

CHAPTER 3

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

INTRODUCTION

This chapter describes the environment being affected or created by the alternatives discussed in Chapter 2 and forms the scientific and analytic basis for the comparisons made between these alternatives. It also lists past, present, and reasonably foreseeable future activities considered in the cumulative effects analysis. The impacts for each alternative are discussed for those issues identified during scoping and considered to be factors in the decision being made. For each issue, this chapter addresses: a) the affected environment, b) direct and indirect effects, c) cumulative effects, and d) consistency with the Gallatin Forest Plan and other applicable laws, regulations, policies, and other direction. Additional information may be found in the project file located at the Gardiner Ranger District.

Some of the effects discussed in this chapter are complex and not easily quantified. Thus, it should be kept in mind that many of the values presented are modeled predictions of the effects and the actual effects may not occur exactly to the degree presented. More important than the exact effects is the comparison of change between alternatives and present condition as predicted by models and analytic projections.

FOREST PLAN MANAGEMENT DIRECTION

This document tiers to the Final Environmental Impact Statement (FEIS) and Land and Resource Management Plan (Forest Plan) for the Gallatin National Forest (USDA Forest Service 1987 PF 206 & 206(a)). The Forest Plan provides direction for all resource management programs, practices, uses, and protection measures for the Gallatin National Forest. The Forest Plan subdivided the forest into 26 management areas (MA's). These areas are described in detail in Chapter 3 of the Forest Plan (FP, pp. III-2 through III-73). The project area is located within MA 13 (grizzly bear/timber management emphasis). This is within occupied grizzly bear habitat (Management Situation 1). Map E-4 displays the management areas in relation to the proposed harvest units.

BACKGROUND

General Description and History of the Area

The project is located between 4 and 8 miles northeast of Gardiner, Montana. The community of Jardine and the inactive Mineral Hill Mine are to the south. There are 52,608 acres of national forest land in Compartments 305 and 306. Of this, 6,966 acres (13%) are considered suitable for timber management (MA 13). The majority (56%) of the compartments are within the AB Wilderness (MA 4). The third major category is allocated to big game winter range/grizzly bear habitat (MA 14). There is some private property within the compartments, which is concentrated around Gardiner, Jardine, and along the Yellowstone River/U.S. Highway 89 corridor.

Timber has been harvested to varying degrees in this area since it was first settled by white Europeans in the late 1800's. These earliest harvest activities focused on providing mine timbers and lumber for structures in support of the mining activity in Jardine. The Jardine Timber Sale is the earliest Forest Service commercial timber sale (1970) for which we could find records. There is evidence of earlier even-aged regeneration cutting further up Bear Creek near "Timber Camp" Campground. The name of the campground indicates there was once a logging camp and sawmill located there.

The proposed harvest units are located within MA 13, between 7400' and 8600' elevation on slopes that range from 15 to 50%. Forest types on the lands classified as suitable for timber management are primarily lodgepole pine, Douglas-fir, and Engelmann spruce-subalpine fir. Whitebark pine stands occur at the higher elevations. Soils in the proposed timber harvest areas are primarily moderately coarse to medium textured. They have formed in glacial till and colluvium derived from Tertiary volcanic and coarse-grained metamorphic rocks. They have moderate to high fertility and moderate erosion potential. Road surfaces may become slick and erodible when wet. Landslide hazard is low.

Past, Present, and Reasonably Foreseeable Future Activities

Described below are several private and public activities within the vicinity of the project area that already have, or will likely occur in or near the project area. The past activities have contributed to creating the existing condition as portrayed by Alternative A (No Action). These activities may produce environmental effects on issues or resources relevant to the proposal. Therefore, these activities have been considered in the cumulative effects analyses.

Past and Present Activities

- Timber harvest and associated road construction within the Bear Creek drainage. Stand records show regeneration harvesting occurred in the area since the mid-1950's. It can be assumed that sporadic harvesting also occurred in the late 1800's. More recent harvest activity includes those sales listed below: See Map E-6 (Appendix E) for a display of past harvesting.
 - Jardine Timber Sale (1970): five clearcut units up the Bear Fork Road and on Bald Mountain.
 - Darroch Creek Timber Sale (1972): four clearcut units up the Darroch Creek and Ash Mountain roads.
 - Pole Creek Timber Sale (c. 1980);
 - Pole Creek Post and Pole Area (1984 to present): 12 acres
 - Palmer Creek Timber Sale (late 1970s): four clearcut units up the Palmer Mountain Road.
 - Palmer Coop Timber Sale (1984-86): 400 acres total (43 acres on NF), clearcut; 3.9 MMBF total volume.
 - Parker Point Timber Sale (1986-87): 8 acres, seed tree cut; along Eagle Creek Road.
 - Parker Salvage Timber Sale (c.1987-88):
 - Deads Gone Timber Sale (1988-89): 28 acres, clearcut on a per-acre basis.
- Personal use firewood, post/pole, and houselog cutting.
- Precommercial thinning, commercial Christmas tree harvesting.
- Hunting, trapping, and other dispersed recreation (summer and winter sports).
- Mineral Hill Mine: recent activity - constructed, operated 1987-1995). Historic prospecting and mining occurred in the area since the late 1800's. At that time, Jardine was a fairly large mining community.
- Noxious weed treatment has been conducted, as needed.
- Gray wolf reintroduction in YNP, 1995-96.
- A service contract to thin five sapling/pole stands along the Eagle Creek road system was started in 1998 and was completed in 1999. Involved one person thinning with a chainsaw.
- Pre-sale closure of approximately 1.4 mile of Road 3243B and the last .4 mile of Road 3243 in the project area.1999.
- There are no active grazing allotments in the project area.

Reasonably Foreseeable Future Activities

- Personal use firewood cutting will continue, with gradually reduced levels of activity due to decreasing amounts of accessible firewood.
- Small sales of houselogs, posts/poles, and other misc. products for local use (personal use and local commercial sales).

- Precommercial thinning of young sapling/pole stands of timber (generally 20-30 years old) will likely occur as needed. There are stands in the Palmer Mountain, Bald Mountain, and Ash Mountain area in need of thinning but there are no proposals at this time.
- Noxious weed treatment as needed using a combination of herbicide, biological control and mechanical treatments.
- The majority of the current road system will likely remain the same into the foreseeable future. Portions of some roads may have additional seasonal or yearlong closures. (No increase in road density is proposed for this area with any of the current Travel Plan Revision Alternatives)
- Continued dispersed recreation (hunting, hiking, biking, firewood cutting, snowmobiling, and cross-country skiing in winter).
- Final closure and reclamation of the Mineral Hill Mine is nearly completed. TVX will keep and maintain 50 acres of this property for water treatment purposes. The mine area consists of private inholdings and the remainder has been listed for sale. It is feasible that if a buyer were to be found, that they could subdivide the property for recreational residences. This has occurred with some of the other recently purchased reclaimed mine properties.
- The Windmill Timber Sale proposes the harvest of 4.5 MBF of timber from approximately 690 acres in the Mill Creek drainage of the Gallatin National Forest. Also proposed are 0.4 miles of new temporary road construction and about 1.5 miles of road reconditioning. Road restoration and stabilization would occur on 22 miles of existing roads to reduce sediment and improve watershed conditions. Prescribed burning would occur within harvest units to reduce fuels and stands would be reforested as necessary following harvest. If implemented, activities within the sale area would be expected to continue through 2009. The nearest unit within the Windmill Timber Sale is located approximately 9 air miles northwest of any proposed unit in the Darroch-Eagle Timber Sale. The bulk of the intervening area is within the Absaroka-Beartooth Wilderness Area. None of the streams within the Mill Creek Drainage drain into Yellowstone National Park indicating that from a hydrologic perspective the Mill Creek Drainage has no influence on park resources. The landscape between the Darroch-Eagle proposal area and the Mill Creek Drainage is characterized by severe, frequently fully forested slopes separated by harsh alpine and sub-alpine ridges. These features mitigate against regular travel, whether by wildlife or humans, from one area to the other. With the recent reversal of the decision concerning the Windmill Timber Sale by the regional appeal review team, it is uncertain whether the project will ever happen.
- The Amendment for Grizzly Bear Conservation Strategy was signed in March of 2003.

EFFECTS ANALYSIS

Grizzly Bear

This issue consists of eight sub-issues: 1) loss of foraging habitat; 2) changes in hiding and security cover; 3) increased potential for bear mortalities; 4) population viability; 5) changes in denning habitat; 6) changes in prey base; 7) increased availability of human attractants; and 8) the effects of this project in concert with other known private and State activities. See *Appendix C, Biological Assessment* for a more detailed discussion of these issues and effects.

Foraging Habitat

Grizzly bears are successful omnivores. They are opportunistic feeders and will use almost any available food. After emerging from the den, grizzly bears seek winterkilled ungulates. During the summer, grizzly bears move to higher elevations and use a variety of food items including various plant species. In late summer and fall, whitebark pine nuts are an important food source, if available. Ungulates and rodents are also significant parts of their diet. Selection of vegetation types is tied to the seasonal availability of various foods and also the need for thermal and hiding cover. Non-forest areas, lodgepole pine forests in various successional stages, open parks in a forested matrix, and old growth may all be important to grizzly bears in their search for food and cover. The proposed harvest, road development, and post-harvest activities may modify grizzly bear foraging habitat.

Affected Environment

Suitable foraging habitat for grizzly bears is found in the analysis area and at the project site. However, specific concentrations of food are not present where timber harvesting would occur. Opportunities for foraging on various graminoids and forbs are ubiquitous. Berry producing shrubs are also common, although biomass is not sufficient for this to be considered a major food source. Old growth habitat associated with Douglas-fir, whitebark pine, and wet subalpine fir communities are important to grizzly bears. The Forest Plan standard (p. III-41) for MA 13 within the grizzly bear recovery zone requires maintenance of 30% of the analysis area in old growth habitat. Currently, there are 20,255 acres (58%) of old growth present. See Table 3-1.

Grizzly bears are attracted to elk calving areas where they prey on newborn elk. The lower elevations of the analysis area, but not the project site, are spring range for ungulates. The lower elevations are also ungulate winter range and carrion are available in the spring. Several species of ungulates are widely dispersed in the analysis area during the summer. Although few in number, moose are probably the prey species most consistently found at or near the project site. They may be present any time of the year. Grizzlies forage in the whitebark pine forests in the analysis area. However, forests with sufficient cone crops to attract bears are not present at the project site. Fisheries are not a significant food source for bears in the analysis area. There are no known tussock (army cut worm) moth sites. There are no known concentrations of vegetative food sources (such as Lomatium cous) at the project site that would qualify as an important food source for bears. See Table 3-1.

