly from the east. Fire is the dominant natural disturbance, and snow avalanches are common. Other disturbances have

[1] **Fluvial** is used in geography and earth science to refer to the processes associated with rivers and streams and the deposits and landforms created by them.

[2] **Colluvial** refers to a process whereby loose rock and soil debris accumulate at the foot of a slope.

affected the watershed's soil including fire suppression, road building and maintenance, recreational use, grazing, and timber harvest. Other sections of this DEIS address impacts to biological resources from these management activities.

3.5.1 AFFECTED ENVIRONMENT

There are four dominant soil map units within the project area. Map units 313 and 353 occur on the benches. Soils were formed in Quaternary[3] or late Tertiary[4] fanglomerate[5] material consisting of small to large angular rock fragments. Map Unit 325 occurs on the steeper north and east facing portions of units 3.4, 3.5, 3.14, and 3.18. Soils are formed in colluvial material composed of angular rock fragments derived from sedimentary[6] rocks. Map Unit 333 occurs on the west facing slopes comprising Unit 3.3. Soils form in sandstone residuum[7] and have rocky surfaces. Elevation ranges in this map unit from about 8,400 to 9,400 feet.

Figures 3-7 and 3-8 depict the extent of map units within the project area and the locations of the soil data points. Table 3-22 lists the soil map units, site photos and site data associated with each harvest unit.

Table 3-22: Soil Data Associated with Each Harvest Unit

Harvest Unit	Soil Map Unit	Site photos	Site data
1.14	313		
1.3	313	P9123803 – P9123812	P09120601
1.5	313		
2.12	333	P9123841 – P9123850	P09120604
2.13	313	P9123851 – P9123865	P09120605
2.15	313		
2.6	313		
2.9	333		
3.1	313	P9133908 – P9133918	P9130605
3.12	353		
3.13	353		
3.14	353-325		
3.16	353	P9133875 – P9133885	P9130602
3.18	353-325	P9133866 – P9133874	P9130601
3.3	333	P9133897 – P9133907	P9130604
3.4	353-325		
3.5	353	P9133886 – P9133895	P9130603

[3] Quaternary - Period from approximately 1.8 million years to the present, characterized by large and rapid environmental changes including periodic buildup of major continental ice sheets and mountain ice caps in many parts of the world; long glacial stages divided by warm episodes of shorter duration

[4] Tertiary - Period from 65 million to 1.8 million years ago, characterized by the rise of mammals

[5] A sedimentary rock consisting of slightly waterworn, heterogeneous fragments of all sizes deposited in an alluvial fan and later cemented into a firm rock.

[6] Sedimentary rock is formed by deposition and consolidation of mineral and organic material and from precipitation of minerals from water. It includes common types such as limestone, chalk, sandstone, some types of shale, etc.

[7] Unconsolidated, weathered or partly weathered sandstone material that accumulated as the consolidated rock disintegrated in place

Stability Rating

Appendix A lists several Forest Plan standards and guidelines that use slope stability ratings which guide the types of harvesting methods that can be used. The slope stability ratings are incorporated into the soil map units described in the soil survey of the area (USFS 1993). The stability rating of the map units within the proposed units were evaluated in the field and all are considered to be stable. A rating of stable indicates that evidence of past landslide activity has not been discerned and the observable characteristics of the land are evidence that the probability of landslides in the future is low.

Soil Quality Monitoring

Soil quality monitoring was conducted within several of the proposed units. These units were expected to have no detrimental soil disturbance. However, two of the units did appear to have minor previous disturbances, such as a previous thinning or selective harvest that was detectable, and these units were assessed using the methods described in *Forest Soil Disturbance Monitoring Protocol* (Page-Dumroese et al. 2009). In these units, detrimental disturbance was low, measured at 0% and 3% of the units (Kleinschmidt 2007).

Coarse Woody Debris

In *Managing Coarse Woody Debris in Forests of the Rocky Mountains* a range of coarse woody debris for several habitat types was identified as a recommended amount to leave after harvesting to maintain productivity. For a subalpine fir/grouse whortleberry habitat type in Montana, the authors recommend 7-15 tons/acre. About half of the previous clear-cut units assessed were within this range (Kleinschmidt 2007). Overall, the site remains productive. Coarse woody debris was also measured on 10 of the 12 undisturbed proposed harvest units and amounts ranged from 13 to 45 tons per acre (average 26 tons/acre).

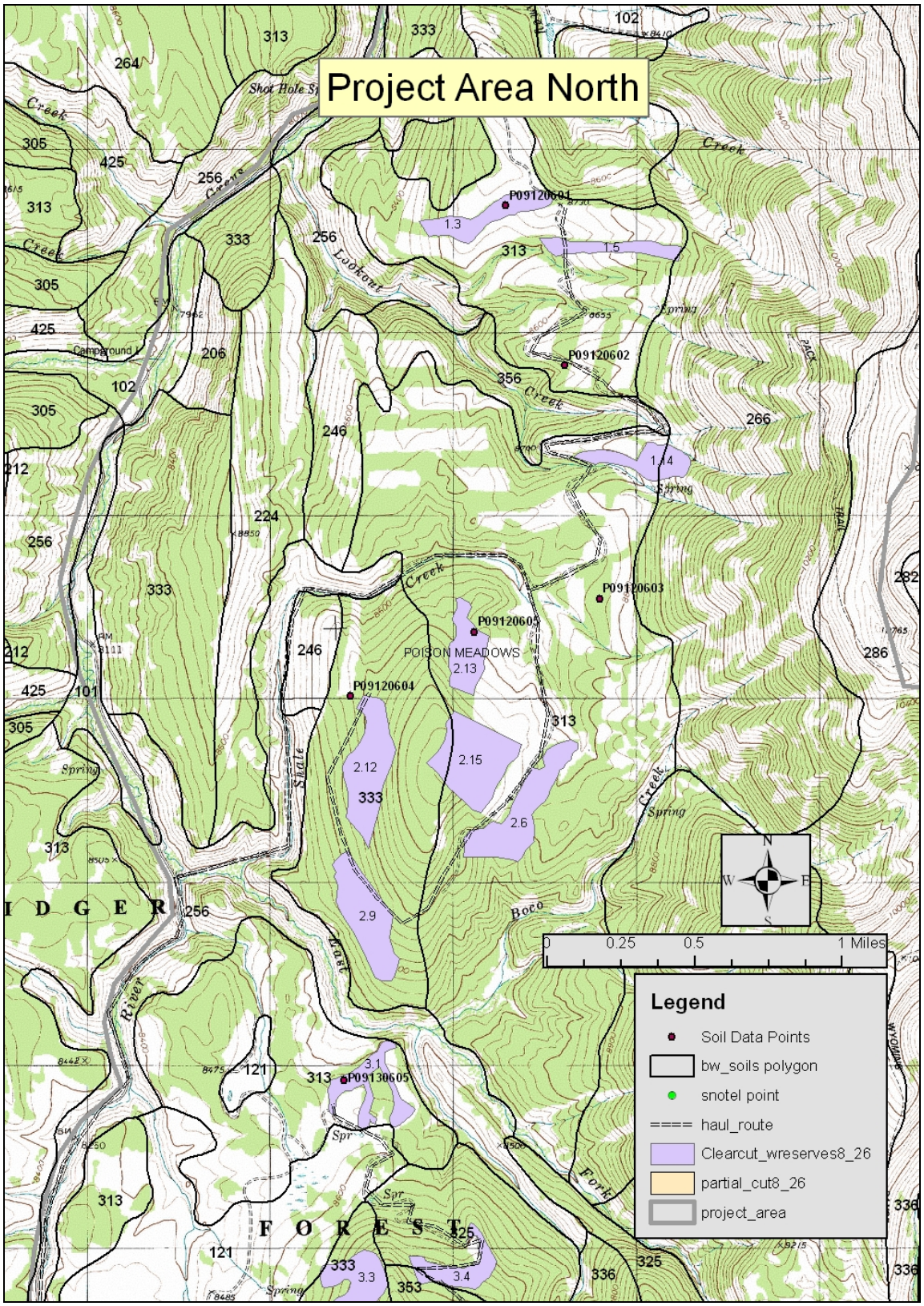


Figure 3-7: Project Area Boundaries

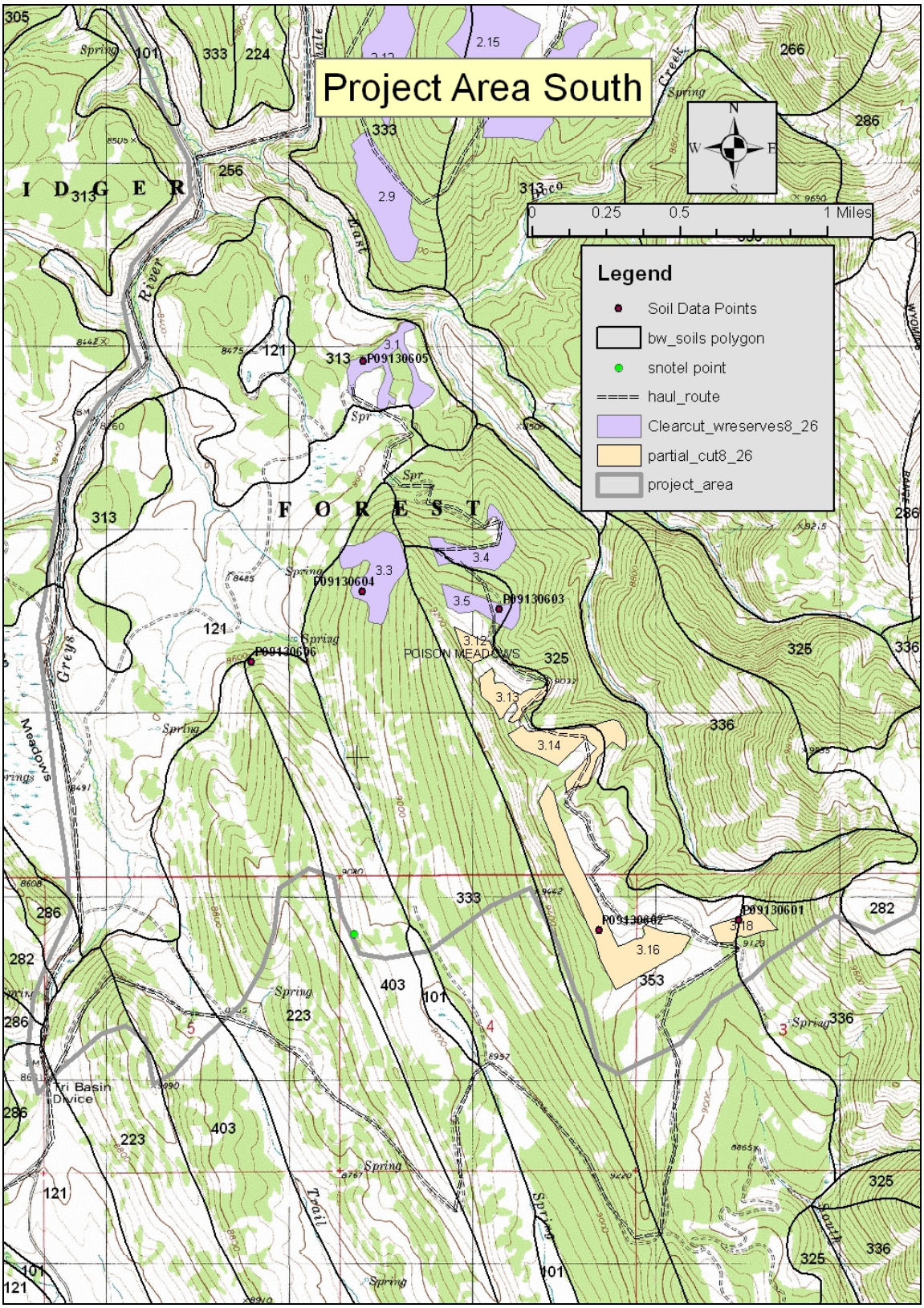


Figure 3-8: Project Area Boundaries

Soil Survey Interpretations

The soil survey rated soils for various timber related activities. Tables 3-23 through 3-25 provide a summary of the most limiting ratings and restrictive features for the soils in the project area.

For the units associated with map units 313 and 353 in Table 3-23, the ratings of most concern for the project area are for the soil rutting hazard and the road suitability because of the low strength of the soil, especially when wet. Other soil and site conditions are favorable for timber related activities.

Table 3-23: Soil Interpretations for Map Units 313 and 353 (units 1.14, 1.3, 1.5, 2.6, 2.13, 3.1, 3.16, 3.14, 3.18, 3.5)

Interpretation	Rating	Restrictive Feature 1	Restrictive Feature 2
Mechanical Site Preparation (Surface)	Well suited or Good		
Mechanical Planting Suitability	Moderately Suited Or Fair	rock fragments	slope
Construction Limitations for Haul Roads/Log Landings	Moderate	strength	
Hand Planting Suitability	Well Suited or Good		
Harvest Equipment Operability	Moderately Suited	strength	
Log Landing Suitability	Moderately Suited Or Fair	strength	
Mechanical Site Preparation (Deep)	Well Suited or Good		
Potential Erosion Hazard (Off-Road/Off-Trail)	Slight		
Potential Erosion Hazard (Road/Trail)	Moderate	slope/erodibility	
Potential Fire Damage Hazard	Moderate	texture/surface depth/coarse fragments	
Potential Seedling Mortality	Low		
Road Suitability (Natural Surface)	Poorly Suited Or Poor	strength	
Soil Rutting Hazard	Severe	strength	

For the units associated with map units 325 in Table 3-24, most of the ratings are unsuitable or severe because of the steeper slopes associated with these units. Roads, log landings and skid trails should be avoided on the steeper portions of these units.

Table 3-24: Soil Interpretations for Map Unit 325 (portions of units 3.14, 3.18, 3.4, 3.5

Interpretation	Rating	Restrictive Feature 1	Restrictive Feature 2
Mechanical Site Preparation (Surface)	Unsuited	rock fragments	slope
Mechanical Planting Suitability	Unsuited	rock fragments	slope
Construction Limitations for Haul Roads/Log Landings	Severe	slope	
Hand Planting Suitability	Moderately Suited or Fair	rock fragments - slope	
Harvest Equipment Operability	Poorly Suited	strength	slope
Log Landing Suitability	Poorly Suited Or Fair	strength	slope
Mechanical Site Preparation (Deep)	Unsuited	slope	
Potential Erosion Hazard (Off-Road/Off-Trail)	Severe	slope	
Potential Erosion Hazard (Road/Trail)	Severe	slope	
Potential Fire Damage Hazard	Low		
Potential Seedling Mortality	Low		
Road Suitability (Natural Surface)	Poorly Suited Or Poor	slope	
Soil Rutting Hazard	Slight	strength	

For the units associated with Map Unit 333 in Table 3-25, the ratings of most concern for the project area are for the mechanical site prep, mechanical planting suitability and hand planting suitability. These are limited because of the rocky nature of the soil. Log landing suitability and mechanical site preparation are limited because of slope. Other soil and site conditions are favorable for timber related activities.

Table 3-25: Soil Interpretations for Map Unit 333 (unit 2.12, 2.9, 3.3)

Interpretation	Rating	Restrictive Feature 1	Restrictive Feature 2
Mechanical Site Preparation (Surface)	Poorly Suited Or Poor	rock fragments	
Mechanical Planting Suitability	Poorly Suited Or Poor	rock fragments	
Construction Limitations for Haul Roads/Log Landings	Moderate	slope	
Hand Planting Suitability	Moderately Suited Or Fair	rock fragments	
Harvest Equipment Operability	Moderately Suited	slope	
Log Landing Suitability	Poorly Suited Or Poor	slope	
Mechanical Site Preparation (Deep)	Poorly Suited Or Poor	slope	
Potential Erosion Hazard (Off-Road/Off-Trail)	Moderate	slope/erodibility	
Potential Erosion Hazard (Road/Trail)	Moderate	slope/erodibility	
Potential Fire Damage Hazard	High	texture/surface depth/coarse fragments	

Potential Seedling Mortality	Low		
Road Suitability (Natural Surface)	Poorly Suited Or Poor	slope	
Soil Rutting Hazard	Slight	strength	

Desired Future Conditions

Desired Future Conditions for soils as outlined in the Forest Plan require that soil quality, productivity, and hydrologic function be maintained and restored where needed within Upper Greys treatment areas. Physical, chemical, and biological soil properties are to be maintained to support desired vegetation conditions and soil-hydrologic functions and processes. Soils are to have adequate protective cover, levels of soil organic matter (litter), and coarse woody material to minimize erosion and facilitate nutrient cycling. Soil productivity is maintained by complying with Regional Soil Guidelines. Regional guidelines recommend that no more than 15 percent of an activity area should have detrimentally disturbed soils after treatment.

3.5.4 ENVIRONMENTAL EFFECTS

Issues and Indicators

Issue	Indicator
Effect on "Forest Health" Timber harvest may have negative effects on long term soil productivity by reduction of soil quality. • Cumulative effects of past timber harvest activity in the project area may have negative effects on long term soil productivity.	• Percent of detrimental disturbance • Amounts of coarse woody debris

Alternative A - No Action

Direct and Indirect Effects

Under the No Action Alternative, there are no direct effects to soils because timber would not be harvested; thus soils would not be disturbed.

Gradual improvement in hydrologic integrity and watershed function would be expected as trees in plantations continue to grow. Chronic sediment production from roads would continue. Sediment production from the area, stream channel network function, and sediment storage within the stream channel would likely remain unchanged. Large-scale disturbance (i.e., fire and debris flows) will likely result in episodic increases in sediment and water yield from which the watershed has a moderate recovery potential.

