APPENDIX C

BIOLOGICAL ASSESSMENT

for the

DARROCH-EAGLE CREEK TIMBER SALE

Gardiner Ranger District
Gallatin National Forest

December 1, 2003

OUTLINE

INTRODUCTION

The U.S. Forest Service (USFS) is required to determine the need for consultation with the U.S. Fish and Wildlife Service (USFWS) on every program or activity that has the potential of affecting a threatened or endangered species or its habitat. This direction is found in Forest Service Manual 1. The mandate was established to comply with the Endangered Species Act, Section 7, which requires all federal agencies, in consultation with the USFWS, to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify their critical habitats.

Analysis to determine the impacts of a proposed action on threatened and endangered species and the need for consultation with the USFWS is conducted in a Biological Assessment (BA). It addresses the preferred alternative identified through a process prescribed by the National Environmental Policy Act (NEPA) and provides sufficient detail to "stand alone" from other environmental analysis documents.

The purpose of this BA is to evaluate how timber harvesting and reforestation of about 195 acres of National Forest land in the Bear Creek drainage, Gardiner Ranger District, would affect threatened and endangered species. The proposal stipulates removing about 1.5 million-board-feet (MMBF) of timber. Project related road adjustments involve constructing 0.9 miles of new (temporary) roads and reconditioning 3.6 miles of existing roads. Most new roads built to accommodate timber removal will be closed 2 years after harvesting occurs. However, new roads near whitebark pine forests will be closed immediately after harvesting is completed to accommodate potential grizzly bear activity in these high quality foraging areas.

To address road density issues before project implementation, a road closure program was conducted in the analysis area in 1999. The intent was to mitigate the effects of any new (temporary) road construction on grizzly bear security habitat during the proposed harvesting activities. It involved closing and stabilizing 1.4 miles of existing open road and improving the closure barrier on another 0.4 miles of currently closed road. These roads were selected based on their relatively low existing volume of motorized vehicle use, as well as the benefits of closure derived for wildlife and watershed values.

DESCRIPTION OF THE ANALYSIS AREA

Five spatial scales were used in this analysis. Reference in this document to the respective analysis areas varies among species being addressed and their associated habitat needs, as well as the specific project component being considered. For additional discussion of prearranged protocol for analysis area boundary configuration and selection, see Appendix 1.

1. HELLROARING/BEAR BEAR MANAGEMENT UNIT

To ensure unbiased results, the Interagency Grizzly Bear Committee (IGBC) developed standardized conventions for addressing effects to grizzly bears. According to this protocol, the Bear Management Unit (BMU) Subunit is the appropriate scale for project-specific analyses (Appendix 1, IGBC 1998). The proposed Darroch-Eagle Creek timber sale would take place in the Hellroaring/Bear BMU Subunit #1 (see below), which is therefore the acceptable analysis area. However, when a landscape-level perspective was necessary, analysis was conducted at the BMU level.

The proposed project area is in the Hellroaring/Bear BMU, which straddles the Gallatin National Forest (GNF)/Yellowstone National Park (YNP) boundary. It is composed of subunits #1 and #2 (204 and 253 square miles, respectively). The majority is in the Absaroka Beartooth Wilderness. It includes most of the Gardiner Basin as well as the Crevice Creek, Hellroaring, and Buffalo Fork drainages.

2. HELLROARING BEAR/BEAR MANAGEMENT UNIT SUBUNIT #1

The subunit is the appropriate level for analyzing effects to grizzly bears (Appendix 1). Timber harvesting would occur in the Hellroaring/Bear BMU Subunit 1, which is located in the north-central and south-central portions of YNP and the GNF, respectively. About an eighth of this subunit is in YNP. Roughly, it includes the eastern portion of the Gardiner Basin and the adjacent drainages in the Absaroka Beartooth Wilderness. This subunit is not one of the three identified in the draft Grizzly Bear Conservation Strategy as needing a reduction in motorized access and an increase in secure habitat to meet established standards.

Highway 89 and the Yellowstone River form the western boundary of this subunit. Human use levels in the river corridor and adjacent private land are comparatively high, while the nearby backcountry receives much less use. Recreation use levels associated with hiking, fishing, hunting, and ATV traffic are also seasonally high. Road densities are relatively high on private ground and the non-wilderness portions of National Forest land.

3. GARDINER BASIN

The third spatial scale used in this analysis is the Gardiner Basin, which is formed by a mostly continuous hydrologic divide encompassing about ten separate drainages. The Gallatin Range is the western edge and the Absaroka Mountains are on the north and east. The higher peaks are about 10,000 feet. The valley floor is terrace topography along the Yellowstone River where vegetation is typical of low to mid-elevation arid grasslands in the intermountain west. The undisturbed native grasslands are dominated by Idaho fescue, bluebunch wheatgrass, needle-and-thread grass, prairie junegrass, and Indian ricegrass. Big sagebrush, and green and rubber rabbitbrush are prevalent shrubs. The habitat type for the majority of the valley floor is big sagebrush/bluebunch wheatgrass (Mueggler and Stewart 1980). Noxious weeds including dalmation toadflax, spotted knapweed, and cheatgrass are present and are a major problem. Mid-slope areas are sagebrush/grasslands, lush mountain meadows with scattered aspen stands, or steeper hillsides with sparse vegetation of mostly native grasses. Juniper, limber pine, and Douglas fir forests occupy the lower, drier forest areas, and lodgepole is dominant at mid-slope. Spruce is plentiful in wetter areas. Substantial forests of whitebark pine are the highest elevation timber.

Highway 89 and the Yellowstone River bisect the Gardiner Basin. Homes and agricultural operations are located along the road corridor. Most land above the valley floor is in public ownership.

Wildlife is plentiful and diverse. The Gardiner Basin is the northwest end of the Northern Yellowstone Winter Range (NYWR), a nationally-recognized wintering area for migratory ungulates. Annually, 10,000 to 25,000 elk (the largest migratory elk herd in the world), 2,000 to 3,000 mule deer, several hundred bighorn sheep, pronghorn, and moose winter on the NYWR. Summer range is abundant and not a limiting factor. However, available winter range is a population determinant. With the most temperate climate and lowest elevation, the Gardiner Basin portion of the NYWR is critical habitat for ungulates during the more severe winters and winter months. Snow conditions determine ungulate distribution in the Basin and restrict animals to the lower elevations. Mountain goats, grizzly bears, black bears, mountain lions, and wolves are also present, but less common.

4. BEAR CREEK AND EAGLE CREEK

For most issues, analysis was conducted at the spatial scale of Bear Creek and Eagle Creek, as defined by the hydrologic divide. This is roughly synonymous with Timber Compartments 305 and 306, which make up the analysis area unless otherwise indicated. There are 52,608 acres of National Forest land in these compartments, of which 6,966 acres (13 percent) are considered suitable for timber management (MA 13, see Management Direction section). Most acres (56 percent) are within the Absaroka Beartooth Wilderenss (MA 4). The third main management category is big game winter range/grizzly bear habitat (MA 14).

Eagle Creek and Bear Creek are linear, high-gradient mountain streams. Eagle Creek is much smaller and roughly parallels a portion of Bear Creek. It is located at the mouth of the Bear Creek drainage, which dominates the landscape. One of the 10 major drainages in the Gardiner Basin, Bear Creek is a 10-mile-long high-gradient stream that begins at about 9,000 feet and descends to the Yellowstone River at about 5,000 feet. The confluence of Bear Creek and the Yellowstone River is 3 miles east of Gardiner

Maintained dirt and gravel roads access most of the analysis area outside of designated Wilderness. Recreation use in the area is comparatively high. This is partially due to the large amount of access, but other features including good hunting, spectacular mountain scenery, Forest Service campgrounds and maintained trails also attract the public.

The Bear Creek drainage is part of an historic mining district. After several decades of inactivity, a mine was operative again from 1988-1997. The small town of Jardine was the center of mining activity in the past and recently. No livestock allotments are present and most private residences are
limited to the immediate Jardine area. The upper end of the drainage is included in the Absaroka Beartooth Wilderness and the lower elevations are part of the NYWR, where large numbers of ungulates annually spend the winter.

Timber harvesting has been extensive and chronic in the Bear Creek drainage. Timber was removed in the 1800s to support the mining industry. More organized harvesting began in the 1950s. Large-scale cutting took place in 1970, with 9 clear-cut units followed by another 4 in 1972. Smaller
sales were conducted in 1980, 1984, 1984-86, 1986-87, and 1987-88. Most timber harvesting occurred in the middle third of the drainage, above the lower elevation grasslands and below the Wilderness boundary.

5. PROJECT SITE

In other instances, it was more appropriate to consider effects in only the area where timber harvesting would occur. This area is referred to as the project site. Specifically, harvesting would involve Darroch Creek and the North Fork of Bear Creek, two tributaries of Bear Creek. The North Fork of Bear Creek would be accessed through Eagle Creek.

FEDERALLY LISTED SPECIES

In accordance with Section 7 of the Endangered Species Act, the GNF periodically requests a list from the USFWS of the threatened or endangered species that must be considered for analysis. According to the current list (March 27, 2002), the grizzly bear, bald eagle, lynx, gray wolf, and Ute Ladies' tresses (*Spiranthes diluvialis*) are the threatened or endangered species that may be present in the analysis area. The wolf is managed under special constraints (see below). In a letter dated April 15, 2002, the GNF clarified that Ute Ladies' tresses is not present on the Forest, and therefore would not be considered in project effects analysis. No critical habitat for threatened or endangered species has been designated or proposed in the project area.

On November 22, 1994, the USFWS (USFWS 1994) approved a plan to establish populations of wolves in YNP and central Idaho. Rules published in the Federal Register designate gray wolves in each area as non-essential experimental populations under Section 10(j) of the Act. Within the designated areas described and depicted in the rules, all gray wolves will be managed in accordance with the prescribed provisions. Wolves designated as non-essential experimental that are not within units of the National Park or National Wildlife Refuge systems, but are within the boundaries of the non-essential experimental population area, are treated as proposed species for Section 7 purposes. As such, federal agencies are only required to confer with the USFWS when they determine that an action they authorize, fund, or carry out "is likely to jeopardize the continued existence" of the species.

DESCRIPTION OF THE PROPOSED ACTION

The USFS proposes to harvest timber and conduct other associated silviculture activities in the Darroch Creek, Bear Creek, and North of Fork Bear Creek drainages, Gardiner Ranger District, Park County, Montana. The project would occur within the Bear Creek watershed, which is about 5 miles northeast of Gardiner, Montana, in T8S, R9E, Sections 25-27, 31, 32, 34, and 35, P.M. If the project is approved, the sale would be awarded in 2004.

Project objectives include:
1. To contribute to the repayment of borrowed funds that were needed to complete the acquisition of the two remaining sections of private inholdings in the Taylor Fork area within the Gallatin National Forest (GNF) previously owned by Big Sky Lumber Company (BSL) by using timber receipts;.
2. To contribute to the supply of wood products from the National Forest.

The Gallatin Land Consolidation Act, 1998, directed the Forest Service to acquire 4 sections of BSL lands in the Taylor Fork area.. If implemented, the Darroch-Eagle Creek Timber Sale would provide revenues towards the purchase amount.

Another justification for this proposal is to provide wood products from National Forest lands. The Forest Plan directs managers to "provide a sustained yield of timber products and improve the productivity of timber growing lands" (Forest

Plan, p. II-1). The forested areas being considered have been identified as suitable for timber harvest, provided grizzly bear habitat objectives are met (Forest Plan, pp. III-40 to 43).

The proposal also involves reforestation of harvested sites, which is a legal requirement. Reforestation conserves natural resources and provides for multiple uses of public lands.
Reforestation potentially maintains wildlife habitat, provides aesthetic and recreation values, sustains timber production, and maintains slope stability thereby conserving soil and water resources.