Direct and Indirect Effects

Alternative A (No Action): This alternative would not affect grizzly bear foraging habitat. The Forest Plan vegetative diversity standard would not be met (see the *Vegetative Diversity* issue discussed separately below).

Alternative B (Proposed Action): The Forest Plan standard concerning old growth that is designed to preserve a component of grizzly bear foraging habitat would not be violated if this alternative is implemented. The vegetative diversity standard would not be met. A total of about 449 acres of mature and old growth forest would be modified. Of this, about 352 acres of old growth would be converted to grass-forb/seedlings through timber harvesting. This would be a reduction of about 1% of the old growth. Vegetative food items used by grizzly bears are currently found at the project site and would also be present after timber harvesting, although changes in species composition would undoubtedly occur. In addition, these vegetative food types are generally abundant in the rest of the analysis area and the GYA. Their availability is not typically a limiting factor affecting the survival of the grizzly population. See Table 3-1.

Ungulates that are part of the prey base for grizzly bears would also be affected by implementing this proposal. This impact is discussed under the *Ungulates* issue in this chapter.

Alternative C: This alternative would have the same effects as Alternative B except a total of about 383 acres of mature and old growth forest would be modified. About 312 acres of old growth would be converted to grass-forb/seedlings through timber harvesting. This would be a reduction of about 1% of the old growth.

Alternative D: This alternative would have the same effects as Alternative B except about 266 acres of mature and old growth forest would be modified. Approximately 231 acres of old growth would be converted to grass-forb/seedlings through timber harvesting. This would cause less than 1% reduction of old growth.

Alternative D-Modified (Preferred Alternative) This alternative would have the same effects as Alternative B except about 195 acres of mature and old growth forest would be modified. Approximately 173 acres of old growth would be converted to grass-forb/seedlings through timber harvesting. This would cause a 0.5% reduction of old growth.

Table 3-1. Changes in grizzly bear foraging habitat, by alternative.

Element/Issue	Alternative A (No Action)	Alternative B (Proposal)	Alternative C	Alternative D	Alternative D- modified (preferred)
Amount of foraging habitat modified (acres harvested):	0	449	383	266	195
Old growth harvested (ac):	0	352	312	231	173
Percent of forested acres that are old growth (post- project):	58.4%	57.4% (-1.0)	57.5% (-0.9)	57.8% (-0.6)	57.9% (-0.5%)
FP, MA 13 old growth standard met? (>30% of forested acres must be old growth)	Yes	Yes	Yes	Yes	Yes

Hiding and Security Cover

The amount and type of human access present in grizzly bear habitat has been firmly linked to the security of bears. Tied to this is the opportunity for bears to avoid humans by remaining unseen using topographic features or screening created by vegetation. Changes in normal spatial and temporal patterns of habitat use can be generated through human activity. Where human presence is an issue, cover can be a limiting factor in bear habitat selection.

Size and shape of harvest units: Forest Plan standards require that harvest units located adjacent to natural or man-made openings have hiding cover maintained on approximately 75% of the opening's perimeter. Minimum width of hiding cover areas is three sight distances (about 600 feet) (Forest Plan standard in MS 1, p. G-11). In addition, regeneration harvest units should be irregular in shape and have no point more than 600 feet from cover (Forest Plan standard in MS 1 p. G-11).

Hiding and Thermal Cover: Forest Plan standards (p. H-8) require that sufficient cover be provided within grizzly bear habitat equivalent to 20% hiding cover, 10% thermal cover, and an additional 10% in either hiding or thermal cover for a total of 40% cover. Cover should be distributed throughout the analysis area.

Duration Of Activity: The duration of an activity is important for understanding how long grizzly bears would be affected by disturbances. As stated in the Forest Plan (p. H-8), only one major management activity can occur per decade. Major activities in MS 1 habitat are to be restricted to no longer than three consecutive years with at least seven years of inactivity between major entries. Past and present major activities on private lands are not considered when assessing reentry dates. Major activities include road construction, cutting and decking trees, and log hauling. Road maintenance, broadcast burning, slash burning, planting, precommercial thinning and inspections are not considered.

Motorized Access Density-Potential Core (Secure) Habitat: Grizzly bears should have areas where they will be secure from encounters with humans and where they can meet their energetic requirements. Secure areas as identified in the IGBC Task Force Report on Motorized Access Management provide areas free of motorized access during the non-denning period. They are considered an important component of the habitat of adult females that have successfully reared and weaned offspring. The Hellroaring/Bear Subunit 1 was used as the analysis area and is consistent with IGBST protocol. *Refer to Appendix C-50*

Affected Environment

Currently, 63% (21,796 acres) of the forested acres in the analysis area provides hiding cover and 20% (6,820 acres) provides thermal cover. Harvest activities are proposed to occur in Compartments 305-306. The last major permitted entries on USFS administered lands were in 1988-89. Reentry may occur after 1996. Currently, 75% of the Hellroaring/Bear Subunit 1 is in secure (core) habitat during Season 1 (March 1-July 15) (BA, Fig. 2) and 69% during Season 2 (July 16-November 30) (BA, Fig. 3). See Table 3-2 below for the current road densities, by season.

Direct and Indirect Effects

Alternative A (No Action): See discussion above under *Affected Environment*. Also, Table 3-2 displays the effects of Alternative A and the other action alternatives on hiding and security cover.

Alternative B (Proposal): Size and Shape of Harvest Units: Implementing this alternative will not compromise the standards for shape of harvest units and percent of perimeter with cover. However, portions of Units 1, 3, 9, and 13 would be further than 600 feet to cover. Therefore, a site-specific Forest Plan amendment would be needed to implement this alternative.

Hiding and Thermal Cover: If Alternative B is implemented, hiding cover would be reduced by 315 acres and thermal cover by 134 acres. This would result in a ratio of 62% of the forested acres in hiding cover and 19% in thermal cover, which exceeds Forest Plans standards.

Duration of Activity: This alternative is consistent with this standard. Major activities would be concluded in three years.

Secure (core) Habitat: Alternative B would not change percent secure habitat during Season 1, but would increase secure habitat to 70% during Season 2.

Road Density: This alternative would decrease the $>2\text{mi}/\text{mi}^2$ open road density by 1% in Season 1. Open road density would be unchanged in Season 2. Total road density would also be unchanged.

This alternative would meet all grizzly bear standards except for the distance-to-cover requirement. Grizzly bears may be less likely to forage at or near the project site with the screening cover of timber removed. See Table 3-2.

Alternative C: Size and Shape of Harvest Units: Same as Alternative B. Implementing this alternative will not compromise the standards for shape of harvest units and percent of perimeter with cover. However, portions of Units 1, 3, 9, and 13 would be further than 600 feet to cover. Therefore, a site-specific Forest Plan amendment would be needed to implement this alternative.

Hiding and Thermal Cover: If Alternative C is implemented, hiding cover would be reduced by 271 acres and thermal cover by 112 acres. This would result in a ratio of 62% of the forested acres in hiding cover and 19% in thermal cover, which is the same as Alternative B and exceeds Forest Plans standards.

Duration of Activity: This alternative is consistent with this standard. Major activities would be concluded in three years.

Secure (core) Habitat: Same as Alternative B. Alternative C would not change percent secure habitat during Season 1, but would increase secure habitat to 70% during Season 2.

Road Density: This alternative would increase the 0.0-1.0 mi/mi² open road density by 1% and decrease the >2mi/mi² open road density by 1% in Season 1. Open road density would be unchanged in Season 2. Total road density would also be unchanged.

This alternative would meet all grizzly bear standards except for the distance-to-cover requirement. Grizzly bears may be less likely to forage at or near the project site with the screening cover of timber removed. See Table 3-2.

Alternative D: Size and Shape of Harvest Units: Implementing this alternative would not compromise the standards for size and shape of harvest units.

Hiding and Thermal Cover: If Alternative D is implemented, hiding cover would be reduced by 199 acres and thermal cover by 67 acres. This would result in a ratio of 62% of the forested acres in hiding cover and 20% in thermal cover, which exceeds Forest Plans standards.

Duration of Activity: The proposed project is consistent with this standard. Major activities would be concluded in three years.

Secure (core) Habitat: Alternative D would not change percent secure habitat during Season 1, but would increase secure habitat to 70% during Season 2.

Road Density: Alternative D would increase the 0.0-1.0 mi/mi² open road density by 1% and decrease the >2mi/mi² open road density by 1% in season one. Open road density would be unchanged in Season 2. Total road density would also be unchanged.

This alternative would meet all grizzly bear standards. Grizzly bears may be less likely to forage at or near the project site with the screening cover of timber removed.

Alternative D-Modified.

Size and Shape of Harvest Units: Implementing this alternative would not compromise the standards for size and shape of harvest units.

Hiding and Thermal Cover: If Alternative D-Modified is implemented, hiding cover would be reduced by 175 acres and thermal cover by 20 acres. This would result in a ratio of 62.4% of the forested acres in hiding cover and 19.7% in thermal cover, which exceeds Forest Plans standards.

Duration of Activity: The proposed project is consistent with this standard. Major activities would be concluded in three years.

Secure (core) Habitat: Alternative D-Modified would not change percent secure habitat during Season 1, but would increase secure habitat 1% to 70% during Season 2.

Road Density: Alternative D-Modified would increase the 0.0-1.0 mi/mi² open road density by 1% and the >2mi/mi² open road density would remain unchanged in season one. Open road density would be unchanged in Season 2. Total road density would also be unchanged.

This alternative would meet all grizzly bear standards. Grizzly bears may be less likely to forage at or near the project site with the screening cover of timber removed.

Table 3-2. Changes in grizzly bear hiding and security cover, by alternative.