Alternative B - Proposed Action Revised

Direct and Indirect Effects

Harvest units that occur within map units 313 and 353 (harvest units 1.14, 1.3, 1.5, 2.6, 2.13, 3.1, 3.16, 3.14, 3.18, 3.5): Within these units the soils are generally well suited for timber harvest activities except for low soil strength which is prone to rutting. Soil rutting may be severe when soils are saturated in the spring or after long periods (2-3 days) of rain. No operations will occur in these units until after soils begin drying out in late spring/early summer.

Harvest units within soil Map Unit 325 (portions of units 3.14, 3.18, 3.4, 3.5): Within these areas steep slopes are the main limitation. Soil erosion may be severe along temporary roads and landing areas. Temporary roads would be limited to short spurs to get to favorable landing areas off the main road in units 3.14, 3.4 and 3.5. There are no temporary roads anticipated in unit 3.18.

Harvest units within Map Unit 333 (harvest units 2.12, 2.9, 3.3): Within these units, site reproduction is limited by the droughty nature of the soils. Also hand planting and mechanical site preparation is limited because of the rocky surfaces.

Cumulative Effects

Past Timber Harvest: Soil disturbance monitoring was conducted on twelve older clear-cut harvest units adjacent to the proposed harvest units. Methods described in *Forest Soil Disturbance Monitoring Protocol* were used to determine percent detrimental disturbance within this area. Data associated with this monitoring are summarized below. A detailed report presenting soil monitoring data by Kleinschmidt (2007) is presented in Appendix A in the Soils Report. Site photos are presented in Appendix B in the Soils Report.

The *Forest Soil Disturbance Monitoring Protocol* (Page-Dumroese, 2009) requires that a minimum of 30 sample points are collected per transect. Visual soil disturbance classes, listed below in Table 3-26, are estimated for each point based on a variety of soil parameters. For the purposes of this assessment, soil disturbance class 3 was considered detrimental soil disturbance. Detrimental soil disturbance is further defined by Forest Service Handbook 2509.18. The amount of detrimental disturbance considered unacceptable is 15 percent of an activity area.

According to Klienschmidt's report, detrimental soil disturbance was present in all 12 of the old clear-cut treatment units. Detrimental disturbance ranged from 0 – 12% of the (activity area) unit (average 6%). Primary types of soil disturbance found were soil displacement and the combination of soil displacement and soil scorch. Causes of this were likely from ground based harvest techniques used in piling slash and skidding of trees. Scorching of soil resulted from the burning of slash piles. None of the units exceeded the 15 percent limit.

In *Managing Coarse Woody Debris in Forests of the Rocky Mountains* a range of coarse woody debris for several habitat types was identified as a recommended amount to leave after harvesting to maintain soil productivity. For a subalpine fir/grouse whortleberry habitat type, which is abundant throughout the project area, the authors recommend 7-15

tons/acre. About half of the previous clear-cut units assessed were within this range (Kleinschmidt 2007). Overall, the site remains productive. Coarse woody debris was also measured on 10 of the 12 undisturbed proposed harvest units to determine the pre-harvest condition; amounts ranged from 13 to 45 tons per acre (average 26 tons/acre).

Recreation activities also contribute minimally to soil erosion and compaction in the project area. The trailhead for the Wyoming Peak trail is located in the northern part of the project area near Lookout Creek. Some dispersed camping sites are also found throughout the area. During the fall hunting season, roads and trails in the project area experience significant vehicle and ATV traffic.

Grazing also impacts the project area. The area is within an active sheep allotment. Some small areas of localized erosion were noted during field reconnaissance.

Table 3-26: Visual Soil Disturbance Classes (*Forest Soil Disturbance Monitoring Protocol*)

Soil Disturbance Class 0 – Undisturbed Soil surface: • No evidence of past equipment operation. • No depressions or wheel tracks evident. • Forest floor layers present and intact. • No soil displacement evident. • No management-generated soil erosion. • Litter and duff layers not burned. No soil char. Water repellency may be present.	**Soil Disturbance Class 1** Soil surface: • Faint wheel tracks or slight depressions evident and are <5 cm deep. • Forest floor layers present and intact. • Surface soil has not been displaced and shows minimal mixing with subsoil. • Burning light: Depth of char < 1 cm. Accessory: Litter charred, or consumed. Duff largely intact. Water repellency is similar to pre-burn conditions. Soil compaction: • Compaction in the surface soil is slightly greater than observed under natural conditions. • Concentrated from 0-10 cm in depth. Observations of soil physical conditions: • Change in soil structure from crumb or granular structure to massive or platy structure, restricted to the surface 0-10 cm. • Platy structure is non-continuous. • Fine, medium, and large roots can penetrate or grow around the platy structure. No "J" rooting is observed. • Erosion is slight
Soil Disturbance Class 2 Soil surface: • Wheel tracks or depressions are 5 to 10 cm deep. • Accessory: Forest floor layers partially intact or missing. • Surface soil partially intact and may be mixed with subsoil. • Burning moderate: Depth of char 1- 5 cm. Accessory: Duff deeply charred or consumed. Surface-soil water repellency increased compared to the pre-burn condition. Soil compaction: • Increased compaction is present from 10-30 cm in depth. Observation of soil physical condition: • Change in soil structure from crumb or granular structure to massive or platy structure, restricted to the surface 10-30 cm. • Platy structure is generally continuous • Accessory: Large roots may penetrate the platy structure, but fine and medium roots may not. • Erosion is moderate	**Soil Disturbance Class 3** Soil surface: • Wheel tracks and depressions highly evident with depth >10 cm. • Accessory: Forest floor layers are missing. • Evidence of surface soil removal, gouging, and piling. • The majority of surface soil has been displaced. Surface soil may be mixed with subsoil. Subsoil partially or totally exposed. • Burning High: Depth of char > 5 cm. Accessory: Duff and litter layer completely consumed. Surface soil is water repellent. Surface reddish or orange in places. Soil compaction: • Increased compaction is deep in the soil profile (> 30 cm in depth). Observations of soil physical conditions • Change in soil structure from granular structure to massive or platy structure extends beyond 30 cm in depth. • Platy structure is continuous. • Accessory: Roots do not penetrate the platy structure. • Erosion is severe and has produced deep gullies or rills.

3.6 Hydrologic Function (Watershed Runoff Processes)

Information provided in this environmental impact statement about hydrology is excerpted from the *Hydrologist Specialist Report for the Upper Greys River Vegetation Management Project* by Hydrologist Ronna Simon. The full text of this report is incorporated by reference.

The Upper Greys Vegetation Management project is contained within one 6th field hydrologic unit code (HUC)[8]: 170401030501: Greys River-Spring Creek. While not a true watershed, it is, instead, the uppermost portion of the Greys River watershed. It is 56.3 square miles in size (36,032 acres) and is shown in Figure 3-9.

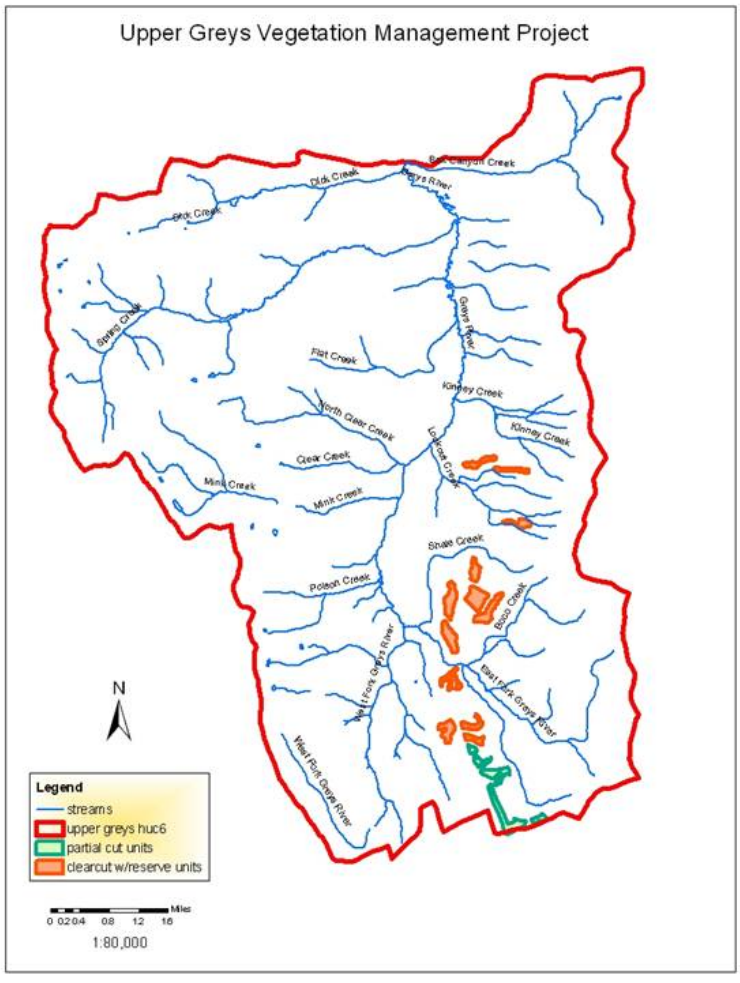


Figure 3-9: Upper Greys 6th field HUC and Proposed Treatment Units

[8] Hydrologic unit codes are a way of identifying all of the drainage basins in the United States in a nested arrangment from largest (Regions) to smallest (Cataloging Units). Watersheds are classified into 6 types of hydrologic units: first-field (regions), second-field (sub-regions), third-fields (accounting units), fourth-field (cataloguing units), fifth-field (watersheds), and sixth-field (sub-watersheds).

3.6.1 AFFECTED ENVIRONMENT

Climate and Precipitation: There is a Snowpack Telemetry (SNOTEL) site operated by the Natural Resources Conservation Service at the south end of the project area, at Spring Creek Divide. Average total annual precipitation for 27 years of record (1981 through 2007) is 35.5 inches. Average annual precipitation on a monthly basis can be found in the Hydrology Specialist Report.

A snow course at Poison Meadows was used to measure snow depths between February 1948 and April 1996. Average first-of-month snow depths were greatest in March, April, and May, with 78, 84, and 74 inches of snow (24.0, 28.8, and 29.5 inches of snow water equivalent), respectively.

Air temperatures have been measured at the Spring Creek Divide SNOTEL site since 1986 (1990 data are missing). Average monthly air temperatures range from 18 in December to 56 in July. Additional data can be found in the Hydrology Specialist Report.

Water Quality: There are no 303(d) listed streams within or immediately downstream of the project area. These are streams where the Wyoming Department of Environmental Quality (WDEQ) has determined that water quality is either impaired or threatened: the list is updated every two years as required by Section 303(d) of the federal *Clean Water Act*. No municipal watersheds, per the definition in Forest Service Manual 2542, are associated with the project area.

The WDEQ classifies streams in the *Wyoming Surface Water Classification List*, Tables A and B, according to beneficial uses that are, or should be, supported for a given stream or reach. Table 3-27 shows the streams in the watershed analysis area that have been classified by WDEQ (WDEQ 2001).

Table 3-27: Stream Classifications

Stream Name	Classification
Greys River*	2AB
Boco Creek*	3B
Box Canyon Cr	2AB
Clear Cr	2AB
Dick Creek	2AB
Flat Creek	2AB
Greys River, East Fork*	2AB
Greys River, West Fork	2AB
Kinney Creek*	3B
Mink Creek	2AB
Poison Creek	2AB
Shale Creek*	3B
Spring Creek	2AB

*Streams within the project area.

According to Wyoming DEQ, "Class 2AB waters are those known to support game fish populations or spawning and nursery areas at least seasonally and all their perennial tributaries and adjacent wetlands and where a game fishery and drinking water use is otherwise attainable. Class 2AB waters are also protected for non-game fisheries, fish

consumption, aquatic life other than fish, primary contact recreation, wildlife, industry, agriculture and scenic value uses." Class 3B streams "are tributary waters including adjacent wetlands that are not known to support fish populations or drinking water supplies and where those uses are not attainable." (available at http://deq.state.wy.us/wqd/WQDrules/Chapter_01.pdf)

- Temperature and specific conductance[9] data were gathered at the gaging station near the mouth of Greys River from 1985 to 1999. Summer water temperatures ranged from 8ºC to 17ºC during the period of record: values were acceptable for support of fisheries and meet State water quality standards.

All water quality data, such as nutrient levels and turbidity, are meeting state standards, and suspended sediment levels are following expected natural trends in a non-regulated system.

Water Quantity: The Bridger-Teton National Forest measured discharges at several sites in the upper Greys River watershed in 1999 and 2000. The most reliable data are from the East Fork and the site at Shot Hole Springs.

- The East Fork information is based on discharges measured from June 13, 1999 to November 7, 1999 and from May 22, 2000 to October 2, 2000. Hydrographs from both sets of data show spring peaks in discharge, tapering off to base flows of less than 10 cfs by late fall.

Stream Channel, Wetland, and Riparian Conditions: There are a number of springs and stream channels (both intermittent and perennial) in the project area. Figure 3-10 includes locations of wetlands and riparian vegetation from the National Wetlands Inventory and the Bridger-Teton vegetation map, as well as the locations of proposed harvest units and existing roads.

[9] A measure of the ability of water to conduct an electrical current.

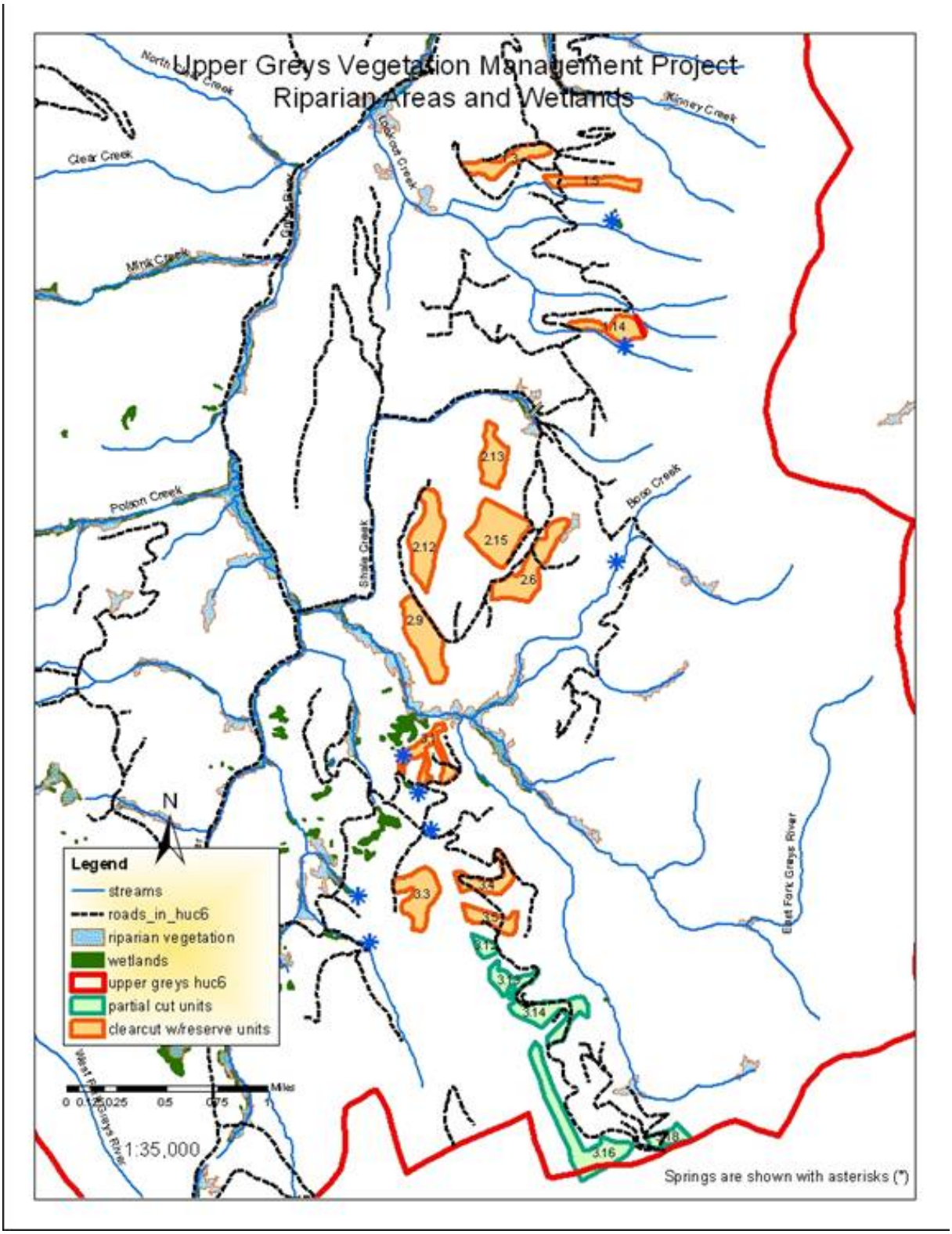


Figure 3-10: Wetlands and Riparian Vegetation

Many units were dropped from the 2006 project proposal, so a number of the channels, springs, and associated wetlands and riparian areas would not be affected under the current proposal. The following text summarizes the Affected Environment of water bodies that could potentially be affected under the proposed action.