ALTERNATIVE D MODIFIED - PREFERRED ALTERNATIVE

The selected alternative, D-Modified (Tables 1 and 2), was developed to provide an economically feasible proposal that did not involve harvest units greater than 40 acres in size. Larger harvest areas require special authorization from the Regional Forester. In addition, analysis showed (by comparing effects of alternatives) that there is no biological reason to support cutting larger areas. Although economic efficiency and maximizing timber receipts (the project's primary purpose) would favor this approach, these reasons alone would not elicit the required Regional Forester approval. Moreover, the conditions necessary for receiving an exception are not present (Forest Plan, pp. II-22 and A-11). For project specifications in addition to the 4 areas discussed below, see Appendix 2.

1. TIMBER HARVEST AND REFORESTATION

Timber harvest and reforestation is proposed on approximately 195 acres of suitable forest land. Harvest prescriptions include silviculture treatments that remove about 60-80 percent of the mature lodgepole pine, Douglas-fir, Engelmann spruce, or subalpine fir (depending on the forest type). Methods for timber removal include tractor skidding on 164 acres and cable yarding on 31 acres.
The normal operating season would be July 1 to October 15 each year for up to 3 years. In Harvest Units 9 and 14, all timber harvest would be concluded before August 30 as mitigation for potential grizzly bear foraging in the adjacent whitebark pine stands.

This proposal would produce approximately 1.5 MMBF of timber from live and insect-killed or damaged trees in the Bear Creek drainage. Because this alternative would not create openings greater than 40 acres, it would not require Regional Forester approval to implement.

Reforestation and associated activities would occur on the harvested acres. Slash treatment and site preparation for reforestation would be conducted after the harvest operation, as needed. Methods would include lopping slash and mechanical trampling and piling on the tractor ground, and lopping and yarding entire trees to landings on the cable ground. Natural regeneration would be allowed on 169 acres and planting would occur on 26 acres. If monitoring indicates natural regeneration is not meeting stocking standards and legal requirements, planting would be conducted.

2. ROAD CONSTRUCTION AND RECONSTRUCTION

Harvest operations would require construction of approximately 0.9 miles of temporary road and reconstruction of 3.6 miles of existing system roads. No new permanent roads would be added to the system with this alternative. Upon completion of harvest activities, the purchaser would be required to close the temporary road constructed to access unit 14. The intent of this immediate post-harvest closure would be to reduce human activities adjacent to potential whitebark pine grizzly bear foraging areas.

After the sale is completed and the landings have been opened to firewood gathering for about two seasons, the remaining newly constructed temporary roads would be closed according to prescribed guidelines (see Appendix 2). This responsibility will fall to the Gardiner Ranger District.

To mitigate temporary road construction effects on grizzly bear security habitat, motorized access was precluded (in 1999) on about 1.8 miles of existing open system roads. This included stabilization and closure of approximately 1.4 miles of open road in the analysis area and closure barrier improvement work on another 0.4 miles of currently closed road (Road 6976C). The closures involved revegetating the road surface where needed to reduce soil erosion and maintain slope stability, and installing or maintaining barriers to prevent use of the road by motorized vehicles. These roads were chosen because of their relatively low existing volume of motorized vehicle use related to firewood cutting and dispersed recreation, as well as the benefits of their closure for wildlife and watershed. These adjustments to the Bear Creek road system will ensure adherence during project implementation to Amendment #19 of the Forest Plan. Amendment #19 disallows an increase in open motorized road density.

3. HABITAT EFFECTIVENESS AMENDMENT

The current Habitat Effectiveness Index (HEI) rating for the involved Habitat Analysis Units (portions of Compartments 305 and 306) are 58 percent, 62 percent, and 49 percent (Eagle Creek, Upper Bear Creek, and the Palmer Mountain, respectively). This does not meet the Forest Plan standard of 70 percent.

Alternative D-modified would require a small amount of new temporary road construction. However, the presale closure (1999) of 1.8 miles of existing road would offset the temporary increase in open road density created by the new roads. In other words, there would be no short or long-term increase in open road density or reduction in HEI due to this alternative. However, because the HEI would not meet the 70 percent standard during and after the project, a temporary site-specific Forest Plan amendment would be necessary to exempt Alternative D-Modified from the 70 percent HEI standard.

4. VEGETATIVE DIVERSITY AMENDMENT

A Forest Plan standard designed to provide for vegetative diversity requires that 6 different vegetative categories must each comprise a minimum of 10 percent of a given analysis area. Compartments 305 and 306 do not meet the requirement for seedling, sapling, and pole-size forest components.

After implementation of Alternative D-Modified, the proportion of the analysis area in each structural stage would be: 25.8 percent grass/forb (25.24 percent grass/forb-natural, 0.56 percent grass/forb-harvested), 0.14 percent seedlings, 3.43 percent saplings, 0.32 percent pole, 23.40 percent mature, and 38.07 percent old-growth. This reflects a slight increase in the grasss/forb component. However, the proposed harvesting would not change enough of the vegetative structure in the analysis area to achieve the Forest Plan vegetative diversity standard. Therefore, this alternative would involve a site-specific Forest Plan amendment exempting Alternative D-Modified from the vegetative diversity standard.

Table 1. Alternative D-Modified - Harvest Unit Summary

Unit No.	Acres	Treatment Method[1]	Volume (MBF)	Logging System	Reforestation	Fuels/Site Prep.
1	16	Cut 70%, Leave 30%	123	Tractor	Natural 16 ac	Entire tree yard (ETY) 50%, lop 50%
1A	5	Cut 70%, Leave 30%	39	Cable	Natural 10 ac	Entire tree yard (ETY) 50%, lop 50%
1B	4	Cut 70%, Leave 30%	31	Tractor	Natural 10 ac	Entire tree yard (ETY) 50%, lop 50%
1C	6	Cut 70%, Leave 30%	46	Cable	Plant 6 ac	Entire tree yard (ETY) 50%, lop 50%
3	20	Cut 80%, Leave 20%	200	Cable	Natural 20 ac	Lop and scatter tops Dozer Pile >20 t/a
3A	5	Cut 80%, Leave 20%	50	Tractor	Natural 5 ac	Lop/trample tops Dozer Pile >20 t/a
4A	2	Cut 80%, Leave 20%	20	Tractor	Natural 2 ac	Lop/trample tops Entire tree yard >20 t/a
4B	16	Cut 80%, Leave 20%	160	Tractor	Natural 16 ac	Lop/trample tops Entire tree yard >20t/a
4C	1	Cut 80%, Leave 20%	10	Tractor	Natural 1 ac	Lop/trample tops Entire tree yard >20 t/a
8	18	Cut 80%, Leave 20%	126	Tractor	Natural 18 ac	Lop/trample tops Dozer pile >20 t/a
9	15	Cut 80%, Leave 20%	150	Tractor	Natural 15 ac	Lop/trample tops Dozer pile >20 t/a
12	3	Cut 80%, Leave 20%	30	Tractor	Natural 3 ac	Lop/trample tops Dozer Pile >20 t/a
13	26	Cut 60%, Leave 40% 20 ac Cut 80%, Leave 20% 6 ac	78	Tractor	Plant 20 ac Natural 6 ac	Lop/trample tops Dozer Pile >20 t/a
14	21	Cut 80%, Leave 20%	168	Tractor	Natural 21 ac	Lop/trample tops Dozer pile >20 t/a
15	37	Cut 80%, Leave 20%	296	Tractor	Natural 37 ac	Lop/trample tops Dozer Pile >20 t/a
Total	**195**		**1527**			

Table 2. Activity schedule (estimated) for the Darroch-Eagle Creek Timber Sale.

Activity	2004	2005	2006	2007	2008
Road construction and reconstruction					
Harvest and hauling					
Slash treatment and site prep[1]					
Firewood removal (personal use minor)					
Close new roads (minor)					

[1] Slash treatment and site preparation will occur concurrently with or immediately after harvesting. For example, yarding tops will occur during harvest operations, when a yarder is on site. Road construction and timber harvest and hauling are considered "major" activities in effects analysis for grizzly bears and the remainder are considered "minor" activities

MANAGEMENT DIRECTION

FOREST PLAN STANDARDS AND GUIDELINES

The Gallatin Forest Plan (USDA 1987) provides direction for threatened or endangered species management in accordance with the Endangered Species Act. Forest Plan (p. II-1) goals for threatened or endangered species include:
1. Providing sufficient habitat for recovered populations of threatened or endangered species.
2. Striving to prevent human-caused grizzly bear losses.
3. Maintaining or improving forage resources.

Forest-wide standards for threatened or endangered species require adherence to:
1. General management for bald eagles as provided in "A Bald Eagle Management Plan for the Greater Yellowstone Ecosystem" (GYEBEWT 1983) (Forest Plan, p. II-19).
2. Requirements for consultation with the USFWS regarding management of threatened or endangered species (Forest Plan, p. II-19).

GALLATIN NATIONAL FOREST MANAGEMENT AREA DESIGNATIONS

Management goals have been established in the Gallatin National Forest Plan (USDA 1987). Specific goals are described for each designated Management Area (MA) to determine what activities and projects are possible. Conservation of threatened and endangered species was a priority in the formation of the standards and guidelines for each MA description.

All of the project area is in MA 13 (Forest Plan p. III-40). This management area consists of forested, occupied grizzly bear habitat. The productive forest lands are available for timber harvest provided grizzly bear habitat objectives are met. The specific relevant management goals include:
1. Managing vegetation to provide habitat necessary to recover the grizzly bear.
2. Meeting grizzly bear mortality reduction goals as established by the Interagency Grizzly Bear Committee (IGBC).
3. Allowing for a level of timber harvest compatible with goal 1.

Portions of the analysis area are in MA 4, which is designated Wilderness. Management goals include:
1. Managing existing wilderness in accordance with the Wilderness Act of 1964, Forest Service manual direction and site specific direction
2. Managing activities within grizzly bear habitat for recovery of the grizzly bear.

Portions of the analysis area are designated MA 14, which are big game winter ranges located in either open grasslands or a mosaic of grasslands and forested habitats. These areas are located within occupied grizzly bear habitat. Management goals for MA 14 include:
1. Maintaining and enhancing big game habitat.
2. Meeting grizzly bear mortality reduction goals as established by the IGBC.
3. Providing forage for livestock consistent with goal 1.

GRIZZLY BEAR MANAGEMENT SITUATION DESIGNATIONS

Occupied grizzly bear habitat in the Greater Yellowstone Area (GYA) is divided into five Management Situation (MS) categories based on grizzly habitat value and population distribution. Like MA designations, they help determine the range of management actions that are appropriate in a given area in terms of grizzly bear conservation. This project will occur in MS 1.

The following description of MS 1 and accompanying management direction appear in several U.S. Department of Agriculture documents (USDA and USDI 1979 p. 3, USDA 1987 p. G-3):

MS 1 - These areas contain grizzly population centers and habitat components needed for the survival and recovery of the species or a segment of its population. The probability is very great that major federal activities or programs may directly or indirectly affect the conservation and recovery of the grizzly.

Grizzly habitat maintenance and improvement (improvement applies to USFS only), and grizzly-human conflict minimization receive the highest management priority (FSM 2603). Management decisions favor the needs of the grizzly bear when grizzly habitat and other land use values compete. Land uses that can affect grizzlies and/or their habitat are made compatible with grizzly needs or such uses are disallowed or eliminated. Grizzly-human conflicts are resolved in favor of grizzlies unless the bear involved is determined to be a nuisance. Nuisance bears may be controlled through either relocation or removal, but only if such control would result in a more natural, free-ranging grizzly population and all reasonable measures have been taken to protect the bear and/or its habitat (including area closures and/or activity curtailments).

INTERAGENCY GRIZZLY BEAR COMMITTEE ACCESS STANDARDS

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. This deleted the previous standards for analyzing the impacts of roads and trails and replaced them with the new IGBC (1994, updated 1998) access definitions and interim standards. Therefore, in this analysis, direction given in the amended Biological Opinion of 1995 will be used.

The direction is as follows:
1. No increase in open motorized access route density over current levels.
2. No increase in total motorized access route density over current levels.
3. No decrease in the amount of core (secure) area from the current level.