Element/Issue	Alternative A (No Action)	Alternative B (Proposal)	Alternative C	Alternative D	Alternative D modified (preferred)
Hiding and Thermal Cover					
Hiding Cover (% of forested compartment):	62.9%	62.0%	62.1%	62.3%	62.4%
Thermal Cover (% of forested compartment):	19.7%	19.3%	19.3%	19.5%	19.7%
FP, Appendix G standards met? % cover: minimum of 20% hiding, 10% thermal, and 10% hiding or thermal.	Yes	Yes	Yes	Yes	Yes
Distance to hiding cover (600') met?	Yes	No	No	Yes	Yes
Forest Plan amendment needed?	No	Yes	Yes	No	No
Duration/Reentry					
USFWS Biological Opinion standards met? (Duration standard: Sale activities <3 consecutive years) (Reentry: one entry/decade)	Yes	Yes	Yes	Yes	Yes
Security Habitat (during project, with pre-sale road closure mitigation applied)					
Secure (Core) Habitat , (% of bear subunit and change +/- from existing):					
Season 1 Secure Habitat:	75%	75% (0)	75% (0)	75% (0)	75% (0)
Season 2 Secure Habitat:	69%	70% (+1)	70% (+1)	70% (+1)	70% (+1)
Open Road Density (% of bear subunit and change +/- from existing):					
Season 1:					
0.0 mi/mi ²	68%	68% (0)	68% (0)	68% (0)	68% (0)
0.0-1.0 mi/mi ²	12%	12% (0)	13% (+1)	13% (+1)	13% (+1)
1.1-2.0 mi/mi ²	8%	8% (0)	8% (0)	8% (0)	8% (0)
>2.0 mi/mi ²	12%	11% (-1)	11% (-1)	12% (0)	12% (0)
Season 2:					
0.0 mi/mi ²	67%	67% (0)	67% (0)	67% (0)	67% (0)
0.0-1.0 mi/mi ²	13%	13% (0)	13% (0)	13% (0)	13% (0)
1.1-2.0 mi/mi ²	8%	8% (0)	8% (0)	8% (0)	8% (0)
>2.0 mi/mi ²	12%	12% (0)	12% (0)	12% (0)	12% (0)
Total Road Density (% of subunit and change +/- from existing):					
0.0 mi/mi ²	67%	67% (0)	67% (0)	67% (0)	67% (0)
0.0-1.0 mi/mi ²	13%	13% (0)	13% (0)	13% (0)	13% (0)
1.1-2.0 mi/mi ²	8%	8% (0)	8% (0)	8% (0)	8% (0)
>2.0 mi/mi ²	12%	12% (0)	12% (0)	12% (0)	12% (0)
FP Amendment 19 standards met? (no reduction in % secure habitat and no increase in road density)	Yes	Yes	Yes	Yes	Yes

Potential for Grizzly Bear Mortalities

Affected Environment

Humans remain the almost exclusive source of grizzly bear mortality in the lower 48 states. Humans have killed about 88 percent of all grizzly bears that have been studied and died within the United States during the last 20 years either illegally or as a result of legal management actions. Reasons for this phenomenon have been well documented and obviously center on contact between people and bears.

Knight et al. stated that the majority of known and probable deaths of Yellowstone grizzlies are clustered around central areas they called "population sinks". These areas include specific recreational developments, sheep grazing allotments, outfitter camps, and several communities adjacent to Yellowstone National Park.

In addition, research has shown that the number of human-caused grizzly bear mortalities is positively correlated both spatially and temporally with increased human access and activity, and the resulting increased contact between bears and humans. Known human-caused mortality occurs disproportionately more often within 1.5-1.6 kilometers of a road compared to areas more remote from roads, or is negatively correlated with distance to the nearest road.

Records of bear mortalities do not demonstrate a pattern of deaths in the analysis area or identify a specific source of bear/human conflicts. During the time these data were collected, human use patterns have been characterized by dispersed recreation over a network of roads and trails, mining activity, and timber harvesting. All extraction of resources and most recreation activity have been limited to the lower 1/2 of the drainage. There has been a consistent but not overwhelming human presence. Implementing this proposal will not create a significant departure from past human use patterns or create an obvious source of conflict between people and bears.

There is a pattern of bear human conflicts and bear mortalities from the private land in and around Gardiner, MT. It is the result of bears seeking attractants in the form of garbage, fruit trees, and gardens. This occurs primarily in late summer and fall, especially during poor food years for bears. This situation persists and is problematic, but is unrelated to the proposed project.

Direct and Indirect Effects

Alternative A (No Action): This alternative would not cause an increase in potential for bear mortalities.

All Action Alternatives: Numbers of human-caused grizzly bear mortalities are directly related to increased human access (quality and quantity), and a corresponding increase in human activity. Implementing any of the action alternatives would decrease, not increase, access. The road reconstruction would, however, improve some access. Because of the nature of the upgrade, the type of human use in the analysis area should not change but the amount may. Vehicle use would continue to involve primarily higher clearance vehicles that can negotiate gravel and dirt roads. Road improvements would not be done to encourage or accommodate standard passenger vehicles suited to paved roads. However, an undetermined number of people may feel more comfortable using the roads because of better safety features. For example, road improvements may result in more traffic by trucks pulling horse and camper trailers. Access improvements could increase human use throughout the analysis area, which is potentially negative for grizzly bears. *See Appendix C Biological Assessment*

Grizzly Bear Population Viability

Affected Environment

It is seldom possible to determine size or to track changes over time for grizzly bears because they are far ranging, secretive, and at low density. In instances like this, population parameters are usually used to assess viability. A series of criteria have been developed to monitor the well being of the Yellowstone grizzly bear population. Adherence of this larger population to this criterion serves as an assessment of viability for grizzly bears in the analysis area.

Alternative A (No Action): This alternative would not cause an increase in potential for bear mortalities.

All Action Alternatives: according to established population parameters, the Yellowstone grizzly bear population is viable and probably increasing. The 2002 population estimate (416) was the highest in at least 10 years. Moreover, bears are appearing in locations where they have not been seen for many years.

In addition, the numbers of sows with cubs of the year is well above the recovery criteria. The 6-year running average of sows with cubs of the year has gradually increased from 12 in 1978 to 38 in 2002. The highest annual count of sows with cubs of the year was 50 in 2002. Sows with cubs of the year have been seen in >16 of 18 BMUs 3 of the past 6 years. Human caused bear mortalities have been <4% of the population for the last 7 years and <30% of those deaths have been females for the past 5 years. All of these are positive indicators of population recovery and, therefore, population viability.

In a spatial context, the proposed timber sale does not represent a threat to the viability of the Yellowstone grizzly bear. The sale would involve 0.3 square miles, while the PCA is 9,209 square miles. Similarly, it is limited temporally; harvesting would occur over three summers. Moreover, harvesting timber on 195 acres in the Bear Creek drainage does not present any specific or inordinate potential sources of mortality for the grizzly bear in the short-term or long-term. In this context, there is no evidence that implementing the Darroch-Eagle Creek timber sale will compromise the viability of the Yellowstone grizzly bear or cause departures from positive trends towards meeting established population recovery parameters.

Denning Habitat

Affected Environment

Suitable denning habitat is present in the analysis area and adjacent drainages. Active dens have been located and bear activity is common during the time of den preparation. However, dens have not been found at or near the project site.

Direct and Indirect Effects

Alternative A (No Action): This alternative would not affect denning habitat.

All Action Alternatives: None of the action alternatives would impact bear den sites. They would also not disturb bears in the process of preparing dens. It is unlikely bears would attempt to den in proximity to existing roads when suitable sites farther from concentrated human activity are plentiful. Because logging would occur from June through October 15, bears in dens would not be affected. In addition, denning habitat is not a factor limiting the grizzly bear population in the GYA.

Prey Base

This sub-issue is discussed in detail as a separate issue below (See *Ungulates*.) In the context of these issues, implementing any of the action alternatives would have no appreciable effect on resident or migratory ungulate populations in the analysis area. Moose are a possible exception because of impacts to

their winter range. However, it is not clear that the loss of these forests would appreciably impact the moose population. In terms of impacts to the grizzly bear, moose are not plentiful enough to significantly contribute to their diet in the analysis area. In summary, implementing this project would not indirectly affect the grizzly bear by directly affecting the ungulate portion of their prey base.

Availability of Human Attractants

Affected Environment

This sub-issue is closely correlated with the sub-issue discussed above that deals with the potential for increased mortality of grizzly bears.

Direct and Indirect Effects

Alternative A (No Action): This alternative would not cause an increase in availability of bear attractants. So, the potential for bear mortalities would be unchanged.

All Action Alternatives: Personnel involved in harvesting the timber would be under contractual obligations to take appropriate measures to avoid conflicts with grizzly bears (contract provision C6.251#). This will include keeping all attractants unavailable to bears. See *Chapter 2-25, Mitigation Measures*. There may be some increase in human activity in the area from other sources including firewood cutters and recreationists using the reconstructed roads. This could potentially mean an increase in attractants. However, a special order is in effect for the area that requires all attractants be kept unavailable to bears.

Cumulative Effects

Many of the issues affecting the Yellowstone grizzly population are beyond the scope of this proposal and analysis. However, this project contributes in some measure to the factors influencing the well being of the Yellowstone grizzly bear. It is impossible to assess the cumulative effect of this project in conjunction with other human activities except to gauge the risks or benefits it affords relative to other activities.

Human activities occur in the analysis area that present a risk to grizzly bears. Many Forest visitors are armed and are engaged in pursuits that potentially put them in conflict with bears. This is especially true of hunting. Logging is not an activity that is inherently risky for bears. The risk to bears that typically accompanies timber sales occurs because of expanded public access generated by the roads built to remove the timber. Improved access, in combination, with existing risks can increase dangers to grizzly bears. The results can potentially affect the GYA grizzly population. Refer to *Appendix C,- Biological Assessment for more detailed information including the Ash/Iron Allotment*.

However, the effects of this project in combination with the current situation are minimized because of existing constraints on human activity and the design of the project. State and Federal regulations are in place to protect bears. They focus on keeping attractants unavailable, and preventing overt acts of aggression against bears. The increase in human presence associated with logging is minimal and the activities of the logging crews can be closely monitored. Also, the quantity and distribution of human use in the Bear Creek drainage will not change substantially because of this project. Core (secure) habitat would not decrease. Road density would decrease. The impacts of improving a portion of the existing road are less certain. They should be minimal because road alterations would be restricted to safety problems and increased vehicle use is not intended or desired. The layout of the sale units for Alternative D and Alternative D-Modified meets Forest Plan standards designed to accommodate the habitat needs of grizzly bears. Alternatives B and C would need a site-specific Forest Plan amendment to exempt several units from the distance-to-cover standard.

At a larger temporal and spatial scale, as a catalyst for the BSL land exchange, implementing this project is positive for the grizzly bear. The Gallatin Land Consolidation Act, 1998, directed the Forest Service to acquire 4 sections of BSL lands in the Taylor Fork area. This was accomplished by purchase with Land and Water Conservation Funds and 4.5 million dollars in timber receipts and other available funds from several National Forests over a 5-year period. If implemented, the Darroch-Eagle Creek timber sale would provide revenues towards payback of borrowed funds needed to complete the purchase. As part of public domain, management of the 4 sections would favor protection of grizzly bears and their habitat. In private ownership, the land is vulnerable to activities that compromise the longevity of the Yellowstone grizzly bear populations.

Applicability of the Forest Plan, Laws, Regulations, Policies, and Other Direction

Forest Plan MA 13 direction and several Forest Plan standards apply to management of grizzly bear habitat. These include standards pertaining to old growth, vegetative diversity, reentry and duration, distance to hiding cover, other hiding cover and thermal cover standards, security habitat, road density, and Habitat Effectiveness Index (HEI) for big game (grizzly bear prey base). The Endangered Species Act and NFMA are the umbrella laws providing guidance. BSL Planning Criteria 1, 10, and 11 apply to grizzly bears.