Greys River: The main impact to Greys River is from Greys River Road (Forest Road 10138) which parallels the stream and is often close to it. Some impacts from this major Forest road include sediment delivery to the stream, reduction of floodplain and riparian function where the road is in the stream's floodplain, reduction of streambank stability, and alteration of channel form and function where crossing structures are too small to accommodate the bankfull channel width and peak flows. Impacts from dispersed camping are associated with the road. Numerous pullouts off the road – in riparian areas and the floodplain along Greys River – are used by the public for trailer camping, and two-track roads have been developed where vehicles are driven off the main road to access campsites. These uses further increase sediment production and accelerated streambank instability by impeding bank vegetation growth and breaking down streambanks. Excess sediment is also contributed to mainstem Greys River from tributary streams, particularly where roads in those sub-watersheds are delivering excess sediment to tributary channels, and where that material is transported downstream.

Many areas within the sub-watershed were grazed heavily by sheep from the early through mid 1900s. Exposure of bare soils, hillslope erosion, delivery of high amounts of sediment to Greys River, and channel instability resulted from this use. Recovery has taken place, and continues to take place, throughout the sub-watershed. Cattle and sheep grazing still occur in the Greys River watershed, but it is often difficult to distinguish recent livestock impacts from those impacts resulting from recreational and road uses.

Lookout Creek: Two sites were surveyed on Lookout Creek in 2008. The lower site is approximately 1/3 mile upstream from the mouth of the stream. The stream reach is classified according to the Rosgen Stream Classification System as a B4a or B4 type channel (the slope was on the break between the two classes). The sinuosity of this channel reach is slightly lower than normal for the channel type because the stream is confined by a hillslope along its right bank. These channel types are moderately sensitive to disturbance, have excellent recovery potential once they are disturbed, have low streambank erosion potential, and vegetation has a moderate role in controlling stream channel form and bank stability. (Rosgen 1996) A photo of this reach is located in the Hydrology Specialists Report.

There is a moderate amount of sediment loading occurring at this lower site. No land use impacts were observed in the reach. Wildlife use was seen through the reach, but was not notably impacting the channel.

The upper site on Lookout Creek was approximately 200 feet downstream from the 10126 road crossing. This was a short reach because there was abundant down timber and heavy brush in the upper portion of the channel. This reach is difficult to classify under the Rosgen classification system. If the entrenchment ratio is ignored, the stream fits firmly in the A4 Rosgen class. These channel types are extremely sensitive to disturbance, have very poor recovery potential once they are disturbed, carry very high sediment loads supplied by their banks and upstream watersheds, have very high streambank erosion potential, and vegetation

has a negligible role in controlling channel form and stability. A photo of this reach is located in the Hydrology Specialists Report.

Sediment size was considerably finer than at the lower site. There is less loading of excess fine materials at this upper site than at the lower site, so the high amount of fines may reflect mostly natural – or long-term – conditions. The only apparent source for fine materials was the road, approximately 200 feet upstream from the site. There were no other obvious, direct, management-related impacts.

Shale Creek: The 10126 road confines Shale Creek for much of its length, further limiting floodplain extent along this stream which is naturally in a confined valley location. Some sections of road are rutted and have poor drainage, and these conditions lead to accelerated sediment delivery to Shale Creek. There are also several culverts that need to be maintained or replaced/reset.

Animal impacts to the channel are apparent (streambank trampling, browse on riparian vegetation), but they do not appear to be as great an impact to the channel as the road.

At the junction of roads 10126 and 10386, the valley opens up and there is a large willow flat; perennial streamflow in Shale Creek begins here. Horse use is evident in the meadow, especially on slightly drier sites, although some use on sedge is also visible. At least some of the horse use in the meadow is associated with sheep herding in the area and there is a dispersed campsite adjacent to the meadow (east side of road #10386).

East Fork Greys River: The road crossing at the East Fork/main Greys River confluence consists of a large, but undersized culvert. Sediment accumulates at the inlet of the pipe because it is too narrow, and the outlet is scoured.

Upstream from the East Fork Greys River's confluence with Shale Creek there is thick shrub cover (mostly willow), and the stream is in a confined valley. It is in very good condition in this lower reach: there are almost no livestock impacts and trailing is minor. A photo is in the Hydrology Specialists Report.

Other hydrologic resources:

Unit 1-5: The channel on the south side of this unit is small and intermittent. It was not flowing when it was visited on August 21, 2008.

Unit 1-14: The north boundary of proposed Unit 1-14 is the draw to the south of (and feeding into) a steep, blown-out gully at the trailhead to Wyoming Peak. Both are headwater tributaries to Lookout Creek.

A spring-fed channel that marks the southern boundary of Unit 1-14 was flowing when it was visited on 9/12/06. Recent animal trails followed the channel at the time of the visit, and the channel would be vulnerable to direct impacts due to the lack of rock to stabilize the channel.

Unit 2-6: There is a steep, well-defined draw in the southwest portion of the unit but there is no defined channel here.

Unit 2-13: There is a road in the bottom of the draw to the east of the unit (upper end of Shale Creek), but no defined channel and virtually no sign of surface runoff.

Unit 3-1: The west edge of the unit is bordered by a steep, active intermittent channel; livestock have been trailing along it. There are discontinuous headcuts in the channel and a great deal of sediment is being transported by it. Near the northwest corner of the proposed unit boundary there is a seep/spring. There are seeps and associated slumps along much of the northwest unit slope that are likely outside the unit boundary but that need to be noted.

Forest Road 10171 (Poison Meadows Road): There are several (at least seven) poor stream crossings along this road that have undersized or failing culverts, or no crossing structures at all. Much of the lower portion of the road (off the Greys River Road) lacks drainage, causing the road to be deeply rutted and delivering excessive amounts of sediment to channels that feed to Greys River. This portion of road will not be used for any proposed activities.

Desired Future Conditions

All streams in the project area are alluvial stream channels (i.e., not formed in bedrock). Desired future condition for these channels would be for them to be able to adjust their form and gradient, over a period of time, to transport the water, wood, and sediment being delivered to them, and for them to be naturally resilient to disturbance (i.e., recovering without human intervention). Channel cross-section form would generally be maintained, even with lateral migration of the channel. Instream levels of fine sediment would be within a natural range except for short periods of time after disturbance. Streambank stability would reflect stream type and potential for recovery from disturbance.

Riparian areas (including floodplains) and wetlands would store and release enough water to maintain natural conditions of groundwater and stream flow that are essential for wetland integrity. Riparian and wetland vegetation composition would reflect the geomorphic setting and site potential, providing for a variety of habitats. Vegetative cover and root-mass on channel banks, wetland areas, floodplains, and shorelines would be sufficient to catch sediment, dissipate stream energy during floods, stabilize stream banks to maintain channel form and reduce excessive bank erosion, and promote floodplain development. Flood waters would be able to access the active floodplain during normal high discharges, approximately every two out of three years on average where there are no droughts (i.e., channels are not downcut).

Surface water quality on National Forest System lands would meet State water quality standards via support of beneficial uses for designated Surface Water Classes (Water Quality Rules and Regulations, Chapter 1, *Wyoming Surface Water Quality Standards*).

3.6.2 ENVIRONMENTAL EFFECTS

Issues and Indicators

Issue	Indicator
a. There is a concern that road construction and maintenance, and harvesting activities, may increase sediment delivery to streams in the analysis area (and effect Snake River Cutthroat Trout)	a. Miles of road, by 6th field HUC, within 300 feet of streams. b. Road density within 6th field HUCs c. Road crossing density: number of road-stream crossings per area of 6th field HUC. d. Equivalent Clear-cut Area (ECA) e. Sediment delivery from selected roads and harvest units to water bodies (using WEPP:Road and Disturbed WEPP) f. Miles of motorized route, by 6th field Hydrologic Unit (HUC), within 300 feet of stream channels. g. Road density within 6th field HUCs
b. There is a concern that adverse impacts to riparian resources may result from proposed road and harvest activities.	

Alternative A - No Action

Direct and Indirect Effects

Changes in water temperature and in sediment delivery to stream channels are the most likely water quality changes to result from timber harvest and road-related activities.

Temperature: Stream temperatures are meeting water quality standards, as described in the Affected Environment section, above. These conditions would continue under the No Action Alternative.

Sediment

Roads within 300 feet of Stream Channels: Roads within 300 feet of stream channels have the potential to deliver sediment to stream channels. There are currently 21.7 miles of road

within 300 feet of stream channels and this mileage would not change under the No Action alternative.

Road Crossing Density: There are currently a total of 58 stream crossings in the Greys River – Spring Creek HUC, leading to a crossing density of 1.03 crossings per square mile of HUC. Existing road crossing density in the HUC (which is the density that would exist under the No Action alternative) is in line with densities in managed watersheds (Schnackenberg and MacDonald, 1998). This indicates that road crossings are currently a possible source of measurable quantities of sediment (or of other effects associated with stream crossings—e.g., channel confinement) to streams in the analysis area.

Road Reconstruction: No measurable change in sediment production or delivery to channels would occur as a result of the No Action Alternative on the Greys River-LaBarge Road segment, because existing use levels would continue, and road conditions and maintenance would not change.

On the Shale Creek Road, sediment production and delivery to Shale Creek would be higher under the No Action Alternative than under the proposed action because rutted road surfaces and culverts that are not functioning would not be repaired. Results from modeling of sediment production and delivery to Shale Creek using WEPP:Road support this determination.

Erosion and Sediment Delivery Rates and Probabilities from Harvest Units: For all harvest units, there is no (or very little) probability of runoff, soil erosion, and sediment delivery to stream channels under the No Action Alternative.

Water Quantity, Riparian and Stream Channel Condition

Road Density: Road density (miles of road/square mile of land) is an indicator of the presence of potentially important sediment input from roads to streams. In the Upper Greys project area, current road density for the sub-watershed is 1.41 miles of road per square mile of watershed, which is considered "moderate" by Quigley et al. (1996) with respect to potential for adverse impacts to streams. This would not change under the No Action Alternative.

Stream Channel Conditions: Conditions of stream channels reflect the impacts of natural events and human activities within their watersheds, and their natural characteristics (e.g., sensitivity to disturbance, ability to recover once disturbed).

Greys River would experience no change from current conditions and trends as a result of the No Action Alternative. No changes in alignment or maintenance of the road would take place.

No changes in channel stability would be expected for the upper reach of Lookout Creek under the No Action Alternative, despite this A4 channel's "extreme" sensitivity to disturbance and "poor" recovery potential according to Rosgen (1996). No changes to the current condition of Lookout Creek would be expected under the No Action alternative.

Current conditions and trends would persist in Shale Creek and East Fork Greys River under the No Action alternative.

Cumulative Effects

Equivalent Clear-cut Area: Timber harvest and vegetation removal from other activities (e.g., fires, roads) may change snow distribution, snowmelt, and stream runoff patterns (e.g., Stegman, 1996; Troendle et al., 2006). Potential changes to runoff include earlier and higher spring runoff peak flows (Reid, 1993; Dissmeyer, 2000). These changes have the potential, in turn, to adversely affect aquatic habitat, increase sediment delivery to streams and decrease stream channel stability. The Equivalent Clear-cut Area method (ECA) provides an indicator of the extent to which watersheds (especially the vegetative component) have been altered by past and foreseeable future activities. ECA is an indicator of cumulative watershed effects, taking into account past, present, and foreseeable future activities. Watersheds having more than approximately 30 percent of their area in an "equivalent clear-cut" condition are generally considered to have a high potential for changes in runoff quantities and timing, based on research results (Bethlamy 1975, Cheng 1989, Burton 1997). The Watershed Disturbance Standard in the Forest Plan does not allow more than 30% disturbance within a three-decade period for this reason.

Taking past fires, timber harvest, and existing roads into account, two percent of the Greys River–Spring Creek sub-basin is in an Equivalent Clear-cut condition. Although fairly extensive harvest took place in the past, most of the units were cut in the 1960s and 1970s which makes them more than 30 years old. The No Action Alternative, then, meets current Forest Plan direction and would not be expected to cause a change in hydrologic conditions.

Stream Channel Conditions: Greys River is not expected to experience changes in other uses along the river (recreation, grazing); so there would be no changes to Greys River attributable to cumulative effects under the No Action Alternative.

Alternative B - Proposed Action Revised

Direct and Indirect Effects

Changes in water temperature and in sediment delivery to stream channels are the most likely water quality changes to result from timber harvest and road-related activities.

Temperature: Temperatures are not expected to change as a result of Alternative B because buffers on stream channels under the proposed action would be sufficient to avoid increased water temperatures that could be associated with riparian canopy removal.

Sediment

The following sections describe potential changes in sediment production and delivery to stream channels as a result of Alternative B.

Roads within 300 feet of Stream Channels: Roads within 300 feet of streams are of interest due to their potential to deliver sediment to stream channels. A number of variables affect the actual distance that sediment will travel: smaller source areas for runoff, increased density of obstructions to overland flow, and gentler hillside gradients lead to shorter travel distances for sediment.

Of the 79.5 miles of existing road in the sub-watershed, 21.7 miles are currently within 300 feet of stream channels. An estimated 3.15 miles of temporary road would be constructed under the proposed action in addition to the existing roads. The temporary roads consist of short segments of road (up to 0.5 mile in length) that would provide access from existing roads to harvest units. Likely locations of the temporary roads have been defined; as stated in the mitigation measures, if the locations of temporary roads change significantly from their proposed locations-- and in particular if they change to be either near streams or to include channel crossings—additional specialist input will be required. Table 3-28 shows the approximate mileages of temporary roads (total road mileage for each unit, adding all short segments together for a given unit).

Table 3-28: Total Temporary Road Mileages (sum of all proposed segments)

Harvest Unit	Total temp road for unit (mi)
1.14	0.1
1.3	0.3
1.5	0.1
2.12	0.3
2.13	0.5
2.6	0.1
2.9	0.5
3.13	0.1
3.14	0.3
3.16	0.4
3.3	0.7
3.4	0.1
3.5	0.1

The proposed locations do not include any stream crossings, are far (greater than 300 feet) from stream channels and wetlands, and the roads would be decommissioned after all post-harvest activities were completed. Some of the temporary roads consist of existing closed roads that would be reopened for vegetation management activities (and closed again afterward). There would be no increase in the amount of road within 300 feet of channels under the proposed action, so there would be no difference in impacts as compared to the No Action alternative.

Road Crossing Density: Road impacts are especially important at crossings if culverts change channel form and capacity, reducing the ability of streams to move sediment, transport flood flows, and if they keep streams from adjusting form to accommodate changes in flows and sediment loads. Culverts are the most common crossing structure used on Forest roads and tend to be undersized. If they are not maintained they may be prone to

clogging by debris, sediment, or structural damage. (Reid, 1993) Poorly designed or installed structures cause creation of sediment deposits upstream due to reduced flow velocities just above the inlet, and knickpoints and plunge pools downstream where velocities are accelerated by culvert pipes, causing erosion. Abandoned roads may also fail due to lack of culvert maintenance: clogging of these structures may lead to road fill washouts and potential delivery of large amounts of sediment in one pulse.

Road crossings are currently a possible source of measurable quantities of sediment (or of other effects associated with stream crossings—e.g., channel confinement) to streams in the analysis area. However there are no proposed stream crossings by temporary roads, so the number of crossings would remain unchanged under the proposed action. Thus there are no differences in effects as compared to the No Action Alternative.

Road Reconstruction: Under the proposed action, road reconstruction activities would take place on portions of the following roads that are proposed to be used for haul:

- 10126 road (Shale Creek/Kinney Creek loop)
- 10386 road (Shale Creek Timber Sale)
- 10171 road (East Fork Loop) from Tri-Basin Divide (the portion near Poison Meadows would not be used)

Reconstruction activities would consist of culvert replacement, spot surfacing, and placement of geotextiles to reduce rutting and drainage problems.

This Greys River-LaBarge Road currently has high volumes of traffic and no reconstruction is proposed for this segment. No measurable change in sediment production or delivery to channels would occur as compared to the No Action Alternative because existing use levels would continue, and road conditions and maintenance would not change.

On the Shale Creek Road, sediment production and delivery to Shale Creek would be lower under Alternative B as compared to the No Action Alternative. This conclusion is borne out by field observations of rutted road surfaces and culverts that are not functioning as they should, as described in the Affected Environment section, above. Road reconstruction under the proposed action would reduce sediment production and delivery to Shale Creek, resulting in fewer negative impacts to the channel than currently exist. Short-term (during reconstruction and haul), sediment production and delivery levels would be higher than long-term due to ground disturbance during reconstruction and increased traffic levels during haul. WEPP:Road modeling results show short-term sediment production to be 0.22 to 0.48 times the current condition (No Action alternative), and long-term sediment production to be 0.08 to 0.20 times the amount currently produced. Sediment delivery to Shale Creek would be 0.24 to 0.36 the amount currently delivered in the short-term, and 0.12 to 0.21 times the current delivery amount in the long-term.

Impacts from the poor-condition section of the Poison Meadows Road would be the same under Alternative B as under the No Action Alternative because no rehabilitation would be conducted under either alternative.

Probabilities of Runoff, Erosion, and Sediment Delivery from Harvest Units: Based on Disturbed WEPP modeling, there is a higher probability of sediment being eroded from harvest units than there is of it being delivered to a stream channel (the sediment would be deposited before reaching the stream channel). The probabilities for runoff and sediment delivery are highest for proposed unit 2.12 because of the pre-existing harvest unit between the proposed harvest unit and Shale Creek, and because of the soil textures in the buffer.