The computer program commonly referred to as “moving windows analysis” is used for calculations related to the IGBC Access Standards and the Biological Opinion. A series of definitions provide a basis for determining if the above standards are achieved in a given area (Appendix 3).

CONSERVATION STRATEGY FOR THE GRIZZLY BEAR IN THE YELLOWSTONE ECOSYSTEM

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.

<u>IMPACTS TO GRIZZLY BEARS</u>

LOSS OF FORAGING HABITAT

<u>Measurement Indicators</u>
Analysis of potential impacts to grizzly bear foraging habitat was based on an assessment of direct effects to specific food sources and changes in vegetation patterns at a landscape level. Habitat impacts were quantified using direction from the Forest Plan for maintenance of old growth and vegetative diversity.

<u>Discussion</u>
Grizzly bears are successful omnivores. They are opportunistic feeders and will use almost any available food. As a result, their habitat within the GYA is characterized by a wide range of vegetation types (USFWS 1993, p. 7).

The search for food has a strong influence on grizzly bear movements. After emerging from the den, grizzly bears seek winter-killed ungulates. They may search lower elevations, drainage bottoms, avalanche chutes, and specific ungulate winter ranges looking for carcasses. 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 (Mattson et al. 1991, p. 1619).

Selection of vegetation types is tied to the seasonal availability of various foods and also the need for thermal and hiding cover. Non-forested 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 (Blanchard 1983, p. 118).

Habitat Types
The forests at the project site are dominated by mature lodgepole pine. They also contain a mix of subalpine fir, Engelmann spruce, Douglas-fir, and whitebark pine. Habitat types were characterized using Pfister et.al. (1977, p. 22). The harvest units include six habitat types in the subalpine fir series. Generally, they have low spring value, moderate to high summer value, and moderate to high fall value for foraging grizzly bears (in the absence of wintering ungulates that provide carrion) (USDA 1986). They are important to bears but do not contain a significant concentration of a particular kind of food. Food types present include succulent graminoids and forbs, the berries of several shrub species, and various insect species found in woody debris. The habitat types represented are:

ABLA/LIBO/VASC - subalpine fir/twinflower/grouse whortleberry
ABLA/VAGL - subalpine fir/huckleberry
ABLA/VASC/VASC - subalpine fir/grouse whortleberry/grouse whortleberry
ABLA/LIBO - subalpine fir/twinflower
ABLA/PIAL/VASC - subalpine fir/whitebark pine/grouse whortleberry
ABLA/CAGE/PSME - subalpine fir/elk sedge/Douglas-fir

Old-Growth
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 percent of the analysis area in old growth habitat. Currently, there are 20,255 acres (38.5 percent) of old growth and 12,333 (23.4 percent) of mature forest present. The proposed project would affect about 195 acres of mature and old growth timber and convert approximately 173 acres of old growth to grass-forb/seedling through timber harvesting. This would cause a 0.5 percent reduction of old growth. The number of acres of old growth remaining after project implementation exceeds Forest Plan standards (Table 3).

Table 3. Changes in Grizzly Bear Foraging Habitat, by Alternative

Element/Issue	Alternative A (No Action)	Alternative D- modified (Preferred)
Amount of foraging habitat modified (acres harvested):	0	195
Old growth harvested (ac):	0	173
Percent of compartment acres that are old growth:	38.5%	38.2% (-0.3%)
Percent of forested acres that are old growth :	58.4%	57.9% (-0.5%)
FP, MA 13 old growth standard met? (>30% of forested acres must be old growth)	Yes	Yes

Vegetative Diversity
Prime grizzly bear habitat includes a diversity of vegetation types. Long-term grizzly bear habitat management should maintain vegetative diversity, approximate natural conditions, and include all succession stages. The Forest Plan provides direction for vegetation management in association with timber harvest activities in grizzly bear habitat. A standard in MS 1 requires a minimum of
10 percent of the timber compartment in the following vegetation types: grass-forb, seedlings, saplings, pole, mature, and old growth. The analysis area does not currently meet these standards in the categories of seedlings, saplings, and pole.

Although past harvesting in the project area has converted some stands to early succession stages, the analysis area does not currently meet the Forest Plan standard. The present vegetative condition is above the standard in older-aged forests (62 percent mature and old-growth) and below the standard in younger-aged forest components (less than 1 percent seedlings, 3.4 percent saplings, and less than 1 percent pole-size). Implementing the proposal would convert about 175 acres of mature and old growth timber stands into grass-forb/seeedling (harvested) and another 20 acres would be affected through a partial cut (40-60 percent harvested) for a total of 195 affected acres. This does not appreciably alter vegetative composition in the analysis area or cause a further departure from Forest Plan standards (Table 4).

Table 4. Vegetation Types in the Analysis Area (Timber Compartments 305-306) - Existing Condition (Alternative A) and Project Implementation (Alternative D-modified). Figures are acres and percent of total compartment acres (52,608) after implementation of the alternative.

Vegetation Type	Percent Pre-harvest (Alt. A)[a]	Acres Pre-harvest (Alt. A)	Percent Post-harvest (Alt. D-mod.)[a]	Acres Post-harvest (Alt. D-mod.)
Grass-forb (natural)	25.2%	13,278	25.245%	13,278
Grass-forb (harvested)	< 1%	39	0.41%	214
Seedlings	< 1%	73	0.14%	73
Saplings	3.4%	1,804	3.43%	1,804
Pole	< 1%	168	0.32%	168
Mature	23.4%	12,333	23.4%	12,331
Old Growth	38.5%	20,255	38.17%	20,082

[a] Non-vegetated areas (rock, water) are not shown.

Conclusion

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 will occur. Opportunities for foraging on various graminoids and forbs are widespread. Berry-producing shrubs are also common, although biomass is not sufficient for this to be considered a major food source. Grizzly bears are attracted to elk calving areas where they prey on newborn elk. The lower elevations of the analysis area are spring range for ungulates but not the project site. The lower elevations are also ungulate winter range and carrion is 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 *Lomation cous*) at the project site that would qualify as an important food source for bears.

Forest Plan standards concerning old growth and vegetative diversity designed to preserve grizzly bear foraging habitat will not be violated if the project is implemented. About 173 acres of old growth will be converted to grass-forb/seedlings through timber harvesting. This will alter but not necessarily reduce foraging opportunities and food abundance. Vegetative food items used by grizzly bears are currently found at the project site and would be present after timber harvesting, although changes in species composition will 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.

Ungulates that are part of the prey base for grizzly bears will also be affected by implementing this proposal. This will be discussed in the "Changes in Prey Base" section.

CHANGES IN HIDING AND SECURITY COVER

Measurement Indicators

Potential effects on hiding and security cover were quantified using Forest Plan standards that address size and shape of harvest units, hiding and thermal cover, and duration of the activity. In addition, the IGBC Access Standards (IGBC 1998) apply here as they relate to security considerations for the bear. As described in an earlier section, they direct:

1. No increase in open motorized access route density over current level.
2. No increase in total motorized access route density over current levels.
3. No decrease in core area from the current level.

Potential core (secure habitat) and road density were quantified to address these issues.

Discussion

The amount and type of human access present in grizzly bear habitat has been inexorably linked to the security of bears (Mattson 1993, pp. 1-5, IGBC 1998). 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 (IGBC 1987, pp. 111, 114-115).

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 percent of their perimeter. Minimum width of hiding cover areas is 3 sight-distances (about 600 feet) (Forest Plan, 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, p. G-11). Compliance was tested by using a scaled ruler and maps showing the layout of the Harvest Units. Implementing this proposal will not compromise these standards.

Hiding and Thermal Cover

Forest Plan standards (p. H-8) require that sufficient cover be provided within grizzly bear habitat equivalent to 20 percent hiding cover, 10 percent thermal cover, and an additional 10 percent in either hiding or thermal cover for a total of 40 percent cover. Cover should be distributed throughout the analysis area (Forest Plan, p. H-8). Currently, 62.9 percent (21,796 acres) of the analysis area provides hiding cover and 19.7 percent (6,820 acres) provides thermal cover. If the project 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 percent hiding cover and 19.7 percent thermal cover, which would exceed minimum Forest Plans standards (Table 5).

Table 5. Changes in Grizzly Bear Hiding and Security Cover, Alternative A and Alternative D-Modified.

Element/Issue	Alternative A (No Action)	Alternative D-Modified (Preferred)
Hiding and Thermal Cover		
Hiding Cover (% of forested compartment):	62.9%	62.4%
Thermal Cover (% of forested compartment):	19.7%	19.7%
FP, Appendix G standards met? (% cover: minimum of 20% hiding, 10% thermal, and 10% hiding or thermal)	Yes	Yes
Distance to hiding cover (600') met?	Yes	Yes
Forest Plan amendment needed?	No	No
Duration/Re-entry		
USFWS Biological Opinion standards met? (Duration standard: Sale activities ≤ 3 consecutive years, Re-entry: one major entry/decade)	Yes	Yes
Security Habitat (during project, with presale road closure mitigation applied)		
Secure (Core) Habitat, (% of bear subunit and change +/- from existing):		
Season 1 Secure Habitat:	75%	75% (0)
Season 2 Secure Habitat:	69%	70% (+1)
Open Road Density (% of bear subunit and change +/- from existing):		
Season 1		
0.0 mi/mi²	68%	68% (0)
0.0-1.0 mi/mi²	12%	13% (+1)
1.1-2.0 mi/mi²	8%	8% (0)
> 2.0 mi/mi²	12%	12% (0)
Season 2		
0.0 mi/mi²	67%	67% (0)
0.0-1.0 mi/mi²	13%	13% (0)
1.1-2.0 mi/mi²	8%	8% (0)
> 2.0 mi/mi²	12%	12% (0)
Total Road Density (% of subunit and change +/- from existing):		
0.0 mi/mi²	67%	67% (0)
0.0-1.0 mi/mi²	13%	13% (0)
1.1-2.0 mi/mi²	8%	8% (0)
> 2.0 mi/mi²	12%	12% (0)
FP Amendment 19 standards met? (no reduction in % secure habitat and no increase in road density)	Yes	Yes

Open road density and total road density calculations were based on the current status of the data set, i.e., linear features in the CEM data base. Although they accurately portray the existing condition in the analysis area, the database is being revised and improved, as more and better information is available. Therefore, the results of future calculations may vary.

Duration of Activity
The duration of an activity is important for understanding how long grizzly bears would be affected by project related 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 3 consecutive years with at least 7 years of inactivity between major entries. Major activities include road construction, cutting and decking trees, and log hauling. Road maintenance, broadcast burning, slash burning, planting, precommercial thinning, inspections, and fire wood cutting are consider minor activities (USFWS 1990).

Harvest activities associated with this project are proposed for Timber Compartments 305-306. The last major permitted entries on USFS administered lands were in 1988-89. Reentry can occur after 1996. The proposed project is consistent with this standard. Major activities will be concluded in 3 years (Table 5).

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 Taskforce Report on Motorized Access Management (IGBC 1998) provide areas free of motorized access during the nondenning period. They are considered an important component of the habitat of adult females that have successfully reared and weaned offspring.

Guidelines have not yet been developed for determining secure habitat in the Yellowstone Grizzly Bear Ecosystem (YGBE), and secure areas have not been designated. The analysis methods employed here have been adopted in the interim. Proposed secure areas in this report were developed using the Cumulative Effects Model (CEM) Access Management Database and coverage. The coverage was queried in ArcView to assess open and total motorized road and trail classifications. Secure areas are analyzed by BMU or Subunit (IGBC 1998). In this case, the Hellroaring/Bear Subunit 1 was used. All motorized roads and trails were buffered with a 0.3-mile zone. Macro programs were developed by Kim Barber (Shoshone National Forest) and the IGBC (1998). Areas outside the buffer greater that 940 acres were classified as proposed secure habitat. This size reflects data from daily and seasonal home range estimates (Blanchard and Knight 1991, p. 61).

Currently (Alternative A), 75 percent of the subunit is in secure (core) habitat during Season 1 and 69 percent during Season 2. Implementation of the proposal would not change percent secure habitat during Season 1, but would increase secure habitat to 70 percent during Season 2 (Table 5).