None of the alternatives studied in detail (including the No Action alternative) would meet the vegetative diversity or the HEI standards. Alternatives B and C would not meet the distance-to-cover standard. All other grizzly bear-related standards would be met. Alternative D and Alternative D-Modified best meet grizzly bear management direction while also achieving the project's purpose and need to a limited extent. Therefore, they would best meet Planning Criteria 1, 10, and 11.

After the Gallatin Forest Plan was written, new data on the effects of access (roads and trails) on bears and new technology for analyzing these effects became available (IGBC 1994, updated 1998). In response to this, in 1995, the USFWS amended their Biological Opinion for the Gallatin Forest Plan and directed the use of the new IGBC standards for addressing the impacts of access issues on grizzlies. Because of these concerns and the availability of the IGBC Access Report, it was decided to amend the Forest Plan on the issue of access within the Grizzly Bear Recovery Zone (Amendment 19). This deleted the previous standards for analyzing the impacts of roads and trails and replaced them with the new IGBC access definitions and interim standards. Therefore, in this analysis, direction given in the amended Biological Opinion of 1995 will be used.

In March 2003, the Conservation Strategy for the Yellowstone grizzly bear was finalized. It describes and summarizes the coordinated efforts to manage the grizzly bear population and its habitat to ensure continued conservation in the GYA. It specifies the population, habitat, and nuisance bear standards to maintain a recovered grizzly bear population. It also documents the regulatory mechanisms and legal authorities, polices, and management and monitoring programs that exist to maintain the recovered grizzly bear population.

Ungulates

Ungulates (such as elk, mule deer, and moose) are a part of the prey base for the threatened grizzly bear. This project is located within grizzly bear habitat and may affect ungulate security, hiding and thermal cover, foraging habitat, population viability, and migration/travel routes, and therefore, may indirectly affect grizzly bears. There is also a concern that existing open road density does not meet the Forest Plan standard for Habitat Effectiveness Index (HEI).

Affected Environment

Summer range is not generally a limiting factor for ungulates in the GYA, but winter range is. This is also true for the analysis area. Mule deer are unable to reach the project site the duration of the winter. Elk are restricted from the project site most of the winter. During the summer, both species are widely dispersed

across the analysis area and a much larger region. An unknown number of moose use the analysis area as both summer and winter range. The population may range from 15 to 30 animals. Moose can tolerate harsher snow conditions and occupy higher elevations than mule deer or elk. However, snow restricts their access to much of the drainage during the winter as well. They are able to reach the project site during most winters but prefer lower areas when the snow is deepest. Site visits did not demonstrate the presence of special habitat features for ungulates. The most consistent evidence of ungulate activity was browsing by moose on young conifers and moose winter pellet groups. Moose travel corridors occur within the project site.

The lower elevations of the analysis area are part of the Northern Yellowstone Winter Range (NYWR), one of the most important big game winter ranges in the country. Annually, most ungulates in the Greater Yellowstone Area are forced to lower elevations for relief from winter conditions. The NYWR is the destination for about 10,000 to 20,000 elk, 2,000 to 3,000 mule deer, 1,000 bison, and several hundred bighorn sheep. They travel from a very large geographic area to reach this region. The lowest portion of the NYWR, the Gardiner Basin, is an especially critical area.

Considerable effort has been made by agencies and graduate students to understand and quantify ungulate movements, distribution, and population dynamics on the NYWR. For example, the Northern Yellowstone Cooperative Wildlife Working Group, a consortium of 4 agencies with management responsibility for ungulates and their habitat, annually monitors ungulate numbers and distribution. These data demonstrate that species viability is not a concern for elk and mule deer. The long-term status of bighorn sheep, moose, and pronghorn is less certain, but all three species are currently reproducing successfully and implementing this proposal will not play a definitive role in determining future population trends.

The animals are traditional in their use of habitat, including routes used to access and move across the winter range. These routes are well known to local biologists. Data also demonstrate that the project site is not part of an historic movement corridor for migrating ungulates. This was confirmed with on-site visits. For information specific to this analysis, about 30 visits to and around the proposed harvest units were completed beginning in November 1998, and continuing through April 1999.

The proposed sale units are at comparatively high elevation and experience harsh winter conditions. They are above the wintering limits of mule deer and are marginal for elk, except during early winter. They are in or adjacent to moose winter range and timber harvesting will impact this species (refer to the Biological Assessment - prey base for grizzly bears). However, the units are not part of a moose migration corridor. Moose numbers in the analysis area are low (about 15-25) and they do not travel long distances between summer and winter range the way the other ungulate species do.

The closest migration route to the Darroch-Eagle Creek sale area is in Pine Creek about 2 to 2.5 miles away. Pole Creek is the closest migration route to the Eagle Creek harvest units, about 1 mile away. By far, the majority of migrating ungulates use the lower end of Bear Creek moving from Yellowstone Park down the Gardner and Yellowstone Rivers. This is about 4 to 5 air miles from the proposed harvest units (Tyers 1999, PF 177).

There are currently 6,820 acres of thermal cover and 21,796 acres of hiding cover for ungulates in the analysis area. Elk forage is provided on 19,346 acres. The current elk cover/forage ratio is 60:40. The Habitat Effectiveness Index (HEI) is 58% in the Eagle Creek area and 62% in upper Bear Creek. Early winter range for moose is currently 17,021 acres. Mid-winter habitat is 16,562 acres and late winter habitat is 10,975 acres. Table 3-3 summarizes current ungulate habitat conditions and potential changes caused by Alternatives B, C, D, and D-modified (from Appendix C, Biological Assessment).

Direct and Indirect Effects

General: The project site is summer range for elk, mule deer, and moose. However, summer range is not a limiting factor for ungulate populations in the area. Some thermal and hiding cover would be lost to ungulates, but potential foraging habitat would slightly increase. The project site does not provide winter range for elk and mule deer. Moose do spend portions of the winter in the areas that would be harvested. Consequently, some winter range would be lost.

Implementing the project would not damage special ungulate habitat features. The most obvious ungulate activity at the project site is from wintering moose. Winter browse is available at the project site and in other late successional conifers forests in the area.

Maintenance of secure unroaded blocks of habitat is an important consideration in the stability of hunted populations of ungulates, as is the retention of suitable winter range. This project will only temporarily increase roaded access. There is no evidence it would increase the vulnerability of resident and migratory ungulates to hunters.

In the context of these issues, implementing this proposal would have no appreciable effect on resident or migratory ungulate populations in the analysis area. Moose are a possible exception because of impacts to their winter range. However, it is not clear that the loss of these forests would impact the population. In terms of impacts to the grizzly bear, moose are not plentiful enough to significantly contribute to their diet in the analysis area. In summary, implementing this proposal would not indirectly affect the grizzly bear by directly affecting the ungulate portion of their prey base.

Alternative A (No Action): This alternative would not change habitat conditions from those described in the *Affected Environment* section.

Alternative B (Proposal): Ungulate migration routes were avoided in developing Alternative B and the other action alternatives. Snow removal from roads can affect ungulate migrations by providing easier access but disrupting traditional movements. For this project, however, harvesting will be done in the summer so the effect of plowing local roads on migrating ungulates will not be an issue. Also, key moose habitat, including known important travel routes, were specifically avoided where possible in developing the proposal and alternatives (Shea 1997) (USDA Forest Service Undated).

Alternative B would reduce hiding cover by 315 acres (1.4%) to 21,481 acres. Thermal cover would be reduced by 134 acres or 2% (6,686 remaining acres).

Potential foraging habitat (nonforested acres) would increase from 19,346 to 19,795 acres, an increase of 2.3%. This alternative would result in a cover/forage ratio of 59:41.

Moose winter range would be affected. Early winter range would be decreased by 2.6% to 16,584 acres. Mid-winter habitat would decrease by 2.5% to 16,149 acres. Late winter habitat would be decreased by 2.9% to 10,657 acres.

Elk effective cover (HEI) would remain at 58% in the Eagle Creek area and drop 3% to 59% in the upper Bear Creek area during sale activities until road closures are completed. HEI would be unaffected in the Palmer Mountain HAU. This does not meet the 70% required in the Forest Plan. However, this project is not intended as a comprehensive road management plan and Alternative B would not appreciably alter long-term elk effective cover. Because of this, a temporary site-specific Forest Plan Amendment would be needed and would allow relief from this standard for the duration of the project.

Alternative C: Alternative C would reduce hiding cover by 271 acres (1.2%) to 21,525 acres. Thermal cover would be reduced by 112 acres or 1.6% (6,708 remaining acres). Potential foraging habitat would

increase from 19,346 to 19,729 acres, an increase of 2.0%. Similar to Alternative B, this alternative would result in a cover/forage ratio of 59:41.

Early winter range for moose would decrease by 2.2% to 16,638 acres. Mid-winter habitat would decrease by 2.3% to 16,184 acres. Late winter habitat would be decreased by 2.6% to 10,684 acres.

Elk effective cover (HEI) would remain at 58% in the Eagle Creek area and would drop 2% to 60% in the upper Bear Creek area during sale activities until road closures are completed. HEI would be unaffected in the Palmer Mountain area. This does not meet the 70% required in the Forest Plan. However, this project is not intended as a comprehensive road management plan and Alternative B would not appreciably alter long-term elk effective cover. Because of this, a temporary site-specific Forest Plan Amendment would be needed and would allow relief from this standard for the duration of the project.

Alternative D: This alternative would reduce hiding cover by 199 acres (0.9%) to 21,597 acres. Alternative D would reduce thermal cover by 67 acres or 1% (6,753 remaining acres). Potential foraging habitat would increase 1.4% to 19,612 acres. This alternative would result in a cover/forage ratio of 58:42.

Moose winter range would be affected to a smaller extent compared to action Alternatives B and C. Early winter range would decrease by 1.6% to 16,755. Mid-winter habitat would decrease 1.6% to 16,304 acres. Late winter habitat would decrease 2.4% to 10,709 acres.

As with Alternative C, HEI would remain at 58% in the Eagle Creek area if Alternative D is implemented. In the upper Bear Creek area, it would drop 2% to 60% during sale activities until road closures have been completed. HEI would be unaffected in the Palmer Mountain area. This does not meet the 70% required in the Forest Plan. Alternative D would not appreciably alter long-term elk effective cover. Because of this, a temporary site-specific Forest Plan Amendment would be needed and would allow relief from this standard for the duration of the project.