Water Quantity, Riparian and Stream Channel Condition

Road Density: As stated above, road density (miles of road per square mile of land) is an indicator of the presence of potentially important sources of sediment input from roads to streams. Increased road density can indicate increased surface fines in streams and wider and shallower channels, which indicate degrading channel conditions (Riggers et al. 1998). Road density was used as an analytical variable in the Interior Columbia Basin assessment (Quigley and Arbelbide 1997), and was found to have a negative correlation with certain habitat parameters, especially pool frequency.

Road density is also an indicator of where other road-related impacts (e.g., alteration of runoff hydrology, confinement of streams and floodplains) may occur, if stream channels are present in the area. Higher road densities may indicate the potential amount of "hydrologic connectivity" between roads and streams, i.e., the degree to which road segments convey road runoff directly to stream channels, thereby becoming part of the stream network. Studies show that peak flow increases and changes in runoff timing are linked to this extension of the drainage network and its connectivity to streams (Furniss et al. 2000; Wemple et al. (1996).

Under the proposed action, road density in the sub-basin would rise to 1.48 miles per square mile compared to 1.41 miles per square mile under the No Action Alternative. Both are considered a "moderate" density by Quigley et al. (1996) with respect to potential for adverse impacts to streams. The additional roads beyond the existing roads would all be temporary roads, which would be closed at the end of activities with long-term road densities returning to 1.41 mile per square mile. Therefore, there would be a short-term increase in road densities during project implementation, but in the long-term, there would be no difference between the No Action Alternative and Alternative B.

Stream Channel Conditions: Greys River would experience no change from current conditions and trends under this alternative. No changes in alignment or maintenance of the road would take place under the proposed action.

The upper Lookout Creek channel would not be impacted by timber harvest activities under the proposed action; there is no harvest proposed upstream from the reach. Road reconstruction activities would have the potential to increase short-term sediment delivery to the reach due to grading, with long-term sediment delivery decreasing below existing conditions if the section of road above the section of channel was properly drained and graveled. No changes in channel stability would be expected for this reach of Lookout Creek, despite this A4 channel's "extreme" sensitivity to disturbance and "poor" recovery potential according to Rosgen (1996). The reach of Lookout Creek in the vicinity of the lower survey site could potentially be indirectly impacted by timber harvest under the proposed action because units 1.3, 1.5, and 1.14 are upstream from it. Road reconstruction

upstream from the reach could also potentially impact it. This reach is a Rosgen B4a or B4 channel type, which is moderately sensitive to disturbance but has excellent recovery potential. Based on the coarse channel materials in this reach, it is unlikely that channel stability would be adversely affected by upstream activities. The moderate RSI value indicates that sediment may accumulate here or could be transported downstream to Greys River if increased delivery to the channel results from management activities.

Shale Creek would experience a localized, short-term increase in instability from culvert replacement, with long-term improvement in channel conditions (compared to the no action alternative) where culverts were properly sized and installed under the proposed action. Road grading and spot surfacing under the proposed action would also produce short-term adverse impacts with long-term improvements in sediment delivery (per WEPP:Road results) and channel condition. Probabilities of increased sediment delivery to Shale Creek from timber harvest in unit 2.12 range from 12 to 16 percent (compared to a no action probability of 2%), depending on the alternative and the scenario.

Indirect impacts to lower East Fork Greys River could result from timber harvest in units 2.9, 3.1, and from their associated roads. But as demonstrated in the Disturbed WEPP results, the probability of sediment delivery ranges from 0% (no action) to 2% under all scenarios. Changes in channel conditions due to management are not likely to occur under the proposed action.

Cumulative Effects

Equivalent Clear-cut Area (ECA): See explanation for ECA under Alternative A. Under Alternative B, all proposed units and roads in the Greys River-Spring Creek sub-basin were added to the existing condition. Another proposed project that was not included in the existing condition (Spring Creek Cleanup) and a 1994 sale that was not included in the database for the existing condition (Lookout Boco) were also added to the analysis for the proposed action. Including all past, present, and foreseeable activities, total ECA would be three percent, which is well below the limit of 30 percent stated in the Forest Plan. The proposed action would meet Forest Plan direction, and would not be expected to cause a change in hydrologic conditions in the sub-basin.

Stream Channel Conditions: Greys River is not expected to experience changes in other uses along the river (recreation, grazing); so there would be no changes to Greys River attributable to cumulative effects under Alternative B.

Summary of Environmental Consequences

Table 3-28 provides a summary of the information provided above.

Table 3-29: Summary of Environmental Consequences

Indicator	No Action	Proposed Action	Assessment of Impacts
Roads within 300 ft of channels	21.7 mi	21.7 mi	Same under both alternatives
Road crossing density	1.03 crossings/sq mi watershed	1.03	Same under both alternatives
Sediment from haul roads-Greys River road			Same under both alternatives
Sediment from haul roads-(Shale Creek Road (using existing condition as basis for comparison)	Lower and upper: 1 (short-term and long-term)	Lower: 0.48 (short-term), 0.20 (long-term). Upper: 0.22 (short-term), 0.08 (long-term)	Less sediment produced from road under proposed action
Sediment entering Shale Creek-Shale Creek Road (using existing condition as basis for comparison)	Lower and upper: 1 (short-term and long-term)	Lower: 0.36 (short-term), 0.21 (long-term). Upper: 0.24 (short-term), 0.12 (long-term)	Less sediment delivered to channel under proposed action
Sediment from harvest on select units	0 – 2% probability of sediment delivery to channels	2 – 16% probability of sediment delivery to channels	Higher probability of sediment delivery to channels under proposed action.
Road density	1.41 mi/sq mi watershed ("moderate")	1.48 mi/sq mi watershed (short-term), 1.41 mi/sq mi watershed (long-term). "moderate"	Short-term increase in road density-related impacts under proposed action; long-term no change from no action
ECA	2% of HUC as ECA	3% of HUC as ECA	Both meet Forest Plan standard. No measurable change to hydrology under either alternative.

3.7 Fisheries

Information provided in this environmental impact statement about fisheries is excerpted from the *Fisheries Specialist Report for the Upper Greys River Vegetation Management Project* by Fisheries Biologist David Fogle. The full text of this report is incorporated by reference.

Fisheries analysis includes the Spring Creek hydrologic unit (6th HUC 170401030501) of the Greys River from the headwaters of the Greys River north to Kinney Creek (36,054 acres). The Upper Greys Vegetation Management Project has been proposed to treat approximately

362 acres of mixed conifer, within a 9,500 acre project area (4%). Analysis for fisheries includes the Greys River and sub-drainages of Kinney, Lookout, Shale, East Fork, and Boco Creek.

3.7.1 AFFECTED ENVIRONMENT

Analysis for fisheries was conducted at the 6th Hydrologic Unit Code (HUC) to utilize the *Wyoming Game and Fish Department, Jackson Region Sub-Basin Management Plan* (WGFD 2005). Bridger-Teton National Forest fish distribution and habitat surveys were conducted on a 1,000 meter reach level on individual streams (Novak 2008). Fish distribution and population data surveys have been completed to verify fish presence and distribution in all named streams in the project area (USFS 2001; Novak 2004). Unnamed tributaries contributing greater than 10% of the flow to a named stream were surveyed where there was an identified need (i.e., known or suspected spawning tributary, stream dominated by non-native trout, connectivity to a fish bearing lake, etc.) (Novak 2008).

The *Wyoming Game and Fish Department, Jackson Region Sub-Basin Management Plan* was used for background information, state management objectives, limiting factors, and management opportunities (WGFD 2005). BTNF fish habitat and distribution inventory were used to determine Affected Environment of fish habitat and population composition on individual streams (USFS 1999).

Approximately 4.2 kilometers of streams in the analysis area were surveyed for aquatic habitat and fish populations in 1999 and 2000. Shale Creek was sampled again in 2006 by Forest Service personnel using electro-fishing equipment to assess fish populations. Of the tributaries sampled Shale Creek was the only sub-drainage sampled that contained fish. Both the 1999 and 2006 samples contained all juvenile cutthroat trout that would indicate successful spawning and rearing habitat in the project area. The Wyoming Game and Fish Department estimates that 50-299 trout pound per mile occur in the Greys River (WGFD 2005).

Habitat surveys indicate stream bank stability on the Greys River in the project area range from 80-100% over a 6,000 meter sample. Stream bank stability was not calculated on Shale, Lookout, Kinney, East Fork, or Boco creeks due to a lack of or low numbers of fish in the sample. Survey notes indicate that the primary source of impact to the fisheries comes from road, trail and sheep grazing.

Table 3-29: Native Fish of the Greys River Drainage

Common Name	Scientific Name
mottled sculpin	*Cottus bairdi*
mountain sucker	*Catostomus platyrhynchus*
mountain whitefish	*Prosopium williamsoni*
redside shiner	*Richardsonius balteatus*
Snake River cutthroat trout	*Oncorhynchus clarki ssp.*
Utah sucker	*Catostomus ardens*

WGFD 2005

Table 3-30: Non-Native Fish of the Greys River Drainage

Common Name	Scientific Name
brook trout	*Salvelinus fontinalis*
rainbow trout	*Oncorhynchus mykiss*
brown trout	*Salmo trutta*
Rainbow x cutthroat trout	

WGFD 2005

Native fish species dominate the overall fish population in the Greys River and non-native fish (brook trout) are rare in the upper Greys River. There are no man-made fish barriers (culverts, dams, or irrigation diversion) in the project area that disrupt migration. A large culvert on the Greys River at Shale Creek forms a partial barrier to fish migration in low water but is passable to spawning trout as evidenced by the presence of juvenile trout in Shale Creek. A Landscape Scale Assessment (LSA) of the Greys River in 2004 recommended replacement of the Shale Creek culvert to provide fish passage (Greys River LSA). Replacement of this culvert is not proposed under this project, because it does not affect the use of the road for vehicle travel or log haul and would not be economically viable under proposed timber harvest levels.

High sediment levels in Shale Creek and East Fork were identified in the Greys River LSA (pg 194) as impairment to trout reproduction and survival. Habitat surveys (USFS 2000) estimated surface fines[10] ranged from 5-30% in the Upper Greys River. The higher percentage of surface fines is attributed to the close proximity of the river to the road.

Shale Creek from the confluence with the Greys River upstream into the project is characterized as having high surface fines (90%) at its origin in a wet meadow. Surface fines decrease (30%) as the channel becomes more confined and substrate becomes coarse and at the confluence with the Greys River estimated surface fine were 10%. Higher surface fines (>30%) were collected in stream reaches where Forest Service Road 10126 is close to the stream.

Fish populations were concentrated in the lower reaches, declining upstream and no fish were found above 500 meter sample points (USFS 2000). Stream bank stability was not calculated on Lookout, Kinney, East Fork, or Boco creeks due to a lack of fish in the sample. Survey notes indicate that the primary source of impact to the fisheries comes from road, trail and sheep grazing.

Threatened and Endangered Species

U.S. Fish and Wildlife Service designated Threatened and Endangered Species for the Bridger-Teton National Forest (USFS 1991).

[10] fine sediment

Kendall Warm Springs Dace (endangered)

The Kendall Warm Springs emerge and flow about 300 yards to join the Green River. The spring outflow supports the only known population of the Kendall Warm Springs dace *(Rhinichthys osculus thermalis)*, which is listed as an endangered species. Kendall Warm Spring dace are not found in the Snake River or its tributaries.

Intermountain Region Sensitive Species

The Forest Service has adopted policies to ensure that agency actions do not drive rare species towards listing as Threatened or Endangered under the *Endangered Species Act*. Forest Service Region 4 has developed lists of "Sensitive Species" that warrant special attention on National Forest System lands (USFS 1991). Sensitive species are defined as "plant and animal species identified by the Regional Forester for which population viability is a concern as evidenced by: (a) significant current or predicted downward trends in population numbers or density, and/or (b) significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution."

Intermountain Region designated Sensitive Species for the Bridger-Teton National Forest (USFS1991) found in the project area:

- **Finespotted Snake River cutthroat trout** (*Oncorhynchus clarki ssp*.)

The distribution of the finespotted Snake River cutthroat trout in the project area overlaps the Yellowstone subspecies. The Yellowstone form is found in headwater tributaries and the finespoted form lower in the drainage (USFS 2003). Biochemical-genetic studies indicate very little difference between the two cutthroat trout. For administrative purposes the Yellowstone River cutthroat trout and finespotted Snake River cutthroat trout (SRC) are considered a single entity. Yellowstone cutthroat trout were petitioned for listing under the *Endangered Species Act* in 1998. A *Range–Wide Status Review* and District Court Decisions resulted in a not warranted (Idaho 2008). Threats to the species include disease, habitat loss, and competition and hybridization with non-native trout.

Rivers and tributaries in the project area provide spawning, rearing and adult habitat for finespotted Snake River cutthroat trout. WGFD estimate 50-299 pounds per mile of trout in the Upper Greys River (WGFD 2004). SRC are well distributed in the project area and are the dominant species in the Upper Snake River. Overall health of finespotted Snake River cutthroat trout populations in the Greys River is strong with good conductivity between streams. Greys River and the sub-drainages of Kinney, Lookout, Shale, East Fork, and Boco creeks meet the WGFD management objective to conserve the wild trout fishery and the integrity of the indigenous Snake River cutthroat trout while maintaining sport fishing opportunities.

Management Indicator Species (MIS)

Bridger-Teton National Forest Land and Resource Management Plan designated Management Indicator fish species.

Finespotted Snake River cutthroat trout (*Oncorhynchus clarki ssp*.)

Rivers and tributaries in the project area provide spawning, rearing and adult habitat for finespotted Snake River cutthroat trout. WGFD estimate 50-299 pounds per mile of trout in the Upper Greys River (WGFD 2004). Finespotted Snake River cutthroat trout are well distributed in the project area and are the dominant species in the Upper Snake River. Overall health of Snake River cutthroat trout populations in the Greys River and sub-drainages of Kinney, Lookout, Shale, East Fork, and Boco creeks is strong with good conductivity between streams. Rivers and streams in the project area meet the WGFD management objective to conserve the wild trout fishery and the integrity of the indigenous Snake River cutthroat trout while maintaining sport fishing opportunities.

Rainbow trout (*Oncorhynchus mykiss)*

Rainbow trout stocking by the Wyoming Game and Fish Department has been discontinued but the species are still present in small numbers in the Snake River. Rainbow trout have not been detected using electrofishing and creek surveys in the Upper Greys River and sub-drainages of Kinney, Lookout, Shale, East Fork, and Boco creeks.

Desired Future Conditions

Fisheries Habitats

Direction from the *Bridger-Teton National Forest Land and Resource Management Plan* is to provide adequate habitat for dependent fish and wildlife populations (USFS 1990. pg 123). Sensitive Species Management Standard regarding fisheries management is to keep Intermountain Region designated Sensitive Species from becoming threatened under the *Endangered Species Act* and act cooperatively with the Wyoming Game and Fish Department in the management of fishery resources (USFS 1990, pg 126).

The principle management objective of the Wyoming Game and Fish Department (WGFD) in this drainage is to conserve the wild trout fishery and the integrity of the indigenous Snake River cutthroat trout while providing sport fishing opportunities.

3.7.2 ENVIRONMENTAL EFFECTS

This section discloses the effects of each alternative on fishery resources. The assessment discusses direct, indirect, and cumulative effects on Snake River cutthroat trout habitat and barriers within the analysis area. The cumulative effects boundary encompasses the 36,054 acre Upper Greys watershed.

Issues and Indicators

Issue	Indicator
Effect on Snake River cutthroat habitat and water quality a. Effects from roads and harvesting activities on sedimentation and fish passage b. Riparian effects	The direct and indirect effects of vegetation management on riparian and Snake River cutthroat trout habitat. *Additional indicators regarding sedimentation and watershed quality are listed in the Watershed Section.*

Alternative A – No Action

Direct and Indirect Effects

Under the No Action Alternative, no vegetation management activities would occur in the Upper Greys River drainages. The impact of not treating 362 acres of conifer trees will have no measurable direct effect on fish or fish habitat.

The no treatment alternative will ensure a continued supply of large woody debris into area streams that will contribute to improved fish habitat in the long term. The No Action Alternative will also increase the likelihood of a large fire that could impair water quality and riparian vegetation with negative direct and indirect effects to fish populations in the project area.

Cumulative Effects

In addition to the proposed Upper Greys Vegetation Management Project there is another proposed timber sale (Spring Clean-up), and 2 active sheep allotments (Spring Creek and Upper Greys) in the Upper Greys watershed. The cumulative effect of not treating 362 acres of conifer trees in the 36,054 acre watershed will have no measurable effect to the overall health of the fisheries in the project area.

Alternative B – Proposed Action Revised

Direct and Indirect Effects

The proposed action is unlikely to have any direct effect on fish or fish habitat as a result of harvesting upland tree species and not entering riparian vegetation. Standards and Guidelines and State best management practices for logging are designed to minimize direct effects to riparian vegetation and fish habitat from roads used as part of the timber harvest operation.

Threatened and Endangered Species:

Kendall Warm Spring dace are not found in the Snake River or its tributaries.

- *Determination:* **No Effect.** Due to the absence of substantially additive effects, the determination of effect for all federally listed species is "**No Effect"**.

Intermountain Region Sensitive species:

Implementation of Alternative B using Forest Service Standards and Guidelines and following State best management practices for logging will result in no measurable direct impacts to riparian areas, finespotted Snake River cutthroat trout populations or effect fish passage.

- *Determination:* Due to the absence of substantially additive effects, the determination of effect for finespotted Snake River cutthroat trout is "**May impact individuals but not likely to cause a trend to federal listing or a loss of viability**".