Road Density
Implementing the proposal would increase the 0.0-1.0 mi/mi^2 open road density by 1 percent in Season 1. Open road density would be unchanged in Season 2. Total road density would be unchanged (Table 5).

Conclusion
Implementing this proposal will not compromise Forest Plan standards for size and shape of harvest units, hiding and thermal cover, or duration of activity. It will not compromise the IGBC standards for grizzly bear/motorized access management. Secure (core) area would not decrease during Season 1 and would increase by 1 percent in Season 2. Open road and total road density would not change. With the screening cover of timber removed, grizzly bears may be less likely to forage at or near the project site during the daylight or at times of higher human use. However, grizzlies should find the project site suitable for foraging at other times; the affected area will serve as grizzly bear habitat after harvesting. Non-forested areas provide feeding opportunities not present in the larger matrix of mature forests.

POTENTIAL FOR GRIZZLY BEAR MORTALITIES

Measurement Indicators
Measurement indicators will be addressed by analyzing the potential for grizzly bear mortalities to increase due to project implementation. One of the population recovery parameters established by the USFWS for the Yellowstone grizzly bear (USFWS 1993, p. 44) is for known human-caused mortality to not exceed 4 percent of the population estimate based on the most recent 3-year sum of females with cubs minus known adult female deaths. In addition, no more than 30 percent of the known human-caused mortality shall be females. These mortality rates cannot be exceeded during any 2 consecutive years for recovery to be achieved. The GNF objective for meeting the YGBE recovery goals is to strive for zero preventable losses, and to design and coordinate multiple use activities to minimize the potential for grizzly/human conflict that could result in mortality or relocation of grizzly bears (Forest Plan, p. G-6).

Historic patterns of grizzly bear mortalities have identified predictable locations where the risk to bears is greater. Knight et.al. (1988) called these areas population sinks. The relationship between these areas, the potential they pose for future grizzly bear mortalities, and the proposed project will also be discussed.

Discussion

Grizzly bears were classified as threatened in 1975 in Montana, Idaho, and Wyoming. They presently occupy over 9,500 square miles of mountainous terrain in and surrounding YNP, including significant contiguous portions of the GNF. Based on adult female survivorship, most of the literature reports a positive trajectory for the YNP population (Eberhardt and Knight 1996, p. 416; Knight et al. 1995, p. 247, IGBST 2001), although there some promient detractors from this conclusion (Mattson, personal communication).

However, the current and future status of the Yellowstone grizzly bear population are controversial topics and difficult to determine (Eberhardt et al. 1994, p. 360). As reflected by its status as a federally listed species, the grizzly is considered vulnerable to extermination. Although the population has probably stabilized (Mattson et al. 1995, p. 104), and possibly even increased (Eberhardt and Knight 1996, p. 416), the current optimism found in some literature is tempered by concern over the consequences of continued habitat erosion from the combined effects of human influence, the decline of several important food sources, and climate change (Mattson and Reid 1991, pp. 364-370).

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 from legal management actions (Mattson et. al. 1995, p. 105). Reasons for this have been well-documented (Knight et al. 1988, pp. 121-124, Mattson and Reid 1991, pp. 364-370, Mattson 1993, pp. 1-5) and obviously center around contact between people and bears.

Sources of mortality for grizzly bears have been identified (Craighead et al. 1988, pp. 3-8, Povilitis 1987, pp. 15-17). By the nature of their activity, hunters and outfitters represent a particular risk to grizzly bears. They are armed, widely dispersed across the landscape, associated with game meat that may attract grizzlies, and camp in the backcountry. Mortalities from this group are usually either killings in self-defense or cases of mistaking grizzly bears for black bears while hunting. In addition, government agencies destroy grizzlies through management actions. These usually involve bears that have become accustomed to associating people with a foraging opportunity because of obtaining food items in areas of human activity. Examples of the items pursued by bears that people provide are garbage, pet food, and human food. These may be made available deliberately or through negligence, and may be present in the front country or backcountry. Bears conditioned to human foods are a threat to human safety and thus are not always tolerated. Poachers are an additional source of mortality, as are vehicle collisions, and sheepherders protecting domestic sheep bands in the backcountry.

The central issue in ensuring viability of grizzly bear populations is minimizing negative human effects. Direct human-caused mortality is responsible for most grizzly bear population declines and extinctions (Mattson 1993, pp. 1-7). A great deal of information is available concerning the responses of grizzly bears to human activities. Understanding this topic is critical to analyzing the impacts of proposed projects on the Yellowstone grizzly bear. Mattson (1993, pp. 1-7) summarized these data in the context of managing grizzly bear habitat security in the GYA. Excerpts from his synthesis are provided here as background information. The following paragraphs are taken directly from his text:

Grizzly bears move away or flee from people during 25-100 percent of encounters, primarily depending on whether the bear population is hunted, they encounter people on foot, whether the bear is in the open, or whether the encounter is near facilities receiving high levels of predictable human use. Flight is less frequent when bears are in cover compared to in the open, part of a protected/unhunted population, near human access that has higher levels of spatially and temporally predictable human use, or when encountering humans in moving vehicles rather than on foot (Jope 1985, Gunther 1984, McLellan and Shackleton 1989, Chester 1980, Albert and Bowyer 1991).

Flight from encounters in open areas is consistently towards cover (Gunther 1984, McLellan and Shackleton 1989, Schleyer et al. 1984, Haroldson and Mattson 1985, Smith 1978).

Aggressive responses to encounters are more likely when a female with dependent young is involved, when the population is unhunted, and when the encounter occurs in areas where there is less human activity that tends to be less *spatially and temporally predictable (McArthur-Jope 1983, Jope 1985, Herrero 1985, Jope and Shelby 1984, Gunther 1984, McLellan and Shackleton 1989, Albert and Bowyer 1991, Olson et al. 1990).*

Fewer bear conflicts and human injuries occur when human use is regulated so that it becomes more temporally and spatially predictable, and restricted to specified levels (Warner 1987, Fagen and Fagen in press, Albert and Bowyer 1991, Dalle-Molle and Van Horn 1989).

A large portion of human fatalities caused by grizzly bears is attributable to human-habituated and food-conditioned bears; and a substantial portion of these fatalities occur at campsites during the night (Herrero 1985, Herrero and Fleck 1990).

Number of conflicts between grizzly bears and humans is positively correlated with levels of human use as it changes seasonally or among years, especially in areas where human activity is unregulated and/or where the bear population is protected from hunting (Fagen and Fagen in press, Mattson et al. 1992, Keating 1986, Titus and Beier 1992, Albert and Bowyer 1991, Kendall 1983, Smith et al. 1989, Dalle-Molle and Van Horn 1989).

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. This relationship is evident in both protected and hunted populations, but is most pronounced where hunting is allowed (Mattson et al. 1992, Mace et al. 1987, Titus and Beier 1992, Mattson and Knight 1991, Smith et al. 1989).

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 (Mattson and Knight 1991, McLellan and Shackleton 1988, Dood et al. 1986, Aune and Kasworm 1989).

Few grizzly bear population ranges include major townsites or recreational developments, however those populations that do exhibit disproportionately the greatest mortalities in association with these features (Servheen 1989, Mattson and Knight 1991).

Ungulate hunters accounted for a large portion of defense of life and property kills in several study areas (Titus and Beier 1992, Smith et al. 1989), including the Yellowstone ecosystem since 1988, or most illegal kills occurred during the big game hunting season (Knick and Kasworm 1989).

Grizzly bears consistently under-use habitat within 100-500 meters of roads. This under-use does not vary substantially with use levels or whether the road is paved or unpaved, and is exhibited at very low levels of traffic (0.5-1.9 vehicles hr^{1}*) (Aune and Kasworm 1989, Kasworm and Manley 1990, Mace and Manley 1993, McLellan and Shackleton 1988, Mattson et al. 1987). Similarly, grizzlies under-use habitat where open road densities exceed 1 mile/*$mile^2$ *(Mace and Manley 1993), and observations of bear sign are negatively correlated with kilometer of road (Elgmork 1978).*

Immediate responses of grizzly bears to humans are arguably a function of the bear's wariness/ habituation, the setting (whether in cover or at an atypical site), whether the encounter is with a vehicle, and whether the bear or human approached immediately prior to detection. Encounters between wary bears and humans on foot, especially in the open and in atypical situations, will likely result in a more extreme response by the bear characterized by either aggression or long-range and rapid flight. Aggressive responses are more probable if this type of encounter involves a female with dependent young.

Overall mortality risk will increase as miles of open roads and numbers of townsites or major recreational developments increases in occupied grizzly bear habitat. This risk could be substantially reduced by termination or reduction of hunter harvest. If mortality risk implicit to these human facilities is at or below sustainable levels, then exhibited under-use would predictably increase, with a possible attendant decrease in human/bear conflicts. Thus, declining levels of human/bear conflict that might be attributed to successful management could alternatively be attributed to over-harvest.

If habituation is lethal to bears, as in the Yellowstone area, and current levels of non-hunting mortality are at or near sustainable levels, then the bear population's future prospects will likely be determined simply by the overall frequency of contact between bears and humans; mediated through the level, dispersal, and predictability of human use. Greater *numbers of unpredictably dispersed and armed humans will result in higher mortality risk for the population given the same levels of overall human use.*

Mortality risk for bears will increase substantially as the number of big game hunters in grizzly bear habitat increases. Risk attributable to big game hunters is disproportionately high because hunters are armed, often dispersed in an unpredictable way across the landscape, and typically associated with animal remains that attract bears.

Known Grizzly Bear Mortalities

From 1975 to 2002, 28 known grizzly bear mortalities or removals from the GYA occurred within the Gardiner Ranger District (Table 6). Two occurred in the analysis area, one in Jardine in 1978, and one in Eagle Creek in 1981. The mortality in Jardine was a poaching incident and the mortality in Eagle Creek was a legal self-defense mortality involving a hunter. Seven grizzly bear mortalities/removals occurred in the Gardiner area. They involved bears seeking attractants at the Gardiner dump or on private property. There has been no human mortality.

Table 6. List of Known Grizzly Bear Mortalities and Removals on the Gardiner Ranger District from 1975 to 2002. (Craighead et al. 1988 section 1975-1987; Frey 1997, pp. 118-119; IGBST annual reports for 1998-2002)

Year	Location	Mortality/Removal
1975	Cooke City dump	Illegal mortality – poacher
1978	Cooke City dump	Illegal mortality – poacher
1978	Jardine	Illegal mortality – poacher
1978	Cooke City dump	Illegal mortality – poacher
1980	Tucker Creek	Illegal mortality – poacher
1981	Eagle Creek	Legal kill - self-defense
1981	Cooke City	Illegal mortality – poacher
1981	Gardiner area	Illegal mortality
1982	Tom Miner Basin	Management control
1982	Cooke City	Management control
1982	Cooke City	Management control
1983	Gardiner dump	Management control
1983	Gardiner dump	Management control
1983	Hellroaring	Illegal mortality - cause unknown
1986	Wolverine Creek	Illegal mortality - mistaken for black bear
1988	Gardiner area	Management control
1990	Hellroaring	Illegal mortality – poacher
1994	Bull Creek	Legal mortality - self-defense
1994	Gardiner area	Management control
1995	Slough Creek	Legal mortality - self-defense
1995	Yellowstone River	Management control
1996	Beattie Gulch	Legal mortality - self-defense
1997	Wigwam Creek	Legal mortality - self-defense
2000	Coyote Creek	Legal mortality - self-defense
2000	Bull Creek	Legal mortality - self-defense
2001	Yellowstone River	Management control
2001	Cooke Pass	Management control
2001	Silver Gate	Management control

Grizzly Bear Population Sinks

Because they are naturally aggressive, omnivorous, and opportunistic in their food habits, and can move long distances, grizzly bears have the ability to capitalize on annually and seasonally available food sources. This may include foraging areas juxtaposed to humans or food items provided by humans, a behavioral pattern that can lead to conflicts and grizzly bear mortalities, especially during periods of natural food shortage. These sites may become population sinks, sites that predictably and regularly bring bears into contact with humans, often resulting in removal of bears from the population.