Alternative D-modified (preferred): This alternative would reduce hiding cover by 175 acres (0.8%) to 21,621 acres. Alternative D-Modified would reduce thermal cover by 20 acres or 0.3% (6,800 remaining acres). Potential foraging habitat would increase 1% to 19,541 acres. This alternative would result in a cover/forage ratio of 58:42.

Moose winter range would be affected to a smaller extent compared to the other action alternatives including Alternative D. Early winter range would decrease by 1.1% to 16,826. Mid-winter habitat would decrease 1.2% to 16,367 acres. Late winter habitat would decrease 1.8% to 10,780 acres.

With Alternative D-modified HEI would remain at 58% in the Eagle Creek area. In the upper Bear Creek area, it would drop 2% to 60% during sale activities until road closures have been completed. HEI would be unaffected in the Palmer Mountain area. This does not meet the 70% required in the Forest Plan. Alternative D-Modified would not appreciably alter long-term elk effective cover. Because of this, a temporary site-specific Forest Plan Amendment would be needed and would allow relief from this standard for the duration of the project.

Table 3-3. Changes in ungulate habitat, by alternative.

Element/Issue	Alternative A (No Action)	Alternative B (Proposal)	Alternative C	Alternative D	Alternative D-modified (preferred)
Security Habitat (HEI)					
Eagle Creek area:	58%	58%	58%	58%	58
Upper Bear Creek area:	62%	59%	60%	60%	60
Palmer Mtn area	49%	49%	49%	49%	49%
Forest Plan standard met? (HEI minimum is 70%)	No	No	No	No	No
FP amendment needed?	No	Yes	Yes	Yes	Yes
Hiding and Thermal Cover					
Hiding cover (ac) (% change):	21,796	21,481 (-1.4%)	21,525 (-1.2%)	21,597 (-0.9%)	21,621 (-0.8%)
Thermal cover (ac) (% change):	6,820	6,686 (-2.0%)	6,708 (-1.6%)	6,753 (-1.0%)	6,800 (-0.3%)
Forage					
Elk Forage (ac) (% change):	19,346	19,795 (+2.3%)	19,729 (+2.0%)	19,612 (+1.4%)	19,541 (+1%)
Moose Winter Forage (ac) (% change):					
Early Winter:	17,021	16,584 (-2.6%)	16,638 (-2.2%)	16,755 (-1.6%)	16,826 (-1.1%)
Mid-Winter:	16,562	16,149 (-2.5%)	16,184 (-2.3%)	16,304 (-1.6%)	16,367 (-1.2%)
Late Winter:	10,975	10,657 (-2.9%)	10,684 (-2.6%)	10,709 (-2.4%)	10,780 (-1.8%)
Cover/Forage Ratio (Elk):	60:40	59:41	59:41	58:42	58:42
Is Planning Criterion 13 met?	Yes	Yes	Yes	Yes	Yes

*Footnote: The No Action alternative does not require a Forest Plan Amendment but is out of compliance for HEI due to existing conditions.

Cumulative Effects

In conjunction with past timber harvesting, the action alternatives would contribute to a reduction of moose winter foraging habitat. However, the effects of this project in concert with other activities in the analysis area are considered minor for other ungulate species.

Applicability of the Forest Plan, Laws, Regulations, Policies, and Other Direction

Relevant Forest Plan direction includes forest-wide standards for HEI, hiding cover, and key habitat components (FP, pp. II-17 and 18) and MA 13 direction (FP, p. III-41). Also, BSL Planning Criterion 13 applies. The alternatives satisfy all requirements except for the HEI standard. A project-specific exemption from the Forest Plan standard of 70% HEI is needed for all alternatives. See *Chapter 1-3, Proposed Action* and *Chapter 2-6, Description of Alternatives* for a discussion of this sub-issue.

Economics

One purpose of this project is to raise revenue from the sale of timber to reimburse funds borrowed from LWCF to complete the purchase of important land in the Taylor Fork drainage. One of the measures of achievement of this purpose is calculation of Present Net Value (PNV) for the alternatives. PNV is an indicator of cost efficiency and economic feasibility.

Economic Feasibility

The Affected Environment

From the standpoint of marketability, the affected environment is specific to the volume and value of the timber in merchantable trees that would be harvested with each action alternative. Stumpage, or more specifically, the net value of standing trees after all harvest and processing costs have been deducted, including costs for regeneration as appropriate, is the sole source of income recognized in an appraisal. Timber volume was estimated from information from previous timber cruises, stand exams, and from ocular estimates. Value was predicted, beginning with the current retail prices for sawn products and working backwards to estimate the commercial value of wood in standing trees (stumpage). This value in turn correlates with historic purchaser bid behavior.

Direct and Indirect Effects

As with any human activity, timber harvest may include both beneficial and adverse impacts to other resource values. These have been addressed in narrative discussions elsewhere in this document. The issue of sale feasibility as it relates to the costs of access and prescribed stand treatments in comparison with the quantity and quality of timber designated for harvest is applicable to any action alternative.

For the Darroch-Eagle Timber Sale, the R1 Transactions Evidence (TE) Equation 03-4 was the point of beginning in an analysis of the relative efficiency of each action alternative. This model predicts how various alternative sale attributes affect the 'Predicted Gross Value'. Although not an actual appraisal, the TE model gives a reasonable prediction of the market value of the trees designated for harvest. The Present Net Value (PNV) analysis begins with the Gross Value of stumpage as predicted using the TE equation, then includes allowances for environmental protection (slash treatment, etc.), road maintenance, road reconstruction, road obliteration, and protected regeneration costs. Direct costs are increased to allow for associated overhead charges, as appropriate. All values are discounted back to the present, using a rate of 4%.

Alternative D-Modified demonstrates the most favorable ratio of benefits to costs of any of the action alternatives and, as such, it is the economically preferred alternative. Alternative B is estimated to have the highest Present Net Value (PNV).

Alternative D-Modified enjoys an advantage in marketability (a Predicted Gross Value of \$75.80 per CCF vs. \$73.96 for Alternative C, \$73.70 for Alternative D and \$72.87 for Alternative B) and this indicates a greater likelihood that a timber sale which implements Alternative D-modified will be competitively bid at a rate higher than would be predicted in an appraisal. Alternative D-modified's advantage over the other action alternatives is due to a greater volume to be accessed using the least costly logging systems (skidders, Cats). Alternative D would remove more volume on a per acre basis than Alternative D-modified but it gains this efficiency by relying on more costly skyline logging for a greater share of the total volume to be removed. Alternative C would apply a more efficient mix of logging systems than Alternative D but it applies this mix to stands that, on average, have less volume to be removed than either Alternatives D or D-modified. Alternative B would implement the least efficient mix of ground-based and skyline logging systems and it applies these systems to stands that offer the least volume to be removed on a per acre basis.

Alternative D has the highest average volume per acre of any of the action alternatives, indicating that the criteria used to identify the stands to be harvested with this alternative best respond to the Purpose and Need. Alternative D-modified would forgo harvest on some of these higher yield acres in favor of applying a less costly mix of ground-based and skyline logging systems. This suggests that there is likely little opportunity to expand the area to be harvested with Alternative D-modified without introducing more costly logging systems. The fact Alternative D-modified has the highest Predicted Gross Value demonstrates that the additional, higher yielding acres treated with Alternative D generate additional logging costs faster than they add value in the form of added volume.

Alternative B harvests the most volume of any action alternative. The rate of harvest on a per acre basis is the least of all the action alternatives, suggesting that some of the stands to be entered with this alternative do not lend themselves to the emphasis placed on financial return in the Purpose and Need. Alternative B is predicted to have the highest logging costs. The combination of low yields and high logging costs demonstrates that, in the case of Alternative B, harvesting the most volume can result in relatively inefficient logging. While Alternative B has the lowest Predicted Gross Value of any action alternative, its value is greater than the average for all sales that have sold from the east-side forests. This indicates that, for all its disadvantages in comparison with Alternatives C, D and D-modified, Alternative B would still result in a marketable timber sale.

Benefit/Cost Ratios.

All of the action alternatives are predicted to have a benefit/cost ratio greater than one (benefits exceed costs) or, to put the point in another way, a positive present net value. Alternative D-modified has the most favorable ratio of benefits to costs, 1.387, indicating that D-modified makes the most efficient use of the capital available for investment. Alternatives B, C, and D are less efficient; the benefit-cost ratios for these alternatives are 1.323, 1.370 and 1.257, respectively.

The Present Net Value (PNV) analysis is begun by estimating the worth of standing trees designated for harvest (Predicted Gross Value or PGV). The current (2003-4 [fiscal year 2003, fourth quarter]) Transactions Evidence (TE) Appraisal equation relies on correlation analysis to identify the sale and tree attributes which best explain variations in purchaser bid behavior. The attributes shown to influence a timber purchaser’s willingness to pay for stumpage (standing trees) and the influence of each on the estimated stumpage value per one hundred cubic feet (CCF), by alternative, are:

Table 3-4 Worth of standing trees for all action alternatives-Projected Gross Value (PGV)

Attribute	Alt B	Alt C	Alt D	Alt D-Mod (preferred)
Tree Diameter	-\$12.25	-\$12.25	-\$12.25	-\$12.25
Tree Defect	+\$14.39	+\$14.39	+\$14.39	+\$14.39
Logging Method	+\$0.34	+\$1.43	+\$1.17	+\$3.28
Haul Distance	+\$3.61	+\$3.61	+\$3.61	+\$3.61
Volume per Acre	+\$6.54	+\$6.82	+\$7.88	+\$7.09
Predicted Gross Value per CCF	\$72.87	\$73.96	\$73.70	\$75.80
Average PGV per CCF	\$66.34	\$66.34	\$66.34	\$66.34
PGV as % of Average	110%	111%	111%	114%

The Average PGV is the average amount per hundred cubic feet bid for all sawtimber sales that have sold on the east side of Region 1. An estimated PGV that exceeds this average is more likely to realize a bid premium, i.e., a bid price greater than the estimated value. The probability of receiving a higher than expected bid is proportional to the magnitude of advantage over the average for all east-side forests. The analysis indicates that Alternative D-modified, the preferred alternative is most likely to be bid at a premium to the market-based estimate. Since the computed PGV's for all of the alternatives exceed the Regional average, there is no basis for concern that a sale designed to implement any action alternative will not sell, given the market conditions in place during development of the 2003-4 TE equation.

The total value of standing trees designated for harvest (PGV) is the sole benefit recognized in the Present Net Value (PNV) analysis. Costs include sale preparation, sale administration, road construction and road maintenance, road obliteration, slash disposal activities, treatment of noxious weeds and any activities prescribed to meet the legal requirement for prompt regeneration, including follow-up exams to monitor progress towards a fully stocked stand. The ratio of benefits to costs is a useful indicator of the relative efficiency of each action alternative. Present Net Value represents the net of total discounted benefits minus total discounted costs.