Management Indicator Species

Implementation of Alternative B using Forest Service Standards and Guidelines and following State best management practices for logging will result in no measurable direct impacts to Finespotted Snake River cutthroat trout and rainbow trout populations, habitat or fish passage.

- *Determination:* **May impact individuals but not likely to cause a trend to federal listing or a loss of viability for finespotted Snake River cutthroat trout. No Effect** for **rainbow trout**.

The project is designed to target upland vegetation but potential effects to fish from sediment may come from haul roads, skid trails, and yarding operations. Forest Service Standards and Guidelines and Wyoming best management practices for timber harvesting and road construction will minimize or eliminate potential effects to fish or fish habitat from sediment generated as a consequence of timber harvesting.

Cumulative Effects

There may be a negative short term effect to individual fish from sediment entering streams as a result of the timber harvest and increased heavy truck traffic. The proposed project will have no long-term effects to fish or fish habitat after the project is completed.

In addition to the proposed Upper Greys project there is another proposed timber sale (Spring Clean-up), and 2 active sheep allotments (Spring Creek and Upper Greys) in the Upper Greys watershed. Ongoing and proposed livestock grazing and proposed timber management will have no long-term negative effect on fisheries but may have short-term effects on individuals as a result of increased vehicle traffic that mobilizes sediment into streams.

3.8 Roads and Transportation

Information provided in this environmental impact statement about roads nd transportation is excerpted from the *Transportation Report for the Upper Greys River Vegetation Management Project* by Engineer Anita Lusty. The full text of this report is incorporated by reference.

This transportation analysis will inventory the existing transportation system in the project area and identify any changes needed for this project. Users of the transportation system include administrative, commercial, and recreational users. Commercial users include timber harvesters, outfitters, and firewood collectors. Hikers, horse riders, anglers, and hunters are the major recreational user groups.

3.8.1 AFFECTED ENVIRONMENT

The roads analysis area is bordered by the Greys River road on the west and the Greys River/Big Piney District boundary on the east. This area is 21 square miles and contains 30.5 miles of open road, and 18.5 miles of closed road. The roads in the project area were constructed for timber harvest in the 1960's and 1970's. Presently, the roads are used for recreation, hunting, and firewood gathering. The Wyoming Peak trailhead is accessed using this road system.

The existing open road density in this analysis area is 1.45 miles of open road per square mile. This is slightly less than the maximum desired condition of 1.5 miles per square mile (for DFC 1B). The maximum short-term open road density would be 1.72 miles per square mile which is slightly lower than the maximum short-term desired condition of 1.75 miles per square mile. This road density estimate includes the unlikely event that all possible temporary roads and temporary spur roads (5.6 miles) would be open at the same time.

Phase I roads begin at the north end of the project area with Shale Creek/Kinney Creek Loop Road (Forest Service Road #10126) and spurs, the Kinney Creek Road (Forest Service Road #10388) and spurs, Lookout Creek Road (Forest Service Road #10135) and spurs, and the Shale Creek/ Lookout Creek Road (Forest Service #10384) and spurs.

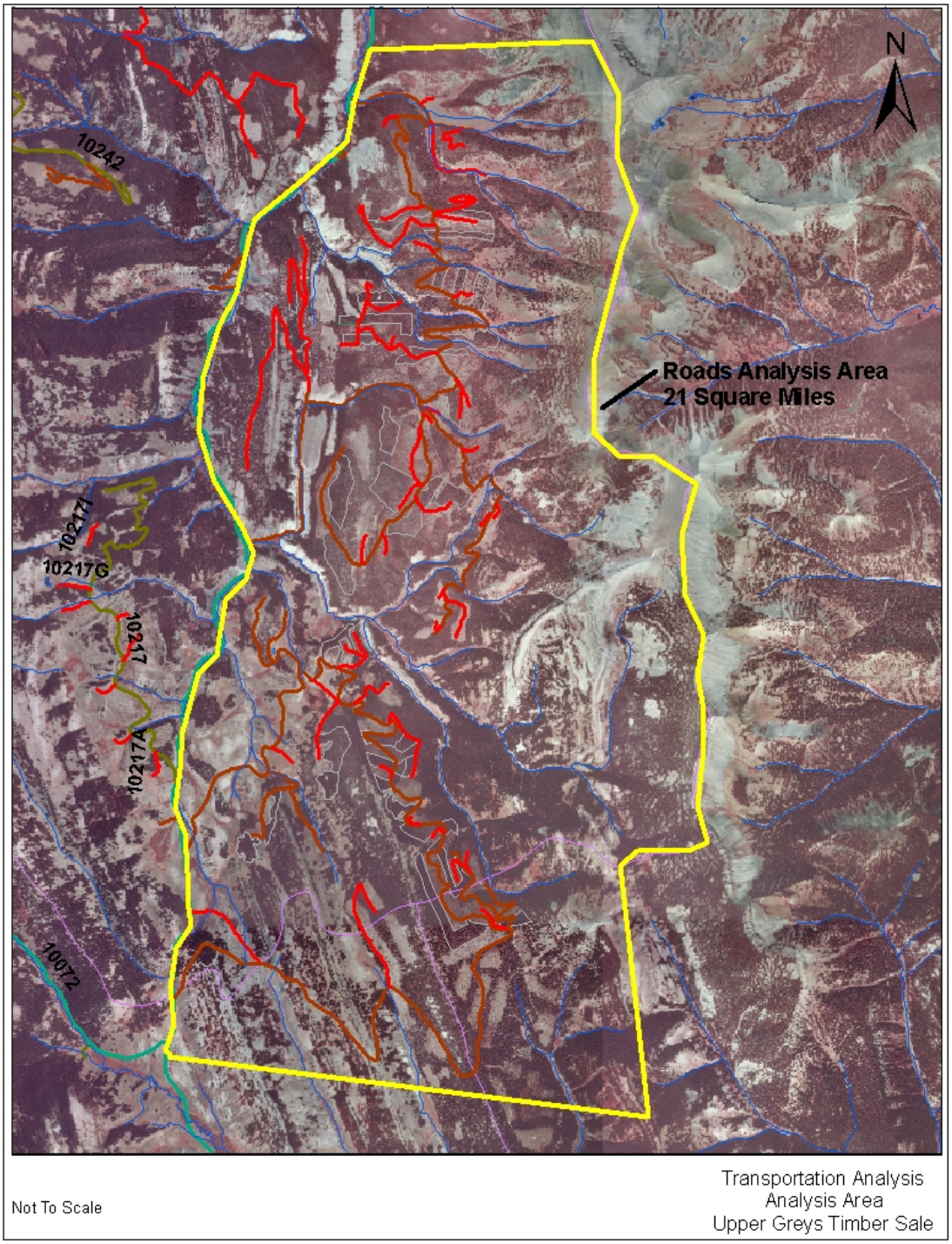


Figure 3-11: Transportation Analysis Area

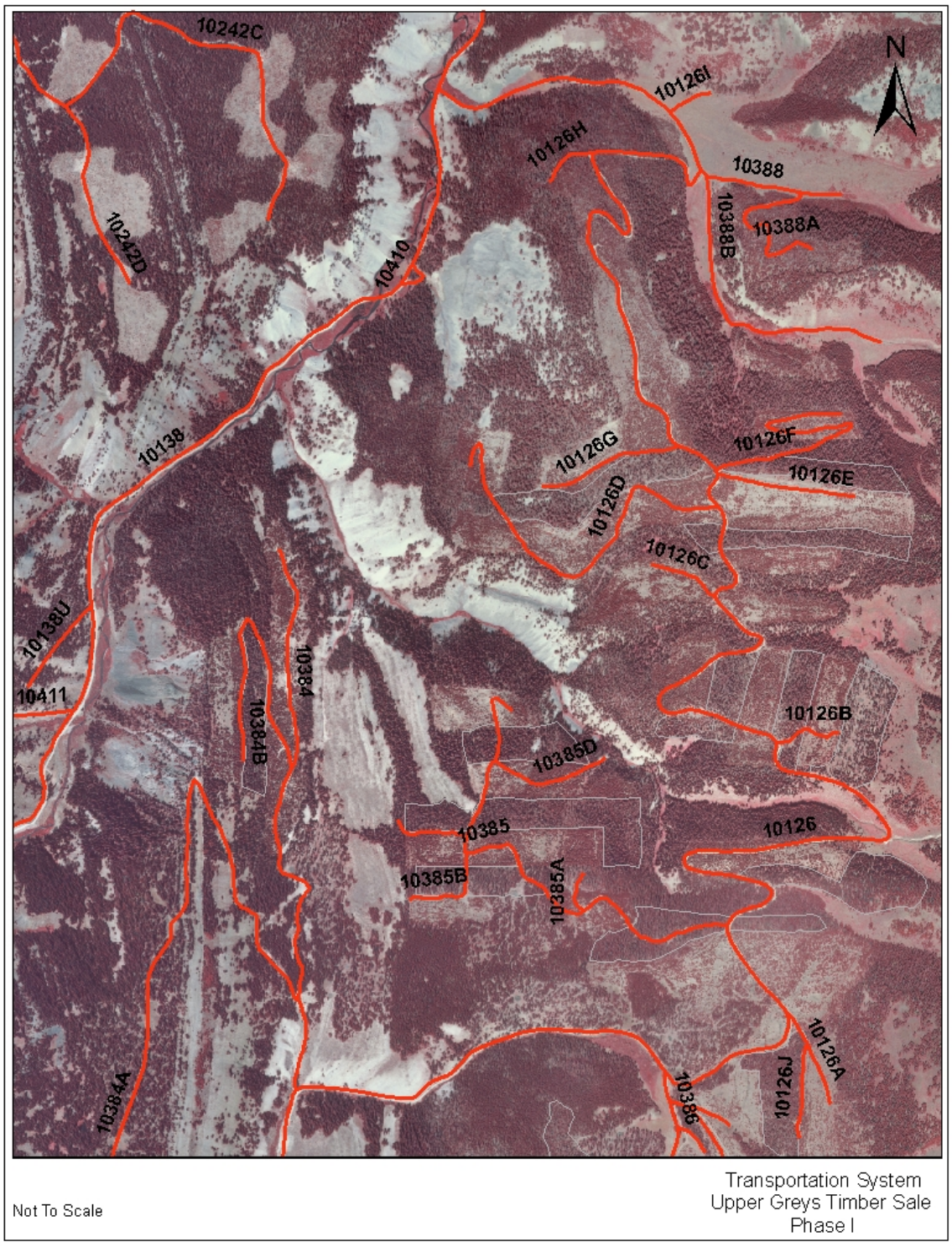


Figure 3-12: Upper Greys Timber Sale Phase I

***Shale Creek/Kinney Creek Loop Road and Spurs*:** The Shale Creek/Kinney Creek Loop, Forest Service Road # 10126, begins on the Greys River Road in Section 4 (at milepost 68) and proceeds east and south for 6.9 miles ending back on the Greys River Road in Section 20

(at milepost 71.5). This road is a collector road with a maintenance level 2, which is a road for use by high clearance vehicles. This road has a well defined prism and is holding up well for the current amount of constructive maintenance and use. Some sections require shoulder clearing, drainage improvement, or spot surfacing for soft and wet areas in order to bring the road up to its design prism. The ten spur roads, Spur A through J, are all local roads with maintenance level 1 (administratively closed to public motorized use).

Kinney Creek Road and Spurs: The Kinney Creek Road, Forest Service Road # 10388, begins on the Shale Creek/Kinney Creek Loop and provides access to the east. This road is a local road with a maintenance level 2. The two spur roads, Spur A and B, are local roads with maintenance level 1 (administratively closed to public motorized use).

Lookout Creek Road and Spurs: The Lookout Creek Road, Forest Service Road # 10385, begins on the Shale Creek/Kinney Creek Loop and provides access to the west. This road and the four spurs (Spur A through D) are local roads with a maintenance level 1 (administratively closed to public motorized use).

Shale Creek/Lookout Creek Road and Spurs: The Shale Creek/Lookout Creek Road, Forest Service Road # 10384, intersects with the Shale Creek/Kinney Creek Loop on its south end. This road and its two spurs are all local roads with a maintenance level 1 (administratively closed to public motorized use).

Table 3-31: Phase 1 Transportation System: Upper Greys Vegetation Management

Road Name	Road Number	Begin MP	End MP	Oper Maint Level	Obj Maint Level	Funct Class	Surfacing	Traffic Service Level
Shale Creek/ Kinney Creek Loop	10126	0	6.86	2	2	C	Native/with spot surfacting	C
Shale Creek/ Kinney Creek Loop, Spur A	10126A	0	0.2	1	1	L	Native	D
Shale Creek/ Kinney Creek Loop, Spur B	10126B	0	0.6	1	1	L	Native	D
Shale Creek/ Kinney Creek Loop, Spur C	10126C	0	0.15	1	1	L	Native	D
Shale Creek/ Kinney Creek Loop, Spur D	10126D	0	0.8	1	1	L	Native	D
Shale Creek/ Kinney Creek Loop, Spur E	10126E	0	0.3	1	1	L	Native	D
Shale Creek/ Kinney Creek Loop, Spur F	10126F	0	0.7	1	1	L	Native	D
Shale Creek/ Kinney Creek Loop, Spur G	10126G	0	0.3	1	1	L	Native	D
Shale Creek/ Kinney Creek Loop, Spur H	10126H	0	0.1	1	1	L	Native	D
Shale Creek/ Kinney Creek Loop, Spur I	10126I	0	0.1	1	1	L	Native	D
Shale Creek/ Kinney Creek Loop, Spur J	10126J	0	0.2	1	1	L	Native	D
Kinney Creek	10388	0	0.3	2	2	L	Native	D

Kinney Creek, Spur A	10388A	0	0.4	1	1	L	Native	D
Kinney Creek, Spur B	10388B	0	0.6	1	1	L	Native	D
Lookout Creek	10385	0	1	1	1	L	Native	D
Lookout Creek, Spur A	10385A	0	0.1	1	1	L	Native	D
Lookout Creek, Spur B	10385B	0	0.2	1	1	L	Native	D
Lookout Creek, Spur C	10385C	0	0.15	1	1	L	Native	D
Lookout Creek, Spur D	10385D	0	0.25	1	1	L	Native	D

Phase II roads cover the southern roads off of the Shale Creek/Kinney Creek Loop including the Shale Creek Timber Sale road (Forest Service Road # 10386) and spurs and the Boco Creek Road (Forest Service Road #10387) and spurs.

Greys River Road: The Greys River Road, Forest Service Road #10138, is in this project area for 3.5 miles from the junction with Shale Creek/Kinney Creek Loop Road to the TriBasin Divide. This road is at an operational maintenance level 3 (for use by passenger cars with low speeds and without any consideration for user comfort) with an objective maintenance level 4 (for use by passenger cars with a moderate degree of user comfort). The road is an arterial road with gravel surfacing. Road improvements that would bring this road up to the objective maintenance level include improvements in road width, existing drainage, sight distance, turnouts, and enhancing surfacing over wet areas.

East Fork Loop Road and Spurs: The East Fork Loop, Forest Service Road # 10171, begins on Greys River Road in Section 20 at Poison Meadows. The road loops around for 10.9 miles and meets the Greys River Road again in Section 5 at the TriBasin Divide. This road is a collector road with a maintenance level 2 and has a well defined prism. This road needs drainage improvement and surfacing in some soft and wet areas on the southern end in order to bring the road up to its design prism. The twelve spur roads, Spurs A through L, are all local roads with maintenance level 1 (administratively closed to public motorized use).

Upper East Fork and Spurs: The Upper East Fork Road, Forest Service Road # 10392, junctions with the East Fork Loop Road accessing old timber units to the east. This road is a local road with a maintenance level 2. Spur road A is also a maintenance level 2 road and spurs B and C are closed to the motorized public (maintenance level 1).

Lower East Fork and Spur: The Lower East Fork Road, Forest Service Road # 10391, junctions with the East Fork Loop Road on the north end accessing recreation areas. This road and spur A are local roads with a maintenance level 2.

***South Meadow, Spur A and South Meadow Detour*:** The South Meadow Road, Forest Service Road #10436 and Spur A are maintenance level 2 roads that access dispersed camping areas. These roads are local road with a maintenance level 2. The South Meadow

Detour, Forest Service Road # 101385, is a closed road (maintenance level 1) that was used as an access to the East Fork Loop from the north.