After reviewing records of bear mortalities from 1973-1985 in the Yellowstone ecosystem, Knight et al. (1988, pp. 121-125) concluded that major population sinks include the communities of West Yellowstone, Cooke City, and Gardiner, Montana; recreational developments; sheep grazing allotments; and various other human concentration areas. In addition, diverse attractants such as apple orchards, outfitter camps, and locations where people have persistently fed individual bears or unlawfully disposed of garbage entice bears into conflict situations. Based on the assessment of Knight et.al., it is relevant in this analysis to discuss the relationship between the effects of the proposed timber sale and the potential population sinks of backcountry sheep allotments, the Gardiner community, and outfitter camps in the Absaroka Beartooth Wilderness. In response to Knight et al.'s observations, government agencies have worked to rectify many of these problems. This has been achieved through public education, removing or making the food source unavailable to bears, and developing management protocol that can be employed if conflicts with bears arise. Consequently, human caused grizzly bear mortalities have declined significantly. This fact, along with other favorable indicators of population trend, prompted the USFWS to discuss delisting the Yellowstone grizzly bear.

Population Sink - Sheep Allotments

Because sheep bands have historically been implicated in grizzly bear mortalities, they have been phased out on public land in the Primary Conservation Area (PCA). The Ash/Iron Mountain Allotment is the only active, currently stocked sheep allotment in the PCA. It is located on the Gardiner Ranger District, GNF. However, unlike other allotments, no human-caused grizzly bear mortalities have been reported in association with sheep grazing here since the grizzly was listed as a protected species in 1975. However, sightings by the sheepherders and anecdotes about various problems and conflicts are common and bears have killed sheep.

While Knight et al. were investigating grizzly bear mortalities, the Gardiner District maintained 2 sheep allotments with about 4,600 sheep. One permittee has not exercised the right to use his allotment since 1986, and the permit was terminated in 1994. Because the term grazing permit for the remaining Ash-Iron Mountain Allotment expired in 1998, the Forest Service prepared an Environmental Impact Statement to analyze the effects of continuing the permit. The decision was made to reissue the permit and combine the allotments into one comprising 73,701 acres and 2,400 sheep. It is managed on a 3 pasture, rest/rotation basis. The USFWS was formally consulted during the process.

In rendering their Biological Opinion, the USFWS (1998, pp. 1-21) did not discount the long history of grizzly bear conflicts and mortality related to domestic sheep grazing in the YGBE and other ecosystems. However, they understood that the proposed sheep grazing permit and Annual Operating Plan would be conditioned by stipulations related to grizzly bears protection that substantially lessened the potential for bear/sheep conflict and for food conditioning and habituation of grizzly bears.

The USFWS determined that although the reissuance of the grazing permit with its associated requirements may result in adverse effects to individual bears, it was not likely to jeopardize the continued existence of the YGBE population. This opinion was based on the intent of the GNF to implement grizzly bear protection items outlined in the grazing permit, Annual Operating Plan, and BA, as well as the Forest's commitments to adhere to the IGBC Grizzly Bear Guidelines, Forest Plan Grizzly Bear Standards and Guidelines, and the grazing permit Grizzly Bear Management and Protection Plan.

A primary factor in the USFWS determination was the understanding that grizzly bears would not be killed or relocated if sheep/bear conflicts arose. The no-jeopardy Biological Opinion was contingent upon full implementation of the Yellowstone Food Storage Order and other mitigation measures as outlined in the term grazing permit issued to the permittee by the USFS. USFWS considerations in rendering a no-jeopardy Biological Opinion, which enabled permit reissuance to continue sheep grazing on the Ash-Iron Mountain Allotment included, but were not limited to, the following:

1. Forest service stipulations in the grazing permit, Annual Operating Plan, and Forest Plan to resolve grizzly/sheep

conflicts in favor of grizzly bears.
2. The current permittees have no history of grizzly bear mortality associated with the sheep grazing on these allotments.
3. The proposed action would result in a formal reduction in number of sheep permitted on the allotments from 4,000 to 2,400, distributed over a larger single area.
4. Two-thirds of the combined allotments will receive no grazing during any given year.
5. Current estimates indicate the YGBE grizzly population is increasing (Eberhardt et al. 1994).

Population Sink - Gardiner Community

Seven human caused grizzly bear mortalities have occurred in the Gardiner area between 1975 and 2002. Some were the result of bears seeking garbage at the local dump, while the rest were bears attracted to garbage, fruit trees, or gardens on private property. In recent years, the dump has been reinforced with fencing and gates, significantly reducing access by bears. However, little has been done to secure attractants on private property, a situation that still has a high potential to result in habituated bears and bear mortalities. The USFS and other federal agencies have no jurisdiction to address these deficiencies.

Population Sink - Outfitter Camps

Outfitter camps are an opportunity for conflicts between humans and bears because they have a sustained annual human presence in bear habitat, and relatively large quantities of attractants in the form of food, garbage, and horse feed. Consequently, Knight et al. characterized them as potential population sinks. No grizzly bear mortalities related to outfitter camps have been recorded on the Gardiner District between 1975 and 2002, although conflicts and incidents have occurred. Outfitter camps are administered under permit. Permit issuance and continuance require appropriate storage of bear attractants. As such, the USFS has considerable leverage to ensure that food storage requirements are met at these camps. In addition, the USFS involved the UFWS in Section 7 consultation regarding outfitter permit reissuance, and received their concurrence. Compliance is monitored with periodic camp inspections and failure to comply can result in permit revocation.

Displacement of Bears into Mortality Sinks

For there to be a relationship between the proposed timber sale and an increased potential of grizzly bear mortality on the sheep allotment, in the Gardiner area, or at outfitter camps, it would be necessary for bears to be displaced from the project site into these high risk areas. There is no evidence that this would occur.

The annual, seasonal, and daily determinants of bear distribution are complex and cannot be easily generalized, especially in relationship to human activities. Road density, traffic volume and type, food source location, amount and quality of cover, age and sex of the bear, and inter- and intraspecific competition are some of the factors involved in determining bear locations and movements. The literature is extensive and highlights the wide range of variability among area-specific findings (IGBC 1987, pp. 27-35, 63-69, 137-156; Mattson 1993, pp. 1-17; Yonge 2001, pp. 1-59).

There is consistent documentation that bears avoid areas of human activity, but the average distances between loci of bear activities and/or home range perimeters and human use centers vary greatly among studies. Because bears can become conditioned to human activity and show a high level of tolerance, the issue is confounded, especially if the location and nature of the human use are predictable and not directed negatively at the bear (Mattson 1993). Moreover, as Yonge (2001) found in his investigations of bear activity around Cooke City, Montana, bears may be willing to consistently forage in very close proximity to high levels of human use if cover is sufficient and energetically efficient feeding opportunities are present. Mattson (1993) and Yonge (2001) postulated that areas with higher levels of human activity might have a positive effect for bears by serving as a kind of refuge for weaker population cohorts (subadults and females with cubs) seeking to avoid intraspecific competition (adult males).

The literature (IGBC 1987, Mattson 1993, Yonge 2001) also indicates that increases in human use levels are harmful to bears if the activities are unregulated; i.e., if guns are allowed, attractants are available, and the extent and duration of human use is not restricted. Conversely, when human activities are controlled by measures that include curtailing the presence of guns, requiring proper attractant storage, and limiting the temporal and spatial scope of the activities, a level of coexistence between humans and bears can be achieved.

It is also important to assess grizzly bear movements in the appropriate spatial context. They are wide-ranging; an adult female's mean annual range is 281 km^2 and an adult male's is 874 km^2 (Blanchard and Knight 1991). By contrast, the area involved in actual timber harvest in the Darroch-Eagle proposal is about 1 km^2 (247 acres). When analyzing bear distribution and movements at the spatial scale of annual ranges, it can be difficult to differentiate among flight behavior, foraging activities, social interactions, or displacement, especially when looking for associations between those movements and a human activity that involves a very small percentage of the area normally traveled by the bear (like the timber sale).

In addition, grizzly bear density in the GYA is estimated at 11-17 animals/1,000 km^2 (Eberhardt and Knight 1996, Keating et al. 2002, Schwartz et al. 2002, Ruth et al. in press). If bears were evenly distributed in the GYA, 0.014 grizzlies would occupy the proposed harvest area and 2.7 would occupy the Bear Creek drainage (based on an average of 14 bears/1,000 km^2, sale area = 1 km^2, and Bear Creek = 194 km^2).

However, grizzly bears are not evenly distributed; density is highest where foraging opportunities are the best and foraging opportunities vary annually, seasonally, and spatially. The proposed sale area does not have specific concentrations of food and offers low spring value and moderate to high value habitat in summer and fall (based on CEM coefficients). Therefore, the proposed sale area would have no more than an average density of grizzly bears.

Recent research by Ruth et al. (in press) typifies the complexities of assessing bear movements and distribution and their underlying causes. Three radio-collared grizzly bears were monitored daily from August 1 to October 30, 1999, in an area that included the Hellroaring/Bear BMU. The bears traveled throughout a 2,904 km^2 area during that time and concentrated their activities within YNP during the summer, where their movements included areas of remote backcountry as well as crowded road corridors and Park developments. During the fall, they converged into a small area on the GNF where they were spatially very closely associated with a relatively large number of big game hunters from the start of the hunting season (September 15) until the end of the study. Ruth et al. postulated that the grizzlies' movements might have been more strongly motivated by the location of food than from the distribution and density of people. For example, they apparently tolerated comparatively high densities of armed hunters dispersed throughout the backcountry, probably because of the potential to retrieve gut piles (large volumes of high protein food) from hunter harvest.

There are also some practical considerations regarding the issue of potential displacement of bears from the project site by timber harvesting activities to the sheep allotment in the Absaroka Beartooth Wilderness. Under the terms of the new (1998) permit and grazing system, the Ash-Iron Mountain Allotment is managed under a 3 pasture, rest/rotation system and encompasses 73,701 acres. The sheep can be placed in any of the 3 pastures in a given year, or moved to a different pasture within the year, if problems with bears are developing in the pasture being used.

The Ash Mountain pasture is the closest to the proposed timber sale area, while the Iron Mountain and Silver Basin pastures are further away. The primary grazing area for the latter 2 pastures is about 13 air miles from the closest proposed timber sale unit and the pasture boundaries are about 9 air miles away. The intervening landscape is rugged and mountainous, including deeply incised valleys and mountain peaks with as much as 4,000 feet difference in elevation.

Conclusion

Records of bear mortalities do not demonstrate a pattern of deaths in the analysis area or identify a specific source of bear/human conflicts. Human use patterns have been characterized by dispersed recreation over a network of roads and trails, mining activity, and timber harvesting. All resource extraction and most recreation activities have been limited to the lower half of the drainage where harvesting would occur. 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, Montana. 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 is persistent and problematic, but unrelated to the proposed project.

Numbers of human-caused grizzly bear mortalities are directly related to increased human access (quality and quantity), and a corresponding increase in human activity (Mattson 1993, pp. 1-7). Implementing this proposal will decrease access. It will however, improve some access points. 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 will continue to involve primarily higher-clearance vehicles that can negotiate gravel and dirt roads. Road improvements will 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.

Summary Points
The relationship between the proposed timber sale and the potential for project implementation to increase the risk of grizzly bear mortalities has many facets. The following is a summary of some of the more important points of this portion of the analysis.

1. Since 1975, there have not been any known grizzly bear mortalities associated with the analysis area, the Ash-Iron Mountain Allotment, or outfitter camps in the Absaroka Beartooth Wilderness. A pattern of mortalities does exist relating to private land around Gardiner.