Table 3-5 Benefit/Cost Ratio and Present Net Value for all action alternatives

Alternative	Benefit/Cost Ratio	Present Net Value
B	1.323	\$125,302.18
C	1.370	\$121,160.32
D	1.257	\$66,889.41
D -Modified	1.387	\$66,687.63

Any of the action alternatives can be implemented and meet the primary Purpose and Need.

The computed Present Net Value (PNV) is not an estimate of the dollars potentially in hand from the sale of timber. Rather, PNV measures differences in effectiveness of alternative investment opportunities. PNV is calculated following procedures that are basic to an economic or cash flow analysis: future benefits and costs are discounted to the present and allowances are made for all quantifiable costs, including those that are paid from dollars appropriated annually in support to the timber program (sale preparation and sale administration).

An estimate of timber receipts is presented in *Chapter 3-20* in this document. The methodology that leads to this estimate is not economic; time is not a factor (none of the values are discounted) and costs are limited to those that are either paid from potential receipts from the sale of timber or have a direct effect on the rate bid for the timber. While the relationships shown in the above table of PNVs are expected to repeat themselves in the estimates of dollars-in-hand (Alternative B is likely to generate the most dollars and Alternative D-Modified] the least) the two methodologies in fact provide different bases for comparing the *alternatives* and, apart from the redundancy in relative differences just noted, the computed *values* cannot be compared.

The following table summarizes the discounted costs for road construction, reconstruction and maintenance, road obliteration, slash treatment and tree regeneration, including monitoring exams, for Alternatives B, C, D and D-Modified:

Table 3-6 . Economic analysis results for Alternatives B, C, D, and D-Modified

Alternative	Road Construction, Reconstruction and Maintenance	Slash Treatment	Regeneration
B	\$76,133.74	\$29,204.56	\$61,690.63
C	\$53,692.49	\$25,130.55	\$58,957.81
D	\$48,529.69	\$17,336.96	\$56,129.99
D-Modified	\$40,210.22	\$8,373.26	\$25,048.98

Alternative A: The No Action alternative will not provide any timber in support to the BSL Land Exchange. The loss in timber volume will need to be overcome through harvest in another area or the property values at issue will need to be balanced among the participating ownerships by some other means.

Table 3-7. Economic Efficiency by alternative

	Alt B	Alt C	Alt D	Alt D (mod)
Total Discounted Costs	-\$387,350.23	-\$327,680.76	-\$260,477.54	-\$172,136.87
Total Discounted Benefits	\$512,652.41	\$448,841.08	\$327,366.94	\$238,824.50
Present Net Value	\$125,302.18	\$121,160.32	\$66,889.41	\$66,687.63
Benefit/Cost Ratio	1.323	1.370	1.257	1.387

Cumulative Effects

None

Applicability of the Forest Plan, Laws, Regulations, Policies, and Other Direction

All four action alternatives are consistent with BSL Planning Criterion 15. There is no other binding direction regarding economics.

Timber Receipts

The need to predict the net dollars in hand from the sale of standing trees (stumpage) stems from the Purpose and Need. The need to balance land values among the ownerships participating in the Gallatin Land Exchange is being met by treating marketable timber as an asset. Assuming the deciding officer selects one of the action alternatives, the resulting timber sale will contribute value towards repayment of funds that were borrowed from LWCF to complete the exchange. Since the receipts from the sale of timber will help balance property values it becomes meaningful to ask, of each alternative, how much money it can be expected to contribute towards completing the land exchange.

The computations leading to an estimate of timber receipts is not an economic analysis; future returns from the sale of stumpage and the investments in road construction, regeneration and other costs entailed in realizing these returns are not discounted. Program costs, including those for sale preparation and sale administration, are not included. In this respect, an estimate of timber receipts is more like a timber appraisal, with the exception that the estimate is needed before a timber sale contract is in place, supported by the actual estimates of timber volume and other measures that complete the sale preparation process. The accuracy of the values used in computing likely timber receipts equals those used in the economic analysis and the same limitations concerning the use or presentation of the resulting values apply. As with

the computed values for Present Net Value and Benefit/Cost ratio, the estimated timber receipts are intended to aid the deciding official in making an informed choice among the alternatives. The varying estimates quantify relative differences among the alternatives and should not be taken as measures of the dollars in hand once the timber sale is offered in a competitive market.

Table 3-8. Estimated timber receipts (Net Sale Value) by alternative

Alternative	Net Sale Value
A	0\$
B	\$367,641
C	\$330,267
D	\$217,520
D-Mod	\$175,668

Alternative ‘A’, the No Action alternative, will not contribute towards repayment of borrowed funds needed to complete the Land Exchange.

Alternative ‘B’ is expected to result in the most timber receipts. As disclosed in the economic analysis, **Alternative ‘B’** generates the highest logging costs and has a less favorable ratio of benefits to costs than all but Alternative D. A decision to implement Alternative B would maximize timber receipts but it would do so at nearly the highest cost to the government. Alternative D-Modified on the other hand would contribute the least amount of dollars to repay the borrowed funds needed to complete the land exchange but these reduced benefits are being generated at the least cost to the government. In addition, Alternative D-Modified has the greatest probability of resulting in a bid for the trees to be removed that exceeds the market-based estimate used in this analysis. A higher than anticipated bid would result in greater timber receipts than have been predicted, effectively reducing the disparity between Alternatives B and D-Modified, while improving Alternative D-Modified’s already advantageous ratio of benefits to costs.

Vegetative Diversity

Affected Environment

Although past harvesting in the project area has converted some stands to early successional stages, the analysis area (Compartments 305, 306) does not currently meet the Forest Plan standard. The present vegetative condition is above the standard in older aged forests (62% mature and old growth) and below the standard in younger aged forests: seedlings (<1%), saplings (3.4%), and pole-size (<1%) components (Kujawa 1999c). See Map E-7 (Appendix E) and Alternative A's figures in Table 3-9 below.

Direct and Indirect Effects

Alternative A (No Action): Alternative A: The No Action alternative would not directly change the diversity of vegetation in the area. Indirectly, natural successional processes would continue and would cause early successional stages (e.g., seedlings and saplings) to continue growing into the next advanced stage (saplings and poles). See Table 3-9 below for current conditions.

All Action Alternatives: The action alternatives will convert a range of acres of mature and old growth stands into a grass/forb (harvested) condition. These stands will be reforested and gradually grow into the seedling stage. Over the decades, they will continue to progress through the different successional stages.

Table 3-9. Vegetative diversity in Compartments 305 and 306, by alternative.

Structural Stage	Alternative A (No Action)	Alternative B (Proposal)	Alternative C	Alternative D	Alternative D-modified (Preferred)
Grass/Forb (natural)	13,278 (25.2%)	13,278 (25.24%)	13,278 (25.24%)	13,278 (25.24%)	13,278 (25.24%)
Grass/Forb (harvested)	39 (<1%)	470 (0.89%)	412 (0.78%)	295 (0.56%)	214 (0.41%)
Seedling	73 (<1%)	73 (0.14%)	73 (0.14%)	73 (0.14%)	73 (0.14%)
Sapling	1,804 (3.4%)	1,792 (3.41%)	1,804 (3.43%)	1,804 (3.43%)	1,804 (3.43%)
Pole	168 (<1%)	168 (0.32%)	168 (0.32%)	168 (0.32%)	168 (0.32%)
Mature	12,333 (23.4%)	12,266 (23.32%)	12,272 (23.33%)	12,308 (23.40%)	12,331 (23.4%)
Old Growth	20,255 (38.5%)	19,903 (37.83%)	19,943 (37.93%)	20,024 (38.07%)	20,082 (38.17%)

* Figures are acres and % of total compartment acres (52,608) after implementation of the alternative):

Alternative B (Proposal): This alternative would convert 449 acres of mature and old growth timber stands into grass-forb (harvested).

Alternative C: This alternative would convert 383 acres of mature and old growth timber stands into grass-forb (harvested).

Alternative D: Alternative D would convert 266 acres of mature and old growth timber stands into grass-forb (harvested).

Alternative D-Modified (Preferred): Alternative D would convert 175 acres of mature and old growth timber stands into grass-forb (harvested) and 20 acres to remain mature (60%-40% harvest) for a total of 195 acres.

Cumulative Effects

Table 3-9 displays, for each alternative, the cumulative acres of national forest land by structural stage or (successional stage) expected after the alternative is implemented. The analysis area is Compartments 305 and 306. The figures were generated using the Forest's Arc View program and querying the TSMRS database for a summary of the successional stage (vegetative condition) code of each stand (Kujawa 1999, PF149a).

Applicability of the Forest Plan, Laws, Regulations, Policies, and Other Direction

The Gallatin Forest Plan forest-wide standard for vegetative diversity applies (FP standard 6.c., pp. II-19 and 20). None of the alternatives would or could feasibly comply with this alternative in the foreseeable future. A project-specific amendment would be needed.

Firewood Availability

Affected Environment

A segment of the Gardiner community is dependent upon firewood as an economical fuel source for home heating. The project area is a source of firewood for people purchasing a personal-use permit. Also, a small amount of commercial firewood cutting for local residents has occurred in the area over the years.

Table 3-10 illustrates local demand for firewood over the past 10 years. An assumption was made that the amount of firewood actually cut matches the amount authorized under the permit, and so would be a relatively accurate measure of the demand.

Table 3-10. Personal-use firewood permits issued for the Gardiner District, FY94-03.

Fiscal Year	No. of Permits Issued	Total Cords Sold	Avg No. of Cords per Permit
94	143	479	3.4
95	196	595	3.0
96	126	413	3.3
97	140	439	3.1
98	122	346	2.8
99	95	316	3.3
00	76	245	3.2
01	98	253	2.6
02	99	254	2.6
03	80	218	2.7

Firewood has become more scarce over the years in the Bear Creek and Eagle Creek areas. This is because the mountain pine beetle epidemic from the 1970s and 1980s, which killed many trees in the area, has subsided to endemic levels and there is a lack of any new access areas. There is however, a growing Douglas-fir beetle epidemic in the Gardiner area.

Direct and Indirect Effects

Alternative A (No Action): This alternative will not have any direct or indirect effect on firewood availability.

All Action Alternatives: Effects are dependent upon the amount of accessible potential firewood that would be removed by each alternative. Accessible firewood is considered dead timber along open road corridors on relatively gentle slopes (<15% on the downhill side and slightly steeper slopes on the uphill side). The corridor width is dependent upon slope (i.e., the steeper the slope, the shorter the distance from the road that the firewood cutter is willing/able to carry wood).