Table 3-32: Phase III Transportation System Upper Greys Vegetation Management

Road Name	Road Number	Begin MP	End MP	Oper Maint Level	Obj Maint Level	Funct Class	Surfacing	Traffic Service Level
Greys River	10138	0	35	4	4	A	Aggregate	C
Greys River	10138	35	75	3	4	A	Aggregate	C
South Meadow Detour	101385	0	0.7	1	1	L	Native	D
East Fork Loop	10171	0	10.9	2	2	C	Native/with spot surfacting	C
East Fork Loop, Spur A	10171A	0	0.2	1	1	L	Native	D
East Fork Loop, Spur B	10171B	0	0.2	1	1	L	Native	D
East Fork Loop, Spur C	10171C	0	0.4	1	1	L	Native	D
East Fork Loop, Spur D	10171D	0	0.2	1	1	L	Native	D
East Fork Loop, Spur E	10171E	0	0.5	1	1	L	Native	D
East Fork Loop, Spur F	10171F	0	0.35	1	1	L	Native	D
East Fork Loop, Spur G	10171G	0	0.6	1	1	L	Native	D
East Fork Loop, Spur H	10171H	0	0.15	1	1	L	Native	D
East Fork Loop, Spur I	10171I	0	0.15	1	1	L	Native	D
East Fork Loop, Spur J	10171J	0	0.25	1	1	L	Native	D
East Fork Loop, Spur K	10171K	0	1	1	1	L	Native	D
East Fork Loop, Spur L	10171L	0	0.1	1	1	L	Native	D
Upper East Fork	10392	0	1	2	2	L	Native	D
Upper East Fork, Spur A	10392A	0	0.5	1	1	L	Native	D
Upper East Fork, Spur B	10392B	0	0.15	1	1	L	Native	D
Upper East Fork, Spur C	10392C	0	0.2	1	1	L	Native	D
Lower East Fork	10391	0	0.8	2	2	L	Native	D
Lower East Fork, Spur A	10391A	0	0.6	2	2	L	Native	D
South Meadow	10436	0	0.9	2	2	L	Native	D
South Meadow, Spur A	10436A	0	0.5	2	2	L	Native	D

Desired Condition

The *Bridger-Teton National Forest Land and Resource Management Plan* lists transportation system goals as:

- Goal 1.2: A safe transportation system meets the needs of commercial users of the Bridger-Teton National Forest.
- Goal 2.5: A safe road and trail system provides access to a range of recreation opportunities and settings.
- Goal 4.1: Road management preserves wildlife security, soil, visual resource, and water-quality values.

The road system in this area includes an extensive roading system with a well maintained, gravel-surfaced main road with gentle grades and potentially high cut and fill slopes. The lower standard branch roads are native surfaced with steeper grades for use by four wheel drive vehicles. These roads may be closed seasonally or year round. The transportation system serves several uses such as recreational vehicles, timber haul trucks, livestock trucks, and firewood trucks. The average open road density is 1.5 miles per square mile with short-term variations of 0.75 to 1.75.

3.8.2 Environmental Effects - Transportation

Issues and Indicators

Issue	Indicator
a. Effect on Snake River Cutthroat habitat and water quality • Effects from roads and harvesting activities on sedimentation and fish passage • Timber haul and associated activities will increase sedimentation from roads to Snake River Cutthroat trout habitat.	a. Miles of unnecessary routes closed with this project. b. Change in open road densities within 6th field HUC, miles of road added, and miles of road upgraded to the permanent transportation system in the project area. c. Miles of road used for timber activities, miles of road with improved drainage or surfacing. d. Miles of road within 300 feet of cutthroat trout habitat in the 6th field HUC. e. Number of road stream crossings in 6th field HUC (open road and closed road).
b. Effect on recreation values in the area and wild and scenic river corridor	**a.** Miles of road improvement on Greys River Road.

• The Greys River Road is traveled too fast by Forest users and does not need road improvement. • Unnecessary routes should be closed or obliterated. • Roads, trails, rights-of-way, easements should not be closed.	**b.** Miles of unnecessary road closed.
c. Effects on Forest Health • Effect on the availability of wood products to local markets	

Table 3-33: Comparison of Indicators across Alternatives

Indicator	No Action	Proposed Action
Miles of road improvement on Greys River Road	0	0
Miles of unnecessary routes closed with this project	0	0
Change in open road densities	0	Maximum temporary increase of road density from 1.45 miles/sq mile to 1.72 mile/sq mile
Miles of road upgraded	0	0
Miles of road closed	0	0
Miles of road used for harvest activities	0	Maximum of 24.9 miles used for harvest activities.
Miles of road with improved drainage or surfacing	0	Approximately 3 miles
Miles of road within 300 feet of streams (within roads analysis area)	10.8	10.8 (5.8 miles used by timber haul)
Number of road crossings total	38	38 (18 crossings on roads used by timber haul)
Number of road crossings on open roads	32	32 (16 crossings on roads used by timber haul)
Number of road crossings on closed roads	6	6 (2 crossings on roads used by timber haul)

Incomplete and Unavailable Information

Many of the roads in the project area are closed administratively with a maintenance level 1 status. Monitoring data showing the effectiveness of physical closures has not been gathered to date.

Alternative A – No Action

Direct and Indirect Effects

The transportation system would not change with this alternative. Road grading and drainage improvements would likely occur annually on the Greys River Road but would be infrequent on the level 2 side roads. Maintenance activities keep sedimentation to a minimum by keeping road crossings effective, improving surfacing where needed, removing material from cut banks if needed, etc. Road closures that are not effective would likely not be improved and unauthorized travel on non-motorized routes would continue.

Use of existing roads by Forest users would continue to deteriorate the road prism over time. If Forest road maintenance abilities continue to be limited to arterial routes and a limited

number of collector route miles, some roads may require closure in the next fifty years. The route to the Wyoming Peak trailhead would likely be a priority to keep open and this recreational activity would not be affected. Other activities such as dispersed camping, hunting, firewood gathering, etc. would be limited or change to a more backcountry use if any of the roads were to deteriorate beyond use.

Alternative B – Proposed Action Revised

Direct and Indirect Effects

Timber harvesting would require road maintenance such as blading, adding or replacing culverts, spot surfacing, and clearing on the following roads in Table 3-34.

Table 3-34: Maintained Roads

Road Name	Road Number	Miles For Timber Sale
Greys River	10138	3.5
Shale Creek/ Kinney Creek Loop	10126	4.6
Shale Creek TS	10386	2.2
East Fork Loop	10171	8.8
Upper East Fork	10392	0.2
Total Miles		19.3

Sections of the following closed roads (Table 3-35) could be temporarily opened to access timber units and would require light blading. These roads have a road prism and would not require much surface disturbance activities. Approximately 2.6 miles of this type of temporary use would occur. Once the timber related activities were completed, the roads would have drainage features such as waterbars constructed and would be physically closed.

Table 3-35: Possible Temporarily Opened Roads

Road Name	Road Number	Miles For Timber Sale
Shale Creek/ Kinney Creek Loop, Spur D	10126D	0.6
Shale Creek/ Kinney Creek Loop, Spur G	10126G	0.3
Shale Creek TS, Spur C	10386C	0.3
East Fork Loop, Spur C	10171C	0.4
East Fork Loop, Spur D	10171D	0.2
East Fork Loop, Spur E	10171E	0.5
East Fork Loop, Spur H	10171H	0.15
East Fork Loop, Spur I	10171I	0.15
Total Miles		2.6

Less than 3 miles of temporary spur roads would be constructed to access timber units where closed road prisms do not exist. These roads would be physically closed once activities are completed in the unit. The existing routes (both open and closed) used by this alternative are shown in the maps below. Temporary spur road locations are finalized during unit layout and are not shown here.

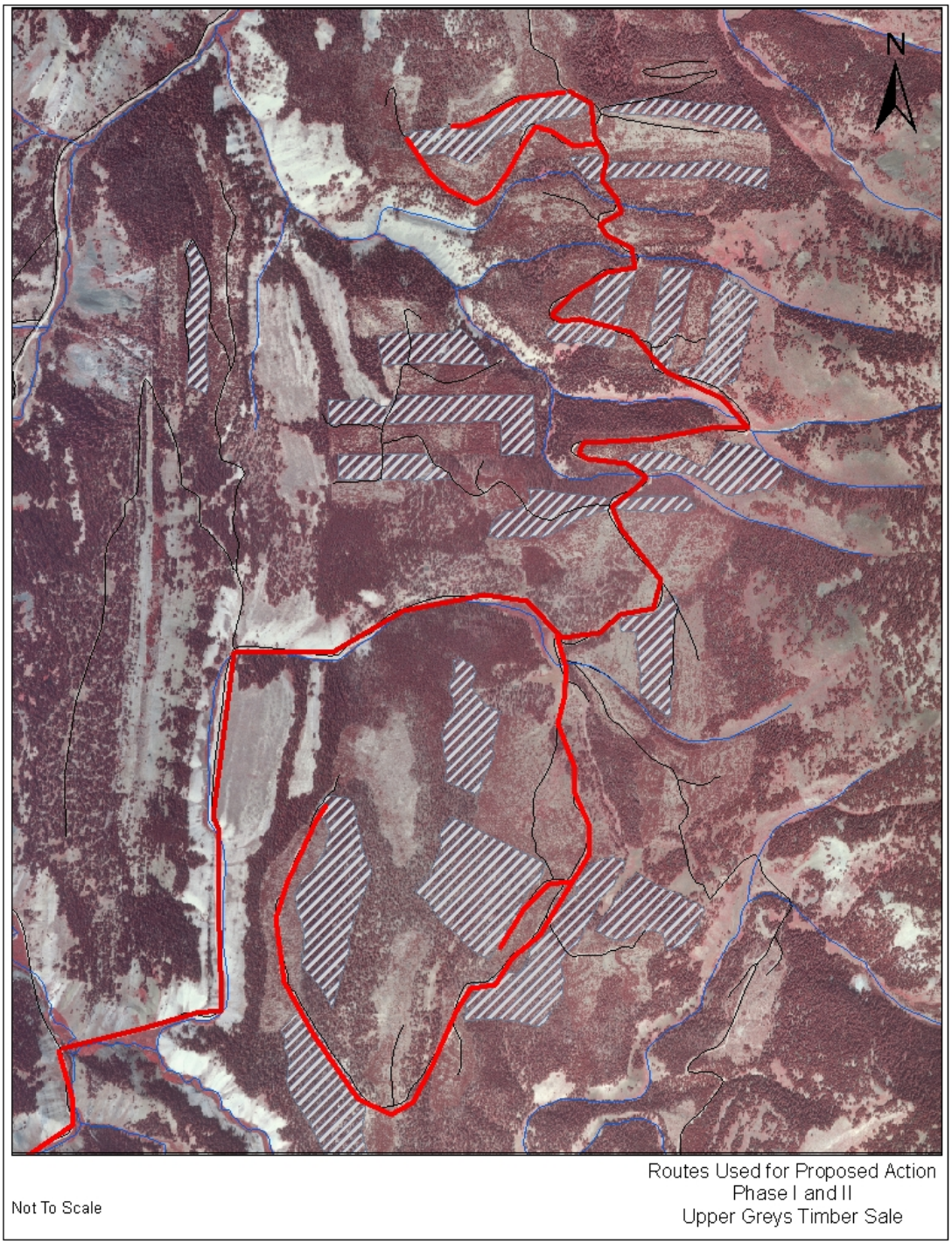


Figure 3-13: Routes Used for the Proposed Action Revised

Design Criteria

No roads would be improved or upgraded with road construction and maintenance activities. Road work would keep the roads at their current service level and maintenance level and would not change their design function or capacity. The existing 21.75 miles of road in the project area would remain open at the same levels as the no action alternative. The existing 18.45 miles of closed road would remain closed once the activities associated with this project are completed. No new roads would be closed.

Approximately 19.3 miles of existing roads would be bladed to establish the designed 12 foot wide road prism for a single lane road and a 24 foot wide prism for the Greys River Road. Turnouts would be added as necessary for safety and drainage would be added or improved with culverts or drivable dips. Road sections that run through wet areas and contribute to sedimentation would likely have some pit run surfacing applied to harden the running surface. Pit run material would be obtained from existing road cuts or borrow areas. Drainage improvements, surfacing, and ditching would occur on approximately 3 miles of existing road.

Temporarily opening up to 2.6 miles of closed roads would require the minimal construction necessary for logging operations. These roads have an existing road prism that is overgrown, waterbarred, and/ or tank trapped to eliminate traffic. Road drainage on these roads would be identified and constructed or improved. These roads would be physically closed in order to prevent motorized access where the topography allows once activities associated with the sale are complete. The road prism would also be waterbarred after timber related activities and would remain intact for future timber harvest.

Less than 3 miles of temporary spur roads constructed to access timber units would be constructed with a minimal road prism with drainage features as necessary. These roads would be fully recontoured once timber activities in the area are complete.

Direct and Indirect Effects

No new roads would be constructed with this alternative nor would any road class be upgraded. Up to 2.6 miles of closed road would be temporarily opened to access units if needed and up to 3 miles of temporary spur roads would be constructed as needed. These road uses would increase the open road density for the short-term. The open road density would return to the current level after harvest activities were completed and the roads were closed again. It is likely that the illegal use of closed roads would decrease after the sale because more affective closures can be constructed.

Sediment production from roads would increase in the short-term during road work, harvest and hauling activities. Road improvements, such as surfacing, ditching, and culvert installation, would, however, reduce sediment production. The increase in sediment production and improvement in road drainage would not affect cutthroat trout habitat much differently than the No Action Alternative.

The increased use on existing roads, open or closed, would not affect the soil resource since there is no soil on these features. The temporary spur roads would affect up to 4.4 acres (if

all 3 miles of spur road were needed) of soil that would take several years to recover from reclamation.

Increased traffic on roads would affect travel to the Wyoming Peak trailhead, sightseeing, hunting and other recreational activities. Forest users would encounter more vehicles in the area and would need to be more aware while driving.

Wildlife would have more encounters with vehicles and people associated with the timber sale for the duration of harvesting activities.

Road improvements would keep several roads in this road system at their designed class and use of these roads would produce less sediment.

There would be no direct, indirect, or cumulative impacts to roadless character of inventoried roadless areas from any alternative, as there are no proposed treatments, nor road building in Inventoried Roadless Areas nor synergistic effects with roadless areas outside the analysis area.

Cumulative Effects

Cumulative effects may arise from increased use of the transportation system during other vegetation management projects, from grazing activities or from increased recreation use. No reasonably foreseeable projects within the analysis area will increase use on any roads within the analysis area. There would be some increased use of the main Greys River Road from the contracted No Bull timber sale and planned implementation of the proposed Spring Creek and Three Forks projects.

3.9 Heritage Resources

Information provided in this environmental impact statement about heritage resources is excerpted from the *Heritage Resources Report for the Upper Greys River Vegetation Management Project* by Forest Archeologist Jamie Schoen. The full text of this report is incorporated by reference.

Section 106 of the National Historic Preservation Act requires Federal agencies to take into account the effects of their undertakings on historic properties. Regulations 36 FCR 800, which implements Section 106, outlines the procedures for the identification of historic properties and for consulting with the State Historic Preservation Office on the affects the undertaking may have on historic properties.

3.9.1 AFFECTED ENVIRONMENT

Cultural resources include prehistoric sites, historic sites, buildings, structures, and traditional cultural properties. These resources are the remains of past patterned human activity. Cultural resource inventories conducted in the Greys River drainage has resulted in the discovery of a number of small prehistoric sites generally indicative of temporary campsites used on a seasonal basis throughout much of the last 5,000 years. Known historic sites include isolated cabins and Forest Service Administrative structures such as guard stations and fire lookouts. Cultural resource inventories conducted throughout the Forest has found that prehistoric and historic sites are generally found on slopes of less than 15%, within ¼ mile of permanent water, and near ecotonal boundaries.

Prehistoric and historic sites can be significant, or eligible for the National Register of Historic Places, if they meet one of the following characteristics: 1) associated with events that have made a significant contribution to the broad patterns of our history, 2) associated with the lives of persons significant in our past, 3) embody the distinctive characteristics of a type, period or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction, or 4) have the ability to yield important information about the past. If eligible properties are found within the project area, then measures are implemented to avoid these properties or to mitigate potential impacts to those properties.

A cultural resource survey was completed on 845 acres within the proposed project area in 1997. No new areas have been added to the area proposed for treatment since 1997. No prehistoric or historic sites were found. A report detailing the results of this survey were submitted to the Wyoming State Historic Preservation Office (SHPO) with the finding that no historic properties would be affected by the project and recommending cultural resource clearance. The Wyoming SHPO concurred with this recommendation on March 24, 1997. No further work is required for the protection of cultural resources.

Desired Condition

The *Bridger-Teton National Forest Land and Resource Management Plan* goal and objectives for cultural resources provide direction for desired conditions (USFS 1990, pg. 121). Cultural resource values are preserved and protected so that their scientific, historic, and social values are retained. If any cultural materials are discovered during implementation of this project, work in the area should halt immediately and the USFS staff and SHPO staff must be contacted. Work in the area may not resume until the materials have been evaluated and adequate measures for their protection have been taken.

Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

The completion of the cultural resource survey for this project, along with the report submitted to the Wyoming state historic Preservation Office, evidences that the procedures outlined in 36 CFR 800, which implements Section 106 of the National Historic Preservation Act have been completed. In addition, the Programmatic Agreement Among the USDA

Forest Service, Wyoming Forests, Wyoming State Historic Preservation Office and Advisory Council on Historic Preservation Regarding Compliance with the National Historic Preservation Act (2008) states that no new inventory is necessary because previous inventory was adequate, and no further SHPO consultation is needed.

3.9.2 ENVIRONMENTAL EFFECTS

Issues and Indicators

Issue	Indicator
Vegetation management activities have the potential to adversely affect historic and/or prehistoric sites.	**a.** Number of prehistoric and historic sites **b.** Potential for damage of those sites

Alternative A – No Action

Direct and Indirect Effects

There would be no direct or indirect effects to cultural resources under this alternative because there are no prehistoric or historic sites in the project areas.

Cumulative Effects

There would be no cumulative effects under this alternative because there or no direct or indirect effects.

Alternative B – Proposed Action Revised

Direct, Indirect and Cumulative Effects

Same as Alternative A.