2. The Forest Service has no jurisdiction over private land in the Gardiner area. However, stipulations in a variety of documents governing management of the sheep allotment do provide for protection of grizzly bears. These include: the Forest Plan Grizzly Bear Standards and Guidelines, Ash-Iron Mountain Allotment BA, USFWS Biological Opinion, the Grizzly Bear Management and Protection Plan in the grazing permit, the Ash-Iron Mountain Allotment Annual Operating Plan, IGBC Grizzly Bear Guidelines, and the Gallatin National Forest Special Order for Food Storage. These documents require that management deference be given to the grizzly bear on the allotment; i.e., the primary management objective is to prevent grizzly bear mortalities. Therefore, if grizzly bears are displaced during timber harvesting into the sheep allotment and problems arise, agencies have ample legal opportunity and imperative to respond in favor of grizzly bear conservation. Similarly, the Forest Service is able to require proper food storage at outfitter camps, inspect to ensure compliance, and take administrative action for shortfalls.

3. The Ash-Iron Mountain Allotment has 3 pastures. Although the boundary to the Ash Mountain pasture is within about one air mile of a portion of the timber sale area, the primary grazing areas of the other 2 are about 13 air miles away. The Forest Service can direct the permittee to put the sheep band in one of the more distant pastures during the year that timber harvesting occurs. Therefore, the potential for grizzly bears to be displaced from the timber harvesting activities and, in essence collide with the sheep band, can be significantly reduced by providing maximum spatial separation between the logging operation and the sheep band. In addition, significant geographic obstacles characterize the intervening distance.

4. The potential for grizzly bears to be displaced from the proposed timber sale area into the sheep band, Gardiner community, or outfitter camps by harvest activities needs to be kept in the appropriate temporal, spatial, and biological context. For example, timber sale activities will occur over three summers, which temporally limits the potential for bears to be displaced. In addition, grizzly bears range over very large areas. The proposed harvest area comprises less than 0.3 percent of the average annual range of a female grizzly and 0.001 percent of the average annual range for a male. Therefore, theoretically, grizzlies that may be using the proposed harvest area have the majority of their ranges remaining as available foraging areas.

In addition, based on the average densities of grizzlies in the GYA, about 0.014 bears may occupy the actual sale area and 2.7 may occupy the Bear Creek drainage; i.e., if bears were displaced by the harvest activities, a very small number would be involved.

Moreover, the proposed project site does not offer any particular habitat features that would attract or concentrate bears. Although the sale area can be characterized as low value habitat in the spring, and moderate to high in the summer and fall, there are no food sources present that would result in high densities of foraging bears.

It is difficult to assess how bears would respond to the harvest operation. Although bears can become conditioned to human activities that do not directly threatened them, it is reasonable to expect that they would be displaced from the cutting areas while logging occurs. However, it is not possible to predict the extent of that displacement. Based on the findings of Yonge (2001) and others, grizzlies may use the abundant cover in the area to continue foraging in the Bear Creek drainage, if not the immediate timber sale area. Although this may be an overly optimistic scenario, a direct linear movement of grizzly bears of many air miles (distance to the sheep band on the more distant pastures) away from an activity that does not directly affect their safety (timber harvest) does not seem to be borne out in the literature.

5. The extent to which bears may become conditioned to the harvest activities and use cover to remain in the area cannot be assessed, nor can the distance bears may move if they are displaced. However, it is known that human activities involving guns, food items that attract bears, and no restrictions on human numbers and access significantly increase risks to bears. In this context, risks to bears can be reduced during the logging operation because the behavior and activities of the loggers can be monitored and regulated by the Forest Service. Similar constraints apply for timber harvest activities in grizzly bear habitat as for the management of the sheep allotment. They are identified in the Forest Plan Grizzly Bear Standards and Guidelines, Darroch-Eagle Creek Timber Sale BA, USFWS letter of concurrence, the permit Grizzly Bear Management and Protection Plan, IGBC Grizzly Bear Guidelines, and the food storage Special Order.

GRIZZLY BEAR POPULATION VIABILITY

Management Indicators

For species with broad distribution, such as the grizzly bear, consistency with species viability strategies can seldom be addressed on small scales. For example, project areas are invariably too small to determine whether management actions are consistent with sustaining population viability. Consequently, large-scale analyses are usually needed to determine whether cumulative activities and management strategies are consistent with maintaining species viability. Therefore, to assess the viability of grizzly bears in the analysis area, it is necessary to address the YGBE population.

Similarly, it is seldom possible to determine population 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 these criteria will serve as an assessment of viability for grizzly bears in the analysis area.

There are several grizzly bear recovery areas in the USFS Northern Region. Recovery goals differ by population. The grizzly bears in the GNF are part of the YGBE population. Each grizzly bear ecosystem also has specific recovery criteria. In addition, a Conservation Strategy for grizzly bears YGBE was recently drafted.

Recovery criteria for the YGBE are:

1. An average of 15 adult females with cubs-of-the-year (COY) must be seen per year on a 6-year running average, both inside the recovery zone and within a 10-mile area immediately surrounding the recovery zone.

2. Sixteen of the 18 recovery zone Bear Management Units must be occupied by females with young from a running 6-year sum of observations, and no two adjacent BMUs can be unoccupied.

3. Known human-caused mortality must not exceed 4 percent of the population estimate based on the most recent 3-year sum of females with cubs minus known adult female deaths. In addition, no more than 30 percent of the known human-caused mortality can be females. These mortality rates cannot be exceeded during any 2 consecutive years for recovery to be achieved.

Discussion

The National Forest Management Act of 1976 and the subsequent 1982 Planning Rule mandate the maintenance of viable populations of all native and desired non-native species of vertebrates (36 CFR 219.19). The Act stipulates that viability requires sufficient numbers and distribution of reproductive individuals to enable population continuance. In addition, suitable habitat must be well distributed within the planning area to allow for intraspecific contact. In this case, the planning area is defined as the area covered by the Gallatin Forest Plan.

The Gallatin Forest Plan (p. I I-1) identified the Forest-wide goal to provide habitat for viable populations of all indigenous wildlife species. It also requires that fish and wildlife habitat be managed to maintain viable populations.

The Endangered Species Act of 1973 directs the USFWS to identify recovery goals that, when met, would allow a species to be delisted. While the language in the Act does not necessarily equate recovery with viability, it is assumed that meeting the recovery goals and removing a species from the list is the first step needed in maintaining long-term species viability.

It is also important to assess consistency with strategies for maintaining species viability at multiple scales. For instance, large natural events, such as wildfires, may make it impossible to meet certain recovery goals or management strategies on some small landscapes. However, analysis at larger scales may reveal that such events will have an overall beneficial effect on some species and is consistent with recovery.

The exact size of the grizzly bear population in the YGBE is not known; several opinions are found in the literature. Recent population estimates (IGBST 1999; Eberhardt and Knight 1996) are a minimum of 344 bears and a range of 245 to 390, respectively. Some believe the grizzly population is growing at about 3-4 percent per year (Eberhardt et al. 1996, Boyce 1995) while others (Pease and Mattson 1999) disagree. The best information suggests that the YGBE population is stable and may be increasing.

The recovery parameter addressing population reproductive potential has been achieved. It required unduplicated sightings of >15 females on average over a 6-year period. Fifty unduplicated females were initially observed within 10 miles of the recovery zone in 2002. The current 6-year average (1997-2002) for counts of unduplicated females with COY within the recovery zone and the 10-mile perimeter is 38. The 6-year averages for total number of COY and average litter size observed at initial sighting were 73 and 1.9, respectively (IGBST 2002, p. 11) (Table 7).

Table 7. Number of Unduplicated Females with COY, Number of COY and Average Litter Size at Initial Observation from 1973-2002 in the Greater Yellowstone Ecosystem. Six-year running averages were calculated using only unduplicated females with COY observed in the recovery zone and 10-mile perimeter (IGBST 2002, p. 16).

Greater Yellowstone Ecosystem				Recovery Zone and 10-mile perimeter 6-year running averages		
Year	**Females**	**COY**	**Mean litter size**	**Females**	**COY**	**Mean litter size**
1973	14	26	1.9			
1974	15	26	1.7			
1975	4	6	1.5			
1976	17	32	1.9			
1977	13	25	1.9			
1978	9	19	2.1	12	22	1.8
1979	13	29	2.2	12	23	1.9
1980	12	23	1.9	11	22	1.9
1981	13	24	1.8	13	25	2.0
1982	11	20	1.8	12	23	2.0
1983	13	22	1.7	12	23	1.9
1984	17	31	1.8	13	25	1.9
1985	9	16	1.8	13	23	1.8
1986	25	48	1.9	15	27	1.8
1987	13	29	2.2	15	28	1.9
1988	19	41	2.2	16	31	1.9
1989a.	16	29	1.8	16	32	1.9
1990	25	58	2.3	18	36	2.0
1991b.	24	43	1.9	20	41	2.0
1992	25	60	2.4	20	43	2.1
1993a.	20	41	2.1	21	45	2.1
1994	20	47	2.4	21	46	2.1
1995	17	37	2.2	22	47	2.2
1996	33	72	2.2	23	50	2.2
1997	31	62	2.0	24	53	2.2
1998	35	70	2.0	26	55	2.1
1999a.	33	63	1.9	28	58	2.1
2000c.	37	72	2.0	31	62	2.0
2001	42	78	1.9	35	69	2.0
2002c.	52	102	2.0	38	73	1.9

a. One female with COY was observed outside the 10-mile perimeter
b. One female with unknown number of COY. Average litter size was calculated using 23 females.
c. Two females with COY were observed outside the 10-mile perimeter.

Adequate distribution of reproductive females throughout the ecosystem is represented by verified reports of female grizzly bears with young (COY, yearlings, 2-year-olds, and/or young of unknown age) by BMU. The population recovery requirements (USFS 1993) include occupancy of 16 of the 18 BMUs by females with young on a running 6-year sum with no 2 adjacent BMUs unoccupied. All 18 BMUs had verified observations of female grizzly bears with young during 2002. All 18 BMUs contained verified observations of sows with COY with young 3 of the last 6 years (through 2002)(IGBST 2002, p. 18), which does not quite fulfill this recovery parameter (Table 8).

Table 8. Bear Management Units in the Greater Yellowstone Ecosystem Occupied by Females with Young (COY, yearlings, 2-year olds, or young of unknown age) as Determined by Verified Reports, 1997-2002 (IGBST 2002, p. 18).

BEAR MANAGEMENT UNIT	1997	1998	1999	2000	2001	2002	Years Occupied
1. Hilgard	X		X	X	X	X	5
2. Gallatin	X	X	X	X	X	X	6
3. Hellroaring/Bear	X		X	X	X	X	5
4. Boulder/Slough	X		X	X	X	X	5
5. Lamar	X	X	X	X	X	X	6
6. Crandall/Sunlight	X	X	X	X	X	X	5
7. Shoshone	X	X	X	X	X	X	6
8. Pelican/Clear	X	X	X	X	X	X	6
9. Washburn	X	X	X	X	X	X	6
10. Firehole/Hayden	X	X	X	X	X	X	6
11. Madison	X	X	X	X	X	X	6
12. Henry's Lake	X	X		X	X	X	5
13. Plateau			X	X	X	X	4
14. TwoOcean/Lake	X	X	X	X	X	X	6
15. Thorofare	X	X	X	X	X	X	6
16. South Absaroka	X	X	X	X	X	X	6
17. Buffalo/Spread	X	X	X	X	X	X	6
18. Bechler/Teton	X	X	X	X	X	X	6
Totals	17	14	17	18	18	18	

The third recovery parameter involves number of losses from the population. Known human-caused mortality has not exceeded 4 percent of the population estimate for the past 7 years (1996-2002, based on the most recent 3-year sum of females with cubs minus known adult female deaths). In addition, < 30 percent of the known human-caused mortalities have been females for the 5-year period from 1998-2002 (Table 9). Therefore, these population recovery criteria have been met (Table 10).

Table 9. Data Used to Calculate Adherence to the USFWS Recovery Standards Related to Grizzly Bear Mortalities. Data include annual counts of unduplicated females with COY, and known and probable human-caused grizzly bear mortalities within the recovery zone and the 10-mile perimeter from 1992-2002. Beginning in 2000, probable human-caused mortalities are used in calculations of annual mortality threshholds (IGBST 2002, p. 28).