The effect is difficult to quantify but a relative, subjective comparison can be made among the alternatives based on acres of accessible ground to be harvested. Alternative B would remove the largest amount of potential firewood and Alternative D-modified the least amount. Unit 15 (to be harvested in all action alternatives) would cause the greatest loss of opportunity. This stand has supported past firewood cutting.

Cumulative Effects

Commercial harvesting in the area over the past few decades has affected the amount of potential firewood available for local residents. Although potential firewood has been removed through these sales, the existing road system was established through these sales. It is this road system that has vastly increased the availability and accessibility of firewood for local residents. Firewood had become less available in the area in the late nineties due to reduced tree mortality, however currently there is an insect epidemic building in the project area (Douglas-fir beetle), as well as the 2001 Fridley and Little Joe wildfires, which also have provided some firewood opportunities. The four action alternatives will contribute a small amount to the reduction of available potential firewood, with Alternative D-modified being the least impactful. The mitigation discussed in Chapter 2-29 will help reduce that effect. None of the action alternatives will cause a significant impact on firewood availability.

Applicability of the Forest Plan, Laws, Regulations, Policies, and Other Direction

No specific FP direction, laws, or other policy relate to this issue.

Small Timber Operations

Affected Environment

The Gardiner District supports small-scale timber sale permit requests by local residents. Past requests for permits have focused primarily on purchasing dead timber (firewood and houselog material), not green sawtimber. Table 3-11 below was compiled from past timber sale permit records and is a reflection of demand for small sales by local residents. No reasonable requests for a small sale are known to have been rejected during this period. In September of 1999 the Categorical Exclusion (CE) authority that enabled us to issue small commercial sawlog permits was revoked, no longer allowing any permits for the harvest of green trees other than removal for public safety or campground maintenance. Based on review and experience with small timber harvest projects, in September of 2003 the Forest Service added three narrow CE's for limited timber harvest to section 31.2, Categories of Actions for Which a Project or Case File and Decision Memo Are required of its Environmental Policy and Procedures Handbook (FSH 1909.15-2003-2, Chapter 30, Section 31.2), categories of actions which do not individually or cumulatively have a significant effect on the human environment and therefore are excluded from having to prepare environmental disclosure documents, thus simplifying analysis and documentation and allowing for routine small timber harvest activities. See the Project File for further details.

Table 3-11. Recent demand by Gardiner area residents for small commercial sales of sawlogs and firewood, permits issued FY94-Present.

Permittee	FY Permit Issued	Product	Volume Harvested
R.Johnson	1994	Houselogs	10 MBF
G.Dolsman	1995	Firewood	10 cords
C.Metje	1996	Sawlogs Firewood	4.2 MBF 2.0 cords
B.Ganje	1996	Sawlogs Firewood	3.6 MBF 18 cords
G.Dolsman	1997	Firewood	20 cords
M.Diehl	1997	Firewood	20 cords
R.Johnson	1998	Houselogs	5.9 MBF
L.Johnson	1998	Firewood	52 cords
B.Feldkamp	1999	Sawlogs	27.2 MBF
G.Dolsman	1999	Firewood	10 cords
T.Mahan	2000	Firewood	5 cords
R.Kelly	2000	Sawlogs Firewood	21.6 MBF 60 cords
L.Johnson	2001	Post & Pole	150 posts
M.Gallaher	2002	Firewood	16 cords
M.Menuey	2003	Sawlogs Firewood	2 MBF 1.4 cords
Cody Lumber	2003	Sawlogs	10.4 MBF

Demand for commercial permits for sawlogs and houselogs has averaged 8.4 MBF/year. Permits for houselogs authorized cutting only dead trees (at the request of the permittee) because these manufacture into higher quality houselogs. Demand for commercial firewood permits has averaged 21.4 cords/year. Again, only dead trees were cut under these permits. In summary, local demand for small sales of green sawtimber has been minor and issuance of permits for this type of sale has not been limited by lack of available timber.

Local operators use primarily horses and brute strength to remove logs from the forest. They do not own heavy equipment such as rubber-tired skidders, crawler tractors, and skyline yarders. Therefore, they are limited from logging on the less accessible steeper slopes and areas further from the existing road system.

Direct and Indirect Effects

Alternative A (No Action): This alternative will not have any direct or indirect effect on availability of wood for local small timber sale operators.

All Action Alternatives: The effects are proportional to the amount of relatively accessible timber removed under each alternative. The effect is difficult to quantify but a relative subjective comparison can be made among the alternatives based on acres of accessible ground to be harvested. Alternative B would remove the largest amount of timber and Alternative D the least amount.

Much of the timber being harvested under the action alternatives requires use of heavy equipment and cable logging systems due to relatively steep slopes. Also, most of the timber in the proposed sale is green (live) and is not in high demand by local operators. Because no residents in the Gardiner area have the necessary logging equipment and a sustained small-scale timber sale program would not likely economically support the purchase, maintenance, and long-term ownership of this equipment, each action alternative would theoretically reduce timber available for local small-scale operators to a small degree. In actuality, the

local demand has been satisfied over recent years as indicated by issuance of permits for all requested small sales.

Cumulative Effects

Commercial harvesting in the area over the past few decades has affected the amount of timber available for local operators. Although these sales have reduced the amount of merchantable timber in the area, the harvested stands have been reforested and will help provide a sustained source of timber for future harvesting if that remains an objective. The four action alternatives will contribute a small amount to a reduction of available merchantable timber, with Alternative D-modified being the least impactful. As with past harvested areas, these new units will also be reforested and contribute to providing a sustainable source of timber. Compared to the local demand, none of the action alternatives will cause a significant short or long-term cumulative impact on availability of timber for local small timber sale operations.

Applicability of the Forest Plan, Laws, Regulations, Policies, and Other Direction

There is no specific direction in the Forest Plan, laws, regulations, or policy regarding this issue. A review of the "Gardiner Area" section of the *Park County Comprehensive Plan* lists the following goal and objectives (Park County 1998):

Goal: Maintain a stable diversified economy compatible with the values of the area.

Objectives:

1. Support projects to increase or diversify economic activity that utilize existing infrastructure and human resources.
2. Discourage large-scale manufacturing and commercial development that is not in character with the area.
3. Discourage polluting industry.
4. Encourage small-scale light manufacturing in appropriate locations.
5. Develop incentives to encourage agricultural land uses to survive.
6. Support the development of locally owned and operated businesses.
7. Support home occupations and cottage industries.

Only private lands, not national forest land, are covered by the *Park County Comprehensive Plan*. Although the County Plan provides valuable information on the community's goals and objectives, it is not applicable to national forest lands. Regardless, the effect of the Darroch-Eagle Creek Timber Sale on local small timber sale operations would be minor and is not in conflict with the *Park County Comprehensive Plan*.

Openings Exceeding 40 Acres

Chapter 3 and Appendix A of this EA provide a comparison of environmental effects created by the range of alternatives considered in this EA. The *Comparison of Alternatives Table 2-8, Chapter 2-31*, displays these differences between the alternatives that exceed and those that remain below the 40-acre threshold. Some of the units in Alternatives B and C would exceed the 40-acre limit, while none of the units in Alternatives D and D-Modified would create openings greater than 40 acres in size. Analysis shows that there is no biological reason that would support the creation of openings greater than 40 acres. The reasons that suggest exceeding this size limit are driven by economic efficiency and maximizing timber receipts. The ID team believes that the conditions required for an exception to obtaining Regional Forester approval in order to create openings larger than 40 acres are not present in this proposed project (*FP, pp. II-22 and A-11*).

Other Specifically Required Disclosures

Effects on Other Threatened and Endangered Species

Gray Wolf

With the reintroduction of the gray wolf in Yellowstone National Park, there is the potential for wolves to be present within the project area. However, as stated in 50 CFR Part 17 (November 22, 1994) "there are no conflicts envisioned with any current or anticipated management actions of the Forest Service....". The CFR also states: "nonessential experimental animals located outside National Wildlife Refuges or National Park lands are treated for purposes of Section 7 of the Act, as if they were only proposed for listing." Therefore, implementing any of the action alternatives is "not likely to jeopardize the continued existence" of the nonessential/experimental gray wolf. See *Appendix C-35, Biological Assessment*.

Bald Eagle

The higher elevations of the analysis area, including the project site, are poor bald eagle habitat because food is limited. There is no evidence that individuals or known or potential bald eagle habitat will be impacted by implementing this project. Implementing any of the action alternatives will have "no effect" on the threatened bald eagle. See *Appendix C-37, Biological Assessment*.

Lynx

Suitable lynx foraging and denning habitat is found in the analysis area, but confirmed sightings have not been reported in the project area. Lynx, however, are believed to exist in northwest Wyoming and southwest Montana and there have been recently documented sightings in Yellowstone National Park. See *EA C-38*. Current levels of human activity could discourage lynx presence in portions of the Gardiner Basin and the analysis area, and additional human activities could further erode habitat quality. However, implementing this proposal would not add human activity annually. The project is temporally limited to a 3-year major activity period and spatially limited to the 195 acres proposed for harvesting in Alternative D-modified (preferred alternative).

Conservation measures direct that not more than 15 percent of lynx habitat within a lynx analysis unit can be changed to an unsuitable condition within a 10-year period. This proposal would affect <1 percent of suitable lynx habitat.

Lynx benefit when a diversity of forest successional stages are present. This project would add to the diversity of available habitat. Although the proposed project area would not be suitable snowshoe hare or lynx foraging habitat immediately after harvesting, in several decades it would provide better quality habitat than it currently does as an old growth forest. Implementing any of the action alternatives is "not likely to adversely affect the threatened lynx". See *Appendix C-38, Biological Assessment*.

Unique Characteristics of the Geographic Area

The project area lies 4-6 miles northeast of the town of Gardiner, MT and approximately 4-5 miles to the north of Yellowstone Park. The Absaroka-Beartooth Wilderness Area is adjacent to the north and east boundaries of the proposed sale area. There are no Wild & Scenic Rivers or ecologically critical areas known to occur in the project area. Possible effects to the Gardiner community are discussed in detail in *Chapter 3-23 through 3-26*. There would be no significant effects to either wilderness or roadless areas as discussed in *Appendix A-23 and A-24, Issues 28. & 29*. There would be no significant effects to wildlife in Yellowstone Park as referenced in *Appendix C, Biological Assessment*.

Effects of Alternatives on Prime Farmland, Rangeland, and Forest Land

There are no prime farmlands, rangelands, or forest lands within the project area.

Effects of Alternatives on Floodplains and Wetlands

Floodplains and wetlands will not be affected by any of the alternatives.