3.10 Environmental Justice

This section addresses whether or not implementation of the proposed project would result in environmental justice effects. On February 11, 1994, the President issued Executive Order 12898 on Environmental Justice in Minority Populations and Low Income Populations. This federal action and USDA Regulations 5600-2 direct federal agencies to integrate environmental justice considerations into federal programs and activities. Environmental justice means that, to the greatest extent practicable and permitted by law, all populations (including disadvantaged populations, such as minorities and low-income individuals) are provided the opportunity to comment before decisions are rendered on, are allowed to share

in the benefits of, are not excluded from, and are not affected in a disproportionately high and adverse manner by, government programs and activities affecting human health or the environment.

3.10.1 AFFECTED ENVIRONMENT

The analysis area is in a completely rural setting and has no permanent human residents. The nearest communities (Afton and Alpine, Wyoming) are approximately 30 to 50 miles to the west and northwest, respectively. Public involvement activities described in Chapter 1, *Purpose of and Need for Action (*see Section 1.9, *Public Involvement)*, and Chapter 4, *Consultation and Coordination,* document the efforts made to provide the public the opportunity to comment on the proposed project. Section 1.9, *Issues,* summarizes issues raised by the public on the proposed project. There were no issues or indicators identified for environmental justice during public scoping.

Implementation of either project alternative would not cause disproportionate adverse human health or environmental effects to minority or low-income populations.

Desired Future Conditions

To meet the direction of Executive Order 12898, the Forest Service requires, where proposals have the potential to disproportionately adversely affect minority or low-income populations, those effects must be considered and disclosed (and mitigated to the degree possible) through the NEPA analysis and documentation.

3.10.2 ENVIRONMENTAL EFFECTS

Alternative A - No Action

Implementation of the No Action Alternative would not cause disproportionate adverse human health or environmental direct, indirect, or cumulative effects to minority or low-income populations.

Alternative B - Proposed Action Revised

There would be the potential for employment for members of any minority groups during implementation of proposed action activities. There would be no disruption of minority groups from project implementation of the proposed action, since implementation would occur in a completely rural setting where there are no permanent human residents and the population in adjacent areas is very dispersed. No disproportionate negative direct, indirect, or cumulative impacts on minorities or low-income communities are expected.

3.11 Recreation and Visual Resources

Information provided in this environmental impact statement about recreation resources is excerpted from the *Recreation Specialist Report for the Upper Greys River Vegetation Management Project* by Recreation Planner Sid Smith. The full text of this report is incorporated by reference.

The proposed treatments would take place during the summer and fall recreation season. Operations would be starting around June or July through the middle of November. No winter operations would take place. Vegetation management activities are proposed on 362 acres in the Upper Greys drainage. Log trucks would be using roads in the Upper Greys drainage and the Smith's Fork road out to Highway 89. Some road maintenance and road improvements would be taking place on these roads.

3.11.1 AFFECTED ENVIRONMENT

Recreation

Forest-Wide Recreation: The northern end of the BTNF is influenced by the tourism associated with Grand Teton National Park, the National Elk Refuge, and private and commercial recreation. The east side of the BTNF is heavily used by wilderness visitors and others attracted to the Wind River Range and the upper Green River. The southern part of the BTNF also receives significant visitation. There were more than 1.7 million visitor days on the BTNF annually as of 1990. The BTNF offers a wide range of dispersed recreation opportunities. Developed campgrounds and picnic areas total 572 acres on the BTNF.

Management Area 35 Recreation: Recreational use of the Upper Greys drainages occurs year-round, with heaviest use occurring during fall hunting seasons. The trend in recreation use is upward. The most popular activities are: fishing, roadside camping, big game hunting, and backcountry travel by foot, horse, and mountain bikes.

Wyoming Peak, the high point of the Wyoming Range, rises along the eastern boundary of the analysis area. There is an historic Fire Lookout building at the peak, which is in some disrepair, as a visitor point of interest. The trailhead, located near proposed unit 1-14, has been proposed for potential increased development, primarily with parking improvements for trailers or additional vehicles, although use has remained fairly low. The route is listed on the District Travel Plan as open to motorized use in a category listed as 'unsuitable' for 4-wheelers. Under the 2005 OHV Rule, the district's new Motor Vehicle Use Map will designate this route as open to motorbikes only. The trail's most popular use appears to be for hiking.

The Wyoming Range National Recreation Trail parallels the crest of the range throughout the east edge of the analysis area. Two other lower use trails up Boco Creek and East Fork (3001 and 3040, respectively) also arise out of the analysis area and climb to the National Recreation Trail.

Two interpretive road signs in the analysis area offer visitors a broader and deeper understanding of their recreation experience. One at Tri-Basin Divide, describes the three major drainages in the area and another just below the Divide to the north, provides information on the Greys River.

As recreation resources, the two major road complexes being utilized by this project have deteriorated over time since their previous use for timber removal. Both Shale Creek and East Fork roads are deeply rutted and sometimes braided where drivers attempt to avoid wet or rocky holes.

On the north end of the Shale Creek Road #10126, north of the Wyoming Peak trailhead, young trees crowd the road bed and make passage for full-size vehicles somewhat tight. Much of the current use of this system appears to occur on the Boco Creek Road #10386, which is accessed from the Shale Creek Road. On both roads, clay soils can decrease user safety whenever wet conditions exist. The East Fork (#3040) Trailhead access is in extremely poor condition with deep ruts and a poorly defined parking/turn-around area. Very little dispersed camping use occurs along these road systems, likely because of the road conditions and the increase in proportion of visitors who tow larger camp trailers as compared with tent or cab-over camping equipment.

Visual Resources

Forest-Wide Visual Management: The Forest Service has developed measurable standards or objectives for the visual management of National Forest lands. These standards are termed Visual Quality Objectives and are shown in the following table.

Table 3-36: Acres and Percent of the BTNF Assigned to the Visual Quality Objectives.

	Bridger-Teton National Forest	
Visual Quality Objective	**Acres**	**Percent**
Preservation	1,300,500	38
Retention	893,800	26
Partial Retention	770,700	22
Modification	447,000	13
Maximum Modification	25,700	1
Total Acreage in Forest	3,437,700	100
Source: Forest Service 1990		

Forest-Wide Visual Resources: The BTNF has many scenic areas including perennial snow fields on mountain peaks, lush green vegetation, and clear mountain lakes and streams.

Most of the Forest is in an undisturbed condition, with an essentially natural landscape. Some lands on the Forest have been altered by activities such as timber harvest, roads, and oil and gas development. Although these activities are conducted within the constraints of the Visual Quality Objectives assigned to the areas within the Forest, some changes to the forest landscape have occurred. Areas that are managed to meet Visual Quality Objectives of Retention and Partial Retention appear natural, even with the landscape altering activities. As timber harvest units, road cuts, and other disturbances revegetate, the degree of landscape change has decreased.

Management Area 35 Visual Resources: The analysis area is part of the Overthrust Belt in the Central Rocky Mountains. The landscape borders on the Greys River to the west and the Wyoming Range to the east, and contains sharp mountain peaks, steep cliff faces, and rock outcroppings. Wyoming Peak on the east edge of the analysis area reaches over 10,000 feet in elevation. Because of the variation in soil types and parent material, such features as stratified rock faces, landslides, alluvial fans, and talus slopes are dispersed along side slopes. Color variations created by the diverse geology and vegetation range from shades of gray and brown to deep shades of green, orange, yellow, and red.

Vegetation varies sharply because of dramatic changes in elevation, slope, aspect, and climate. North-facing slopes are densely forested, and south-facing aspects have sparser vegetation, revealing the geology of the area. The majority of the landscape is occupied by conifer forest with lodgepole pine being the most dominant species. Other species such as Engelmann spruce, aspen, and subalpine fir also comprise the forested portions of the landscape. The remaining 30 percent of the area consists of grasses and sagebrush. Bands of riparian vegetation follow the alignments of creeks. Kinney, Lookout, Shale, Boco, and East Fork creeks, and many small tributaries dissect and add to the diversity of the landscape.

Evidence of current and past management activities in the watershed includes: transportation systems; various types of vegetation treatments; domestic grazing; and recreation use.

The road system is the predominant constructed feature on the "Roaded Natural" Recreation Opportunity Spectrum landscape, which makes up the majority of the Upper Greys area. In addition to the road system, other human-made elements include: fencing, clear cuts, evidence of grazing and recreation use (for example, soil compaction and changes in vegetation), trail systems, and signs. Clear-cuts occur along the lower benches of the hill slopes.

Critical viewpoints and corridors offer views of and to the area. They serve as locations from which specific effects to the scenic resources can be described and evaluated. Travel routes within the area include: the Greys River Road and the less frequented roads in the Shale Creek and East Fork drainages. Trails within the management area include: the Wyoming Range National Recreation Trail, Wyoming Peak trail and East Fork trail. The scenic integrity is important to the recreation experience being sought along these trails.

Desired Future Conditions

Recreation

Similar to the BTNF-wide Management Prescriptions, Standards, and Guidelines, the Desired Future Conditions (DFCs) describe land management direction intended to accomplish the Goals and Objectives. The DFCs are used as basic tools for land management; each DFC has a unique set of Prescriptions, Standards, and Guidelines.

The analysis area within Management Area 35 consists of the following 2 DFCs: 1B and 12. All proposed management activities would occur in DFC 1B. The table below shows the management prescription for these DFC's. Because DFCs encompass large areas and prescribed activities may not occur everywhere within the area, other Recreation Opportunity Spectrum classes may be present, particularly those tending toward the primitive end of the spectrum.

Table 3-37: Recreation Prescriptions Associated with Management Prescriptions.

Prescription	Description
Management Prescription 1B	
Recreation Prescription	Recreation is managed to provide Roaded Natural appearing opportunities in roaded areas, and Semi-Primitive opportunities in other areas. Roaded recreation opportunities are compatible with timber, livestock grazing, and minerals development. Recreation activities suitable for this area include dispersed, road-oriented uses such as firewood gathering, roadside camping and day use, OHV use on open routes, hunting, and winter sports. Use of closed roads for semi-primitive forms of recreation such as horseback riding and hiking is suitable.
Management Prescription 12	
Recreation Prescription	Recreation and other human activities are managed to meet needs of the big-game species.
Recreation Opportunity Guideline	Existing roaded recreation opportunities should be allowed to continue where they do not interfere with objectives for this area. Areas of Semi-Primitive recreation should be provided for both motorized and non-motorized use. Existing and future road systems should be managed to retain backcountry areas that are large and remote enough to provide Semi-Primitive recreation.

Visual Resources

Similar to the BTNF-wide Management Prescriptions, Standards, and Guidelines, the DFCs describe land management direction intended to accomplish the Goals and Objectives. The DFCs are used as basic tools for land management; each DFC has a unique set of Prescriptions, Standards, and Guidelines.

Management Area 35 consists of the following 2 DFCs: 1B, and 12. The Visual Quality Objective classifications that are associated with each of the DFCs are listed in Table 3-38. Because DFCs are applied to large areas and every landscape-altering activity may not occur everywhere within the area, other Visual Quality Objectives may apply. All the proposed treatments are within the partial retention (human activities are to remain subordinate to the

surrounding natural landscape) or modification areas (human activities can be dominant but borrow from naturally occurring line, form, color, and textures of the natural landscape).

Table 3-38: Visual Quality Objective Classifications Associated with the DFCs of Management Area 35

Desired Future Condition	Visual Quality Objective Classifications			
	Preservation	Retention	Partial Retention	Modification
1B			X	X
12		X	X	X
Source: Forest Service 1990				

Table 3-39: Visual Prescriptions associated with Management Prescriptions.

Prescription	Description
Management Prescription 1B	
Visual Quality Prescription	The Visual Quality Objective is generally Partial Retention or Modification. In sensitive foreground areas, the Visual Quality Objective is Retention.
Management Prescription 12	
Visual Quality Prescription	The Visual Quality Objectives are Retention and Partial Retention.

3.11.2 ENVIRONMENTAL EFFECTS

This section addresses the potential direct and indirect effects to recreation opportunities and visual resources from the implementation of Alternatives A and B. This section also addresses the potential cumulative impacts on recreation opportunities and visual resources from implementing the project in combination with the projects listed in Table 3-1. All of these projects would be located in Lincoln County on the Greys River Ranger District.

Issues and Indicators

Issue	Indicator
Effect on recreation values in the area and wild and scenic river corridor	To what extent are recreation opportunities impacted by proposed project activities and do proposed activities effect the wild and scenic character of the Greys River.
Treatment of the other issues will also have some impacts on the nature and quality of the visual resources and recreation opportunities in the analysis area within Management Area 35.	

RECREATION

Alternative A - No Action

Direct and Indirect Effects

No vegetation management or road improvements would occur. Ongoing management activities (including routine maintenance of existing roads and trails, fire suppression, tree/firewood sales, oil and gas activities, outfitting, and range management) that currently occur within the analysis area would continue to occur on the same schedule that they currently are performed.

Without any changes in current management of the travel system on this south end of the Greys River Road, continued degradation of the recreation resource can be expected. Ongoing increases in motorized vehicle use for recreational experiences would lead one to expect further rutting and braiding of both roads and motorized trails. As the designated system degenerates, motorized users often create their own routes across areas that are not open to that use.

Implementation of Alternative A would have no direct impact on existing recreation opportunities such as dispersed camping and day use, OHV use, hiking, picnicking, mountain biking, or winter sports within the analysis area because no treatment activities would occur that could conflict with those recreational pursuits. Indirect impacts could occur if current heavy fuel loadings allow for large fire growth and make some areas unsuitable for recreation uses.

Cumulative Impacts

Implementation of Alternative A (No Action) would not contribute incrementally to cumulative impacts when considered in combination with the other existing and potential projects on the Greys River Ranger District. This is because Alternative A consists of no change from existing vegetation management practices.

Alternative B - Proposed Action Revised

Direct and Indirect Impacts

Implementation of Alternative B would result in some short-term disruption of summer and fall recreation opportunities and recreation use in the immediate treatment area due to logging and road improvement operations and presence of equipment.

The trail to Wyoming Peak is accessed from one of the main haul routes in the project area, and one proposed clear-cut unit (1.14, 16 acres) is located near the trailhead and along a short portion of the trail. Any system trail resources that are negatively impacted during commodity production activities will be rehabilitated.

Some safety concerns may be present with log truck traffic and recreation traffic on these peripheral road systems. No impacts on winter recreation opportunities or recreationists engaging in recreation activities between November 30 and March 31 are expected.

Avoidance of the culvert crossing the Greys River at the north end of the East Fork loop, as in the current project design, may help protect this degraded road section for another short time period. Avoidance of the north end of the Shale Creek Road, as well, may retain some of the remaining roadbed gravel on this steep section, allowing for some continued recreation use, although that may be restricted by lodgepole regrowth (or travel plan revision) to narrower off-highway vehicles.

Any temporary or skid roads must be reclaimed as specified in the proposed action in order to be effectively closed. The old timber road system still retains visible roaded areas that are closed on paper only. Given the distance of this area from major patrol corridors, law enforcement is insufficient for achieving compliance with travel management regulations.

Proposed harvest units are ½ mile or greater from the Greys River and are not visible from the river. Potential wild and scenic character of the river would not be affected.

Cumulative Effects

The currently proposed Spring Creek Sanitation Sale would treat up to 250 acres of partial-cuts approximately 3 miles from this proposed project. It is possible that the Spring Creek project could be in operation during the same timeframe as this proposal. The only overlap to this project would be hauling of logs along the Greys River and Smith's Fork roads. If this occurs the duration of this traffic would most likely be limited to 1 season. Similar restrictions through mitigation measures on hauling times would limit impacts on heaviest recreation use periods.

All other reasonably foreseeable projects that would involve log hauling would most likely not be active at the same time and would haul logs down the Greys River towards Alpine and therefore not have additive impacts. All projects are within Forest Plan forecasts and will follow all standards and guidelines.

Visual Resources

Alternative A - No Action

Direct and Indirect Impacts

Alternative A implementation would result in no vegetation management occurring within the analysis area over the next 5 to 10 years. Ongoing management activities (including routine maintenance of existing roads and trails, fire suppression, tree/firewood sales, oil and gas activities, outfitting, and range management) that currently occur within the analysis area would continue to occur on the same schedule that they currently are performed.

If Alternative A is implemented, no change to the landscape would occur, and no impact on visual resources would result. There would continue to be sharp contrast between previous harvest units and un-cut areas for the next 20 to 30 years.

Cumulative Impacts

Implementation of Alternative A (No Action) would not contribute incrementally to cumulative impacts when considered in combination with the other projects that would be implemented in the Greys River Ranger District. This is because Alternative A consists of no change from existing vegetation management practices.

Alternative B - Proposed Action Revised

Direct and Indirect Impacts

Implementation of Alternative B (Proposed Action Revised) would result in treatment of 362 acres over the next 5 to 10 years in addition to ongoing management activities that currently occur within the analysis area.

The scenic quality of the treatment area may be affected by the proposed clear-cutting of 270 acres that is included in this alternative. However due to the existing clear-cut areas that have been visible within the treatment area over the past 40 years, new clear-cuts would not be out of character with the scenic environment. New treatment units would be located to reduce sharp contrasts with cut and un-cut patches.

The partial-cut treatment activities over 92 acres would mostly blend with the existing landscape pattern because significant numbers of trees will remain uncut.

Proposed activities would be consistent with the partial retention Visual Quality Objective of the area because: activities may be evident, but would remain visually subordinate to the landscape. Proposed activities would also be consistent with the Modification Visual Quality Objective because the landscape modifications associated with this alternative may visually dominate the landscape, but must be similar to the visual characteristics of the surrounding area. Activities would not be visible from the Greys River corridor.