Human-Caused Mortality					Human-Caused Mortality 6-year Running Average		
Year	Females with COY	Total	Female	Adult female	Total	Female	Adult female
1992	25	4	1	0	3.8	1.8	1.0
1993	19	3	2	2	3.8	1.8	1.0
1994	20	10	3	3	4.7	2.0	1.5
1995	17	17	7	3	7.2	3.2	2.0
1996	33	10	4	3	7.3	2.8	1.8
1997	31	7	3	2	8.5	3.3	2.2
1998	35	1	1	1	8.0	3.3	2.3
1999	32	5	1	1	8.3	3.2	2.2
2000	35	16	6	3	9.3	3.7	2.2
2001	42	19	8	6	9.7	3.8	2.7
2002	50	15	7	4	10.5	4.3	2.8

Table 10. Results of Adherence to the USFWS Grizzly Bear Recovery Plan Mortality Thresholds. Calculations of mortality thresholds do not include mortalities or unduplicated females with COY documented outside the 10-mile perimeter (IGBST 2002 p. 28).

Total Human-Caused Mortality				Total Female Mortality	
Year	Minimum Population Estimate	4% of Minimum Population	Threshold Result	30% of Total Mortality	Threshold Result
1992	255	10.2		3.1	
1993	241	9.6	Under	2.9	Under
1994	215	8.6	Under	2.6	Under
1995	175	7.0	Exceeded	2.1	Exceeded
1996	223	8.9	Under	2.7	Exceeded
1997	266	10.7	Under	3.2	Exceeded
1998	339	13.6	Under	4.1	Under
1999	343	13.7	Under	4.1	Under
2000	354	14.2	Under	4.2	Under
2001	361	14.5	Under	4.3	Under
2002	416	16.6	Under	5.0	Under

Conclusion

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 (IGBST 2002).

In addition, the number of sows with COY is well above the recovery criteria. The 6-year running average of sows with COY has gradually increased from 12 in 1978 to 38 in 2002 (IGBST 2002). The highest annual count of sows with COY was 50 in 2002. Sows with COY have been seen in >16 of 18 BMUs for 3 of the past 6 years. Human-caused bear mortalities have been < 4 percent of the population for the last 7 years and < 30 percent 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.

CHANGES IN DENNING HABITAT

Measurement Indicators
Analysis of potential effects on denning habitat was based on an assessment of the presence of suitable habitat for denning, the existence of known denning areas, and the potential for disturbing bears during the denning period.

Discussion
Reports on grizzly bear denning in the YGBE are limited comparatively. However, what is available is informative. Judd et al. (1986, pp. 111-116) investigated grizzly bear denning behavior and den site characteristics between 1975 and 1980. Radio-telemetry was used to locate 101 grizzly bear dens, 35 of which were examined on the ground.

November 9 was the mean entrance date for 70 bears tracked to dens over a 5-year period. There was variation among individual bears and years. The earliest entrance date they recorded was September 28 for a pregnant female, and the latest was December 21. Pregnant females entered dens earliest, but differences in the mean denning dates of sex and age groups other than pregnant females were not significant. Bears frequented the immediate area of den sites from 8-22 days before entering (Judd et al. 1986, pp. 111-116).

Male grizzlies were usually the first to leave their dens, emerging from mid-February to late March. The other population segments generally emerged as follows: single females and those with yearlings and 2-year-olds, followed by females with new cubs. The last group emerged from early to mid-April (Judd et al. 1986, pp. 111-116).

Judd et al. (1986, pp. 111-116) concluded that bears did not seek den sites in open areas or show strong preference for a specific canopy coverage of trees. Sites with whitebark pine and subalpine fir appeared to be preferred for dens. Both tree species are found at higher elevations. Elevation of dens ranged from 2,000 to 3,050 meters; and the average elevation was 2,470 meters with an apparent clumping in the 2,450 to 2,750 meter range.
Dens were found on all aspects, with an apparent preference for northern exposures. Most dens were found in the 30-60 degree slope range. Some dens were reused, but others collapsed after a season of use (Judd et al. 1986, pp. 111-116).

Judd et al. (1986, pp. 111-116) concluded that availability of den sites did not appear to be a critical element of grizzly bear habitat in the Yellowstone area. They based this statement on the fact that grizzly bears appeared to be able to use sites with a wide range of environmental characteristics. In addition, given the amount of protected habitat in YNP and the surrounding USFS Wilderness Areas, and the large home range size of grizzly bears, they did not think den sites would become scarce in the foreseeable future.

Although studies on grizzly bear denning are not numerous in the Yellowstone area, many have been done in Canada, Alaska, and the Northern Continental Divide Ecosystem. These findings have been summarized by the IGBC (1987, p. 115). With the exception of entry and emergence dates, den characteristics are relatively consistent. These data also indicate the adaptability of grizzly bears in den site selection. Another pattern that emerges from looking at den site selection continent-wide is a strong fidelity to denning areas. Although den reuse has been documented in many areas, it is not considered common, but returning to the same denning area is. Denning areas apparently possess characteristics that make them favorable, and some individuals remain traditional in using them (IGBC 1987, p. 115).

Judd et al. (1986, pp. 111-116) acknowledged that a deficiency in their investigation is the lack of insight gained on the impact of human activity on grizzly bear denning. The sites they investigated were remote from human activity at all times of the year and thus offered no opportunity to address the issue. Studies in Alaska and Canada have investigated this, but cause and effect relationships were difficult to determine. Bears tolerated some human activities but not others; distance of the activity from the dens was an important factor but patterns were difficult to quantify. In spite of this, they reported that agitation within the den could have serious consequences for females with newborns. In addition, the ability of bears to reduce energy output may be a function of the secure den environment, and human disturbance during denning could accelerate starvation and has resulted in den abandonment (IGBC 1987, p. 115).

<u>Conclusion</u>
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. The proposed action would not impact bear den sites. It 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. Finally, denning habitat is not a factor limiting the grizzly bear population in the YGBE.

CHANGES IN PREY BASE

<u>Measurement Indicators</u>
Determination of potential effects on the prey base included a qualitative assessment of the impact of the project on ungulates and changes in their accessibility to grizzly bears. In addition, acres of existing summer elk hiding and thermal cover and moose winter range were quantified. From this, acres of habitat affected were determined. Forest Plan standards stipulate 20 percent hiding cover, and 10 percent thermal cover (FP G-11 #4A-5, H-8). Elk habitat security was calculated using the HEI (Lyon et. al. 1985, p. 6). Forest Plan standards direct that 70 percent effective cover, as determined by HEI calculations, be maintained during hunting season. Forest Plan standards also require that at least two-thirds of the hiding cover associated with key habitat components be maintained (II-18). These components include wallows, foraging areas, critical hiding cover, thermal cover, migration routes, and staging areas. Their existence is to be determined by on-site visits. Project effects on the viability of elk and mule deer populations in the analysis area were evaluated using current population estimates, long-term population trends, and age and sex ratios for these species on the NYWR.

<u>Discussion</u>
The food habits of the Yellowstone grizzly bear are summarized in Mattson et al. (1991, pp. 1619-1627). Ungulate meat is estimated to be one of the top two sources of energy in the average diet. Carrion scavenged from March through May constitutes a major portion of this ingested meat. Among animal food sources (ungulates and rodents), elk, bison, moose, pocket gophers, and voles appear to be specifically commonly pursued. Use of these foods helps explain patterns of grizzly bear distribution and cover type selection (Mattson et al. 1991, pp. 1619-1627).

Ungulates were especially important in the diet during March, April, May, September and October. Studies indicate that ungulates are used as food when they are most available and vulnerable. This occurs as winter-kill or weakened animals during the spring (Green and Mattson 1988, pp. 32-50, Henry and Mattson 1988, pp. 51-59), as calves during May and June (Gunther and Renkin 1990, pp. 329-334), or as weakened bulls during the fall rut (Schleyer 1983). Some grizzlies have learned to kill adult ungulates during the summer (Servheen and Knight 1990, pp. 35-49).

Human activities can affect ungulate populations. This can occur by lowering numbers through habitat modification, hunting, road kills, and stress-induced mortality, as well as by redistributing them on the landscape.

Human activities that displace ungulates can generate stress and affect the birth and death process (i.e., demographics). Stress can lower fecundity and render the offspring less fit even to the second generation. It can cause abortion and trampling of the neonate, mortality through muscle degeneration, necrobacillosis, lung damage, or loss of disease and parasite resistance. However, although isolated observations can confirm these events, it is difficult to determine their impact on population processes or establish a causal agent (Shank 1979, pp. 1-28).

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. The lower elevations of the analysis area are part of the winter range for the largest migratory elk herd in the world. The population ranges from 10,000 to 25,000. An additional 2,000 to 3,000 mule deer use portions of the same winter range. Snow conditions exclude them from the upper half of Bear Creek drainage during the more critical winter months. 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 does restrict moose 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.

There are currently 6,820 acres of thermal cover for ungulates in the analysis area. Implementing the proposal would result in a loss of 20 acres or 0.3 percent (6,800 remaining acres). There are currently 21,796 acres of hiding cover. Implementing the proposal would reduce hiding cover by 175 acres (0.8 percent) to 21,621 acres. Forage is currently available on 19,346 acres. The current elk cover/forage ratio is 60:40. The project would increase the number of acres of potential foraging habitat (unforested acres) from 19,346 to 19,541, an increase of 1 percent. Implementing the project would result in a cover/forage ratio of 58:42 (Table 11).

Moose winter range would be affected. Early winter range would be decreased by 1.1 percent from 17,021 acres to 16,826. Midwinter habitat would be decreased by 1.2 percent from 16,562 acres to 16,367 acres. Late winter habitat would be decreased by 1.8 percent from 10,975 acres to 10,780 acres (Table 11).

Elk effective cover (HEI or habitat effectiveness index) would remain unchanged in the Eagle Creek at 58 percent if the project were implemented. In the upper Bear Creek area, it would decrease from 62 percent to 60 percent during the sale then return to 62 percent after closure of temporary roads. This does not meet the 70 percent required in the Forest Plan. However, this project is not intended as a comprehensive road management plan and will not appreciably alter elk effective cover. Because of this, a temporary Forest Plan Amendment would allow relief from this standard for the duration of the project. When the project is completed, this management concern remains. However, through this project, elk effective cover has been improved in the Bear Creek area; before project mitigation began, the HEI was 53 percent. That is an improvement of 9 percent by project end. This issue will receive further attention during the Forest Travel Plan revision process, which is the appropriate venue to address travel management comprehensively.

Table 11. Changes in Ungulate Habitat, by Alternative.

Element/Issue	Alternative A (No Action)	Alternative D-modified (Preferred)
Security Habitat (HEI)		
Eagle Creek area	58%	58%
Upper Bear Creek area	62%	60%
Forest Plan Standard met?		
(HEI minimum is 70%)	No	No
FP Amendment needed?	Yes	Yes
Hiding and Thermal Cover		
Hiding Cover		
Acres	21,796	21,621
Percent Change		-0.8%
Thermal Cover		
Acres	6,820	6,800
Percent Change		-0.3%
Elk Forage		
Acres	19,346	19,541
Percent Change		+1%
Moose Winter Forage		
Early Winter:		
Acres	17,021	16,826
Percent Change		-1.1%
Mid-Winter:		
Acres	16,562	16,367
Percent Change		-1.2%
Late Winter:		
Acres	10,975	10,780
Percent Change		-1.8%
Cover/Forage Ratio (Elk)	60:40	58:42
Planning Criterion 13 met?	Yes	Yes

This issue involves the direct effects to ungulates from being displaced from the Darroch-Eagle sale area during the process of timber removal and the impact this may have on grizzly bears. As will be explained, there is no evidence that this cause and effect relationship would exist. Harvest activities will not displace ungulates in significant numbers, in part because significant numbers are not found in the sale area. Therefore, grizzly bears will not be compelled to move away from the timber sale area in pursuit of the departing ungulates.