Effects of Alternatives on Social Groups

None of the action alternatives will have discernible effects on minorities, American Indians, or women, or the civil rights of any United States citizen. No alternative would have a disproportionate adverse impact on minorities or low-income individuals. *See Appendix A-25 Issue 35. Environmental Justice*

Effects on Public Health and Safety

There would be no significant effects on public health and safety due to effective mitigation measures as described in *Chapter 2-26* and in *Appendix A-24, Issue 31*

Effects to Scientific, Cultural, or Historic Resources

There are no known scientific, cultural, or historic resources or sites that have been found in the project area. There have been several surveys conducted over the past 20 years with the most recent survey completed in the Summer of 1998. *See Appendix A-24 for further details.*

Short-term Use versus Maintenance and Enhancement of Long-term Productivity

Short-term uses are those uses that generally occur annually. Long-term productivity refers to the ability of the land to produce a continuous supply of a resource. Minor amounts of soil loss and displacement would occur as a result of any of the action alternatives. Application of the soil mitigation measures described in Chapter 2-27 and BMP's in Appendix D would ensure this project will maintain long-term soil productivity and would be adequate to keep impacts within acceptable. Impacts to other resources (wildlife and vegetation) are limited in time and intensity and would not deplete their long-term productivity.

Irreversible and Irrecoverable Commitment of Resources

An *irreversible* commitment of resources refers to the use or commitment of a resource that are incapable of being reversed or changed. For example, nonrenewable resources, such as minerals in the ore, would be removed forever during the milling of the ore and would be irreversibly lost or committed. Irrecoverable commitment of resources refers to actions that result in changes to resources that cannot be recovered or regained. There are no irreversible or irrecoverable commitments of resources with the implementation of any of the action alternatives proposed in this EA. Even though forested areas will be harvested and wood fiber removed, these resources are recoverable within a relatively short period of time (90-120 years).

Possible Conflicts with Other Land Use Plans, Policies, and Controls

None of the alternatives discussed in this EA would be inconsistent with the objectives of Federal, Regional, State, and Local land use plans, policies, and controls for the project area. The Park County Comprehensive Plan does not apply to national forest lands in the project area. See the Endangered Species Act discussion below and *Appendix C, Biological Assessment* regarding consultation and coordination with the U.S. Fish and Wildlife Service on effects to threatened and endangered species.

The proposed amendments identified in this EA are consistent with the objectives of the Gallatin Forest Plan. However, these areas are not currently meeting Forest Plan Standards, and therefore amendments to those standards are required and must be disclosed. In reference to Amendment 19, the Biological Assessment has been included as Appendix C in this EA.

Energy Requirements and Conservation Potential of Alternatives

The energy required to implement Alternatives B, C, D, or D-modified in terms of use of petroleum products is insignificant when viewed in the context of production costs and the effect on national and worldwide petroleum reserves.

Probable Adverse Environmental Effects That Cannot Be Avoided

Implementation of a timber harvest and associated road development proposal will not result in adverse environmental effects that cannot be avoided. Reclamation of any disturbed sites is proposed in association with the timber harvest and road related activities.

Applicable Laws and Regulations

Federal Laws

Based on the issues identified in Chapter 2, the principle Federal laws applicable to this proposal include the: Gallatin Range Consolidation and Protection Act of 1993, Gallatin Land Consolidation Act of 1998 (P.L. 105-267), Department of the Interior and Related Agencies Appropriations Act of 2004 (P.L. 108-108), National Forest Management Act of 1976, Endangered Species Act of 1973, National Historic Preservation Act (as amended 1992), American Indian Religious Freedom Act, and Native American Graves and Repatriation Act. Compliance with these laws is discussed below, or references within this document are noted. The Clean Air Act and Clean Water Act are discussed below under *State Laws*.

Gallatin Range Consolidation and Protection Act of 1993; Gallatin Land Consolidation Act of 1998 (P.L. 105-267), Department of the Interior and Related Agencies Appropriations Act of 2004 (P.L. 108-108).

The Gallatin Range Consolidation and Protection Act of 1993 provided for Federal acquisition of over 83,000 acres, in a series of exchanges and purchases, of Big Sky Lumber Company Lands (BSL) inholdings within the Gallatin National Forest. A large portion of the project authorized by this Act has been completed. The Gallatin Land Consolidation Act of 1998 provided further direction to complete the project. The Timber Sale Program component involved a timber-for-land exchange. This part of the Act required the Forest Service to generate revenue from the sale of national forest timber and to deposit the revenue into a special account by 12/31/03. These funds would then be used to purchase up to four sections of BSL lands in the Taylor Fork drainage. For various reasons, sufficient timber receipts to complete the timber-for-land exchange in the Taylor Fork drainage could not be generated in full by the 12/31/03 deadline. To address this problem and to be able to complete implementation of the Gallatin Land Consolidation Act of 1998 ("Gallatin II") Senator Conrad Burns introduced and Congress passed (November of 2003), legislation included in a key rider to the Department of the Interior and Related Agencies Appropriations Act of 2004 (P.L. 108-108) Section 333--"Implementation of the Gallatin Land Consolidation Act. This new legislation allowed the Forest Service to borrow the funds needed to complete the BSL timber-for-land exchange in a timely manner from LCWF funds allotted for an approved project on another forest. The Forest Service now has 5 years (2004-2008) to reimburse the borrowed LWCF funds, using tools and authorities provided in the new act: a) Timber receipts, b) sale of Gallatin NF lands, and c) use of excess NFF receipts in Montana. On the Gallatin National Forest, timber sale receipts generated during the next five years including sold sales with active harvest and proposed sales will be made available to help reimburse the borrowed funds.. The Darroch-Eagle Creek Timber Sale is a proposal intended to help achieve that objective. The project complies with the relevant direction provided in all three of these laws.

National Forest Management Act of 1976/Gallatin Forest Plan

Timber production on Federal land is a use allowed by several acts of Congress. It is a part of the mission of the Forest Service to manage the timber resource on a multiple-use/sustained yield basis. The National Forest Management Act (NFMA) restricts timber production to lands classified as suitable for timber management (36 CFR 219.14). NFMA also set certain management requirements for forest plans to meet, pertaining to conservation of such resources as soil and water and plant and animal diversity (36 CFR 219.27) (Novak 1999, PF 159) (*Appendix A-24 Issue 33*). The Gallatin Forest Plan standards are established to meet these requirements.

In accordance with NFMA, the proposed timber harvesting would occur only on suitable timberland. Other NFMA requirements would also be met. The action alternatives require one or more site-specific, temporary Forest Plan amendments due to either: a) pre-existing resource conditions that do not currently meet Forest Plan standards or b) design aspects of the alternative that would not meet Forest Plan standards.

Three project-specific Forest Plan Amendments would be required to implement Alternatives B and C, two of which are due to existing conditions (*Chapter 1-5*). Two project-specific Forest Plan Amendments would be required to implement Alternatives D and D-modified, both due to pre-existing conditions. Alternatives B and C would require Regional Forester approval in order to comply with NFMA (36 CFR 219.27 (d)(2) and Forest Plan (*Appendix A-11*) 40-acre opening requirements, while Alternatives D and D-Modified would comply with NFMA and the Forest Plan without additional approval. Refer to Chapter 3 for a more detailed discussion of consistency with Forest Plan management direction for the significant issues. See *Chapter 2-31, Table 2-8, Comparison of Alternatives* for a comparative display of necessary Forest Plan Amendments. Also, *Appendix A-24, Issue 33 (Silviculture/NFMA Requirements)* discusses compliance with specific NFMA requirements.

Endangered Species Act of 1973

Under Section 7 of the Endangered Species Act, each Federal agency must ensure that any action authorized, funded, or carried out is not likely to jeopardize the continued existence of any threatened or endangered species. If a threatened or endangered species, or species proposed for listing occurs in an area where a project is proposed, a Biological Assessment (BA) must be conducted. If the action will result in a "may affect" determination for the species, formal consultation with the U.S. Fish and Wildlife Service must occur and they will issue a Biological Opinion. If the action results in a "not likely to adversely affect" or "beneficial effect" conclusion, formal consultation is not necessary but informal consultation and a letter of concurrence must be obtained from the U.S. Fish and Wildlife Service. If a "no effect" results, no consultation is necessary. To reduce effects of an action to an acceptable level, mitigation (coordination measures) may be necessary.

This EA has complied with the Endangered Species Act, Section 7, in the completion of a BA for the preferred alternative (*See Appendix C*). The findings in the BA for Alternative D-modified (preferred alternative) are that the project is "not likely to adversely affect" the threatened grizzly bear and it will have "no effect" on the threatened bald eagle. It is "not likely to jeopardize the continued existence" of the nonessential/experimental population of gray wolves. The project is "not likely to adversely affect" the threatened lynx. Consultation has been initiated with the U.S. Fish and Wildlife Service as a result of the grizzly bear and lynx determinations.

Heritage Program Laws

Several Federal laws provide for preservation of historic, prehistoric, and other cultural resources. These include the National Historic Preservation Act (NHPA), the American Indian Religious Freedom Act (AIRFA), and the Native American Graves Protection and Repatriation Act (NAGPRA). These laws essentially require that adequate and extensive review of these undertakings be conducted in order to assess the possible effects of these activities upon cultural resources. They also provide that Federal agencies conduct adequate consultation with pertinent tribes in order to be informed of any possible conflicts an undertaking would have on their ability to conduct traditional religious practices.

The project area has been surveyed several times over the years for the presence of cultural resources. These surveys have not found any cultural resources. The project area has supported timber harvesting during the past few decades. Mitigation measures to protect cultural resources will be incorporated into the timber sale contract. The likelihood of harming cultural resources by implementing this project is remote. The pertinent tribes were contacted during the scoping stage for the project and they did not express any concerns to the Forest Service. Therefore, the proposal to harvest timber in this area is consistent with these laws.

State Laws

Clean Air Act

All action alternatives would comply with Montana air quality standards.

Clean Water Act

Montana State Water Quality Standards assign an A-1 classification to streams supporting pure Yellowstone cutthroat trout (Darroch Creek). Bear Creek below the AB Wilderness boundary is classified as a B-1 stream. The A-1 designation has strict non-degradation constraints while B-1 waters must be suitable for drinking, culinary, and processing purposes after conventional treatment. Beneficial uses must be maintained, the most limiting of which is the trout fishery in Bear Creek and tributaries. The analysis for this proposal found that timber harvesting under Alternatives B, C, and D would be in compliance with State Water Quality Standards.

Environmental Justice

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations, directs federal agencies to integrate environmental justice considerations into federal programs and activities. Environmental Justice means that, to the greatest extent practical and permitted by law, all populations are provided the opportunity to comment before decisions are rendered or 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 (RO 13898 and Departmental Regulation 5600-2).