Cumulative Impacts

The currently proposed Spring Creek Sanitation Sale would treat up to 250 acres of partial-cuts approximately 3 miles from this proposed project. It is possible that the Spring Creek project could be in operation during the same timeframe as this proposal. The Spring Creek project area would be in the background of the same viewshed for portions of the Wyoming Range trail. These treatments would mostly blend with the existing landscape pattern because significant numbers of trees will remain uncut, so cumulative visual impacts would be small. All other reasonably foreseeable projects would most likely not be active at the same time and would not be in the same viewshed of any portion of the analysis area, and therefore not have additive impacts.

3.12 Economics

Information provided in this environmental impact statement about economics is excerpted from the *Economic Report for the Upper Greys Vegetation Management Project* by Jeff Laub, Forester. The full text of this report is incorporated by reference.

FOREST PLAN DIRECTION

Economic analysis will also help, in overall comparison of alternatives and is linked to the *Bridger-Teton Forest Plan FEIS* Problem Topic Number 1: Community Economics and Jobs from the Forest- Competition for Resources.

The following Bridger-Teton National Forest Plan goals are relevant:

- Goal 1.1a: Provide an average annual volume of 12 million board feet of green sawlogs;
- Goal 1.1c: Provide timber volumes at costs that reflect current market values and as small and large product sales to meet local demand

The following standards and guidelines from the LRMP apply:

Timber Sale Cost Efficiency Guideline (p 157)	An economic analysis will be part of this analysis to ensure benefits exceed or equal costs.
Desired Stocking Guideline, Site Preparation Guideline and Reforestation Guideline and Standard (p 156)	A combination of natural seeding and tree planting will be used to effeciently re-stock harvested stands to desired trees per acre. Surveys will be conducted following reforestation to verify results and determine need for protection needs and future treatments. Projects will be identified in the analysis and in a sale area improvement plan and KV funds will be used where appropriate.
Silvcultural System Guideline (p 156)	Clearcutting and shelterwood will be the primary methods used, as specified for future managed stands.

Harvest of timber associated with vegetation management represents the only direct market related products to come from the proposal. Revenues, costs and jobs and income effects from timber harvests will be considered. A comparative discussion of relative values and costs associated with other resource management activities is also included.

Revenues

Estimates of revenues from proposed timber harvest are based on a review of Standard Rates during 2008-9. Advertised and bid rates of timber sales varied based on market and sale conditions, but were similar to Standard rates. Standard rates are used for comparative purposes.

Standard Rates are weighted averages for appraisal zone, species and condition based on monthly Region 4 timber sale transactional evidence. Standard Rates for 2008 - 2009 ranged from $25.00 to $32.00/CCF ($50.00 to $64.00/MBF) for live mixed conifer sawlogs. The average value of $28.00/CCF ($56/MBF) is used as expected price in the analysis.

Dead sawtimber rates fluctuated more than live sawtimber, from $28.00 -$50.00/CCF with an average of $42,00/ CCF ($84.00/MBF). Dead sawtimber overall will make up approximately 10% of timber sold.

The combination of live and dead sawtimber rates is $29.00/CCF, based on average 2008-09 standard rates. For 2007, when the project was proposed, the average combined rate was $45.00/CCF. These rates estimate average costs for sales in the appraisal zone and compare them to log index prices to obtain an estimated stumpage price for timber. Actual bid rates for timber will vary widely. Most timber sales that have been offered on the Greys River Ranger District have sold, including sales in the immediate vicinity of the Upper Greys project.

Advertised sale rates for individual timber sales are derived from the Forest Service Transaction Evidence Appraisal System (TEA). TEA compares the logging costs such as falling, bucking, skidding hauling and other sale costs such as road maintenance, slash work, temporary road construction to the value of lumber prices published quarterly by the Western Wood Products Association.

Costs

Sale Preparation and Administration Cost: The costs of implementing and administering harvest activities in alternative B is estimated at $77.00 per MBF. This includes environmental analysis and documentation, other resource support, sale planning and layout, tree marking, cruising, contract preparation and administration, and Forest Service associated costs for brush disposal, road work, and road maintenance. This is based on 5 year B-T NF averages for 1997-2002.

Reforestation Cost: These costs would include tree planting, plantation protection and regeneration surveys to ensure adequate stocking levels. Not all areas harvested will require planting. Many areas are partial cut areas which will rely on natural regeneration where needed.

Job and Employment Values: Figures are derived from BTLRMP EIS and subsequent updates through economic analysis and landscape assessments.

Economic Summary and Alternative Comparison Worksheet:

This economic analysis is based on current information in a fluctuating market and is provided to show a relative difference between alternatives. A variety of influential factors could fluctuate unexpectedly and significantly increase or decrease the value of any alternative.

3.12.1 ENVIRONMENTAL EFFECTS

Issues and Indicators

Economics is not a major issue for this analysis. However, Issue #5 relates to economic viability of wood products from the project.

Issues	Indicators
Effect on the availability of wood products to local markets	Volume of sawlogs and other products produced and jobs created

Alternative A - No Action

Direct and Indirect Effects

This alternative would not harvest any timber. No jobs would be supported locally, nor would this alternative provide any monies to the county to supplement school and road budgets.

No expenses would be incurred for sale preparation or harvest administration. Costs associated with NEPA analysis have already been incurred. Given the incurred costs, the total expenditure to implement this alternative would exceed the revenue generated by $150,000.00 (Table 3-40). Although there is no legal or policy mandate requiring that revenues generated by an individual project exceed the cost of implementation, this alternative would be "below cost".

Selection of this alternative would likely forego the opportunity to capture the value of any high risk diseased or damaged trees in the analysis area. With a majority of the trees greater than 100 years old, mortality is exceeding tree growth in many areas.

Alternative B – Proposed Action Revised

Direct and Indirect Effects

This alternative would harvest an estimated 9,000 CCF (hundred cubic feet) (4,230 MBF [thousand board feet]) of timber and generate an estimated appraised value of $266,000.00. The county would receive about $66,000.00 to supplement budgets for schools and roads. Sawlogs and other wood products, as well as employment opportunities associated with this

alternative, would help sustain local and regional sawmills and economies. Jobs supported by this alternative would directly and indirectly benefit local and regional economies.

Approximate costs of NEPA analysis ($150,000) are included in sale preparation and harvest administration ($77.00, USFS Stars Historical Data, 2001). The required returns to the county (25%) come from actual timber revenues when timber is harvested. Implementation of this alternative would capture the value of trees on 362 acres prior to the loss of their value as sawlogs, which contributes jobs and value to local and regional economies.

Table 3-40: Economic Comparison

	Alt. 1	Alt. 2	Alt. 2 (Based on 2007 Figures)
Net Volume (CCF)	0	9000	9000
Gross Revenue (Sawlog Standard Rate Value)	**$0**	**$261,000.00**	**$405,000.00**
Gross Revenue (Fuelwood bid Value)	**$0**	**$5,000.00**	**7,500.00**
Projected NEPA Costs	-$150,000	0 (*1)	0
Projected Sale Preparation and Harvest Administration Costs	$0	**-$325,710.00**	**-$325,710.00**
Reforestation Cost	0	**80,000.00**	**80,000.00**
Returns to County	$0	$66,000.00	$101,250.00
Projected jobs associated with alternative	0	54	54
Net Revenue (Gross Revenue – Costs)	**- $150,000.00**	**-$139,710.00**	**+6,790.00**

*1: NEPA costs included in sale preparation and administrative costs for Alternative B. NEPA costs split out from sale preparation costs in Alternative A, since NEPA costs already committed (as part of the sale preparation budget), and no sale preparation or administrative costs incurred.

Estimated economic values shown for Alternative B, *based on 2007 figures*, are included to show potential of positive return based on better market conditions. The 2007 figures reflect values at the time of scoping for this project. Volume of timber scoped was also greater than Alternative B (Proposed Action Revised), which would have made the net revenue figure more positive. These figures are more in line with the Timber Sale Cost Efficiency Guideline in the Forest Plan.

Cumulative Effects and Non-Market Economic Discussion

Road improvements with Alternative B will have direct costs factored into the timber sale appraisal. However benefits of road improvements will have non-monetary benefits to watershed conditions and recreation users for many years.

There will be some short-term effects on recreation use from logging activities and log hauling on system roads. These activities may change recreation use patterns while activities are underway, but most recreation users should not be impacted.

There are some minor effects to wildlife habitat (both positive and negative) with both alternatives, but not sufficient change to affect overall wildlife populations or recreation use (hunting, wildlife watching, hiking) associated with wildlife.

The Forest Plan included allowable timber sale quantities in support of Goal 1.1a. Under Alternative B, the levels of harvest planned in the current proposal would be 4.0 to 4.5 MMBF (million board feet). Using the higher figure (sale would take place over 3 years) and adding other projects planned under the current 5 year vegetation plan for the Greys River Ranger District, harvest levels would be approximately 2.0 MMBF per year, less than ½ of those allowed in the Forest Plan.

3.13 Range/Grazing

3.13.1 AFFECTED ENVIRONMENT

There are no historical records of sensitive plant species in the project area with only boreal draba known to be present on the Greys River District. Its presence in the project area is unlikely due to the habitat/communities it is found in.

The project area lays partially within the Mink Creek Sheep and Goat Allotment and the LaBarge Creek Cattle and Horse Allotment. The Mink Creek Allotment is administered out of the Greys River Ranger District, and the LaBarge Creek Allotment is administered out of the Kemmerer Ranger District. Timber harvest activities are proposed along the southeastern corner of the Mink Creek Allotment and in the northern pasture of the LaBarge Creek Allotment.

On the Mink Creek Allotment, 1,200 ewes and lambs are permitted with a season of use between July 11 and September 15. The bands of sheep are herded along the open grassy ridgetops utilizing the flowering and broad leaf plants. Herder camps are established in the vicinity of Poison Meadows.

On the LaBarge Creek Allotment, 878 cow/calf pairs are permitted with a season of use between July 1 through September 30. The livestock are moved into this area of the allotment generally mid to late summer -- August and September -- due to the high elevation and resulting late plant development.

Cattle use is primarily within open meadows and along roadways, streams and creeks. Cattle drift is a problem due to poor vegetative conditions in the dry meadows and consequent lack of adequate forage across these upper pastures.

A drift fence does exist and is located at Tri-Basin Divide which serves to prevent cattle movement between the two pastures. The fence is in poor condition and extends approximately 1/2 mile across the open watershed divide tying off at nearby timbered areas. This fence has not effectively prevented livestock movement between units.

Noxious weeds: Canada and musk thistle and dyer woad are the primary species of concern throughout the project area. Chemical and manual treatment of these species occurs annually through cooperative efforts with Lincoln County Weed and Pest.

3.13.2 ENVIRONMENTAL EFFECTS

Alternative A - No Action

Direct, Indirect and Cumulative Effects

Alternative A would have no effect direct, indirect or cumulative effects on range or grazing activities.

Alternative B - Proposed Action Revised

Direct and Indirect Effects

Cattle Grazing Drift: Cattle movement between the upper two pastures on the LaBarge Creek Allotment may increase due to the creation of additional travel or access routes after implementation of Phase III. The potential for this drift to occur is relatively high at harvest units located east of Tri-Basin Divide. Livestock drift will increase when targeted use levels are reached along creek bottoms and dry meadows along the upper end of the Spring Creek drainage. Drift activities will decrease over time with roadways being put to bed and plantation establishment and growth. Establishment of early seral species may encourage sheep use within plantation sites.

Noxious weeds: Implementation of this alternative may increase the number and kind of species population and infestation levels of noxious weeds within the project area as well as travel routes utilized.

This alternative would require grazing permittee coordination with Range Allotment Annual Operating Plans to ensure sheep or cattle do not bed down or are allowed to concentrate in areas where reforestation activities have occurred for at least a 5 year period. Placement of salt blocks, mineral blocks, or other patterns of activity that create concentrations will also be prohibited. Grazing use in the plantations will be monitored throughout the grazing season to ensure that grazing intensity is light and sensitive areas are properly managed. Mitigation measures to limit the occurrence and spread of noxious weeds are included.

Cumulative Effects

The additional timber sales that are reasonably foreseeable in the Greys River drainage may cumulatively add to noxious weeds. Mitigation measures to limit the occurrence and spread of noxious weeds will be included in all of these. The closest projects are the planned Spring

Creek salvage, approximately 2 miles to the south and the existing Bull Trail timber sale approximately 13 miles to the south.

3.14 Other Required Analyses

SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

NEPA requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). As declared by Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans.

The action alternative - Alternative B—Proposed Action Revised, is designed to bring forest conditions closer to properly functioning conditions based on naturally occurring disturbance regimes. The range of alternatives, mitigation measures, and management requirements are designed to avoid or reduce environmental effects and ensure that long-term productivity is not impaired by short-term uses and management practices.

UNAVOIDABLE ADVERSE EFFECTS

Some minor adverse effects on components of the ecosystem cannot be avoided even with selection of the No Action Alternative. Alternative designs, mitigation measures, and management requirements would avoid or reduce most environmental effects from implementation of action alternatives. A summary of specific adverse effects for each alternative is presented below. The various resource sections in this chapter provide more information on the type, duration, and scope of impacts, as well as resource benefits.

Alternative A—No Action

Vegetation. Vegetation would remain outside desired conditions. The risk of stand replacement fires, particularly in older stands, would continue and increase.

Fire. Disturbance would be limited in playing its historical ecological role under No Action.

Alternative B—Proposed Action Revised

Vegetation. There would be a short-term loss of forested habitat within the 3.15 miles of temporary road footprints.

Wildlife. There would likely be some short-term adverse individual effects, due to displacement of wildlife from treatment areas during treatment activities. This effect would decrease over time.

Individual bald eagles, spotted frogs, elk, mule deer, moose goshawks, great grey owls, three toed woodpeckers, pine marten, and grizzly bears may be impacted. Individuals or minor parts of habitat for Payson's milkvetch and migratory birds may be impacted, but it is unlikely to contribute to a trend toward federal listing or loss of viability of species or populations. There is some potential for negligible effects on snowshoe hare habitat in lynx analysis units and potential for incidental displacement of individual lynx during timber harvest activities. It may affect, but not likely to adversely affect Canada Lynx.

Water Quality. There could be a short-term increase in sediment input into streams during project and road improvement activities.

Stream Channels. There would be short-term disturbance of stream channels during replacement of culverts.

Soils: There would be limited loss of soil productivity on landing areas, temporary roads and skid trails.

Recreation. Some short-term disturbance of dispersed recreation would be expected due to timber harvest and road improvement activities.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of mined ore. Irretrievable commitments are those that are lost for a period of time such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line rights-of-way or road.

There would be no irreversible commitment of resources with the proposed project. A very small irretrievable commitment would be made in those areas where roads are improved.

CUMULATIVE EFFECTS

Cumulative effects are discussed in each resource section of this EIS.

OTHER REQUIRED DISCLOSURES

NEPA at 40 CFR 1502.25(a) directs "to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with …other environmental review laws and executive orders." This section contains disclosures or effects that are specifically required by federal law, regulation, or policy.

Endangered Species Act: The direct, indirect, and cumulative effects upon listed species are described in Wildlife section of this EIS.

Clean Air Act: Broadcast burning of slash on up to 270 acres of clear-cut units is planned for Alternative B. This burning would take place in fire-dependent ecosystems in which periodic fires burned on an average of every 150 to 200 years. Burning of additional fuels

from slash associated with timber harvest (mostly slash pile burning) would take place on 92 acres (Alternative B). Any prescribed burning undertaken as part of this project would be managed to comply with state and federal air quality regulations and control.

National Historic Preservation Act: See Section 3.8, *Heritage Resources* for discussion.

Clean Water Act: Section 313 of the Clean Water Act as well as Executive Order 12088 requires federal agencies to comply with all federal, state and local requirements for control and abatement of water pollution. Timber sale and slash burning activities proposed for this project would comply. Timber sale contract provisions regarding prevention and containment of oil and fuel spills would be included. No harvesting operations would be occurring within 300 feet of streams.

Prime Farmland, Rangeland, and Forest Land: All alternatives to this project are in accordance with the Secretary of Agriculture Memorandum 1827 for prime farmland, rangeland, and forestland. The definition of prime forestland does not apply to National Forest land. National Forest lands would be managed in accordance with Forest Plan Standards and Guidelines and best management practices. Any timber sale or burning operations conducted on National Forest land will be conducted with coordination and sensitivity to adjacent private and public lands.

Equal Employment Opportunity and Civil Rights: The USDA prohibits discrimination in all its programs and activities, including this proposal, on the basis of race, national origin, sex, religion, age, disability, political beliefs, sexual orientation, or marital or family status. Persons with disabilities who require alternative means for communication of program information (Braille, large print, audio tape, etc.) should contact USDA's TARGET center at 202-720-2600 (voice and TDD). The civil rights or civil liberties of any American citizen including women and minorities are not differentially affected by the implementation of any alternatives, including the No Action Alternative.

To file a complaint of discrimination, write USDA, Director, Office of Civil Rights, Room 326-W, Whitten Bldg, 1400 Independence Ave, SW Washington D.C. 20250-9410, or call 202-720-5964.

Wetlands and Floodplains: Use of existing stream crossings under the action alternative may cause minor, mitigatable effects to riparian areas, wetlands, and floodplains. No new crossings of streams are planned. Mitigation work to improve existing crossings would be implemented as described for the action alternative. No timber harvest activities or lighting of slash burns would take place within 300 feet of streams. No net loss of wetlands is anticipated.

Conflicts with other agency goals and objectives: Consultation with other agencies indicates that there are no major conflicts between this proposed action and the goals and objectives of other government entities.