The proposed timber sale will occur primarily during the summer, when meat is not a major food item for grizzly bears. Grizzlies will not be pursuing ungulates as a primary food source during the period that the majority of the timber harvesting is scheduled. The availability of summer and fall range is not a limiting factor for ungulates in the GYA. There is no reason to expect large concentrations of ungulates at the project site for grizzlies to pursue during that period. When logging is scheduled to occur, ungulates have no environmental restrictions on their movements, and can move readily across the landscape. In addition, the area does not contain habitat features of inordinate value to attract them. Therefore, ungulate displacement from the timber harvesting activities would be minimal, as would the subsequent potential for related effects to grizzly bear movements.

Numerous species-specific studies employing instrumented animals have been conducted in the area and support these statements. They include investigations of all the major ungulate species: mule deer (Gogan, personal communication), bighorn sheep (Legg 1996, pp. 1-52; Ostavar 1998, pp. 1-60), elk (Vore 1990, pp. 1-80), pronghorn (Baccadori 2002, pp. 1-42), moose (Tyers, 2003), and bison (Aune, personal communication).

Ungulate Population Viability

Eradication of ungulate species would be negative for grizzly bears because they would loose an important seasonal food source. Because of this, the effects of the proposed timber sale on ungulate population viability will be addressed.

Elk, mule deer, and moose on the NYWR use seasonal movements as a survival strategy. During favorable conditions, they occupy the analysis area and, potentially, the project site. Long-term data sets collected by a consortium of collaborating agencies confirm the viability of the elk and mule deer populations involved. Evidence for the longevity of these species on the NYWR include recent range expansion, surveys that quantify thousands of individuals, and adequate sex and age ratios to ensure species continuance. Moreover, the elk and mule deer populations appear to be especially resilient, having survived recent landscape-level habitat perturbations, including the 1988 fires and prolonged drought. Significantly, they also persisted and flourished in the analysis area while extensive logging occurred during the last half of the twentieth century.

There is no evidence that elk and mule deer, components of the prey base for grizzly bears, are at risk of extirpation at any spatial scale used in this analysis. The proposed project would not be deleterious to elk and mule deer population viability or retention of favorable species-specific population structures. Conversely, moose numbers have decreased substantially post-1988 fires and further habitat changes could produce negative population effects. However, numbers are low compared to the other ungulate species; moose do not comprise a significant portion of the grizzly bears' diet.

While viability assessments for grizzly bears and other rare, secretive, far-ranging animals involve measuring adherence to prescribed population parameters, modeling species longevity for abundant animals such as elk and mule deer usually involves total population counts and classification of animals into sex and age groups. That approach has been taken for decades on the NYWR. Managers are fortunate to have these comprehensive, long-term data sets available to evaluate viability of ungulate populations.

In February 1983, representatives from the GNF, Montana Fish, Wildlife, and Parks, and YNP formed the Northern Yellowstone Elk Working Group. The intent of the group was to address management of the northern Yellowstone elk herd. Over time, the focus of this committee evolved by necessity and consensus from a single species interest group into a multiple species and wildlife habitat oriented organization. By 1994, the group's activities had expanded sufficiently to warrant revised goals and objectives and a name change to the Northern Yellowstone Cooperative Wildlife Working Group (NYCWWG). Also, the U.S. Geological Service, Biological Resources Division was added to the group. Thus, all the agencies with jurisdiction over ungulates and their habitat on the NYWR were brought together under a Memorandum of Understanding to coordinate management activities, research, and wildlife surveys.

NYCWWG members have agreed to methods for annually tracking numbers and population structures for elk, mule deer, pronghorn, moose, and bighorn sheep on the NYWR. Consequently, managers have available a substantial and scientifically sound data base on NYWR ungulate demographics that is endorsed by the appropriate agencies. Moreover, the data are added to annually, enabling assessments of change over time (Lemke 2003). These data are used by the Montana Department of Fish, Wildlife and Parks to establish and adjust hunting season regulation and harvest quotas.

These data demonstrate that northern Yellowstone elk expanded their range by 41 percent from approximately 268,240 acres to 377,238 acres between the mid-1970s to the mid-1990s. The most important expansion involved a doubling of winter range north of YNP from 54,805 acres to 131,613 acres (Lemke 2003).

In addition, data on total elk population numbers are collected annually from fixed-wing survey flights. The most recent annual winter elk count was conducted on December 24, 2002. A total of 9,215 elk were counted, including 6,897 elk (75 percent) inside YNP, and 2,318 elk (25 percent) north of YNP. This count is 23 percent or 2,754 elk below the December 2001 count of 11,969. However, some of the disparity in numbers is due to poor survey conditions. Since 1976, elk counts have ranged from 8,980 in 1977 to 19,045 in 1994, with an average total count of 13,625 elk. Despite poor counting conditions in 2002, northern Yellowstone elk numbers suggest a population decline in recent years (Lemke 2003).

Elk readily migrate into the Gardiner Basin and the analysis area. Elk wintering north of the YNP are counted 2-3 times each year (early, mid, and late winter) between December and March to evaluate trends in abundance and distribution. The most recent survey was flown north of YNP on March 19, 2003. Results indicate a minimum of 3,494 elk wintering north of YNP. This is 32 percent or 1,610 fewer animals than the 5,104 found in the same area in 2002. Based on the population estimate of 9,215 animals (which is probably a low count), about 38 percent of the northern Yellowstone elk herd wintered north of YNP in 2003. Since 1989, estimates of elk wintering north of YNP have ranged from 1,533 to 8,626 (mean = 5,093). In the last 4 years (2000-2003), the number of elk wintering north of YNP has declined (mean = 3,982 elk) compared to the 5 previous years (mean = 6,923) (Lemke 2003).

The NYCWWG typically conducts elk classification surveys in February or March using a stratified sample of count units across the winter range inside and outside YNP. A late winter elk classification survey was flown on March 24, 2003. A total of 4,200 elk were classified. Estimated sex and age ratios for the population were 12 calves, 4 yearlings bulls, and 18 adult bulls per 100 cows. The estimated ratio of 12 calves per 100 cows is similar to last years estimate of 14 calves per 100 cows, but less than the range of 22-34 calves per 100 cows observed during the previous 6 years (Lemke 2003).

The estimated ratio of 22 total bulls per 100 cows is much lower than the average ratio of 46 bulls per 100 cows since 1995 (range = 22-65 bulls per 100 cows), but similar to ratios of 14-28 bulls per 100 cows from 1986-1991. This variability and low ratio in 2003 likely reflects sampling bias and/ or variation in elk distribution among classification units. It is unlikely that the proportion of adult bulls in the population has changed that quickly or erratically (Lemke 2003).

Since 1968, calves to cow ratios have ranged from 17-48 calves per 100 cows (mean = 33 calves per 100 cows). Total bull ratios since 1968 have ranged from 14-65 bulls per 100 cows (mean = 37 bulls per 100 cows) (Lemke 2003).

Compared to hunted elk populations in southwest Montana, northern Yellowstone elk have lower calf to cow ratios and higher bull to cow ratios. Southwest Montana elk populations typically range from 35-55 calves per 100 cows and 5-15 bulls per 100 cows (Lemke 2003).

The NYCWWG also monitors the status and distribution of NYWR mule deer by conducting a winter helicopter classification survey, and a spring helicopter total count, recruitment survey, and carcass count. Data from these surveys are used in setting Montana's deer hunting regulations and determining trends in the mule deer population. From 1990 to 2002, ratios of mule deer bucks to does have ranged from 7-24 bucks per 100 does with relatively high buck rations in recent years. The spring survey was conducted on April 28 and May 1 and 2, 2003. A total of 2,023 mule deer were observed, 55 more than were seen in 2003. This year's count was < 1 percent above the long-term average of 2,014 deer. Differences in the number of deer counted during annual surveys have varied from 0-30 percent. This was the second highest count since the hard winter of 1997 and also the third count in a row above 1,900 deer since 1997. The distribution of mule deer inside YNP and east and west of the Yellowstone River was similar to previous yeas; i.e., very few deer inside YNP with the majority located on the east side of the river north of YNP (Lemke 2003).

A total of 702 mule deer (35 percent of observed deer) were classified as to age. Since 1986, classified sample sizes have ranged from 260-1,796 deer. Based on the sample of 702 deer (486 adults, 216 fawns) there was a ratio of 44 fawns per 100 adults. This compares to 33 fawns per 100 adults in 2002 and a range of 14-57 fawns per 100 adults since 1986. The lowest fawn recruitment ratios (14 to 18 fawns per 100 does) correspond to the springs following major winterkill events in 1989 and 1997 (Lemke 2003).

NYWR elk and mule deer populations demonstrate among-year variation in numbers and sex and age ratios. Long-term trends are also apparent. There is evidence that elk numbers and recruitment may be decreasing, while mule deer numbers may be stable or increasing. Regardless, these data also indicate that, although the analysis area provides habitat for NYWR elk and mule deer, the viability of these populations will not be compromised by the proposed timber harvesting in Bear Creek. Habitat alteration at the spatial scale of the project site is not consequential in the context of long-term persistence of populations that number into the thousands, seasonally move long distances, and show no signs of imminent extirpation or even a significant downward trend.

Conclusion

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. Project implementation would result in some loss of ungulate thermal and hiding cover, 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 moose winter range would be lost by the removal of old growth forests.

Implementing the project would not damage special ungulate habitat features as defined in the Gallatin Forest Plan. A possible exception involves impacts to moose winter range, although it is unlikely that the loss of this habitat will affect population viability. Winter browse is available at the project site and in other late succession 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 will increase the vulnerability of resident and migratory ungulates to hunters. Access to most USFS roads in the analysis area will continue to be controlled with gates and seasonal closures as shown on the GNF Travel Plan map.

Implementing this proposal would not result in the displacement or loss of a significant number of individual ungulates. Consequently, ungulate species viability would not be compromised. Furthermore, NYWR and analysis area elk and mule deer populations are not in any danger of extirpation. Populations number into the thousands, they are well-distributed across available habitat, and sex and age ratios are adequate to ensure population continuance.

It is unlikely that ungulate movements out of the sale area will affect grizzly bear distribution in the Hellroaring/Bear BMU during logging operations; i.e., it is unlikely that timber harvesting would precipitate a displacement of significant numbers of ungulates, thereby functioning as the primary determinant of grizzly bear behavior. It is also unreasonable to draw a spatial connection between a potential displacement of ungulates during logging, movements of grizzlies in response, and an inevitable juxtaposition of the redistributed grizzlies with the domestic sheep band or any other potential source of conflict between bears and humans. Densities of ungulates and grizzly bears in the timber sale area during the summer are not sufficient to create this phenomenon. In addition, ungulates are not a primary food source for grizzlies in the summer and there are too many other confounding spatial, temporal, and behavioral factors involved to accurately predict this scenario.

In the context of these issues, implementing this proposal would have no appreciable effect on resident or migratory ungulate populations in the analysis area. Therefore, indirect effects to grizzly bears will also be minimal. Project effects will be greatest for moose because of impacts to their winter range. However, it is not clear that the loss of these forests would influence 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.

INCREASED AVAILABILITY OF HUMAN ATTRACTANTS

Measurement Indicators
This issue is closely correlated with the one dealing with the potential for increased mortality of grizzly bears. The measurement indictor is the same- the potential for grizzly bear mortalities to increase because of implementing this proposal.

Discussion
The relationship between grizzly bear mortalities and the availability of attractants is well-documented (Mattson 1993, pp. 1-7, Povilitis 1987, pp. 15-17), as is the history of the fate of habituated bears in the GYA (Knight et al. 1988, pp. 121-124; Craighead et al. 1988, pp. 3-8). The discussion for the issue dealing with the increased risks of mortality to grizzly bears applies here, as well.

Conclusion
Personnel involved in harvesting the timber would be under contractual obligations to act appropriately to avoid conflicts with grizzly bears. This would include keeping all attractants unavailable to bears. There may be some increase in human activity in the area from other sources, including firewood cutters and recreationists using the improved road. This could potentially mean an increase in attractants. However, the food storage Special Order is in effect for the area that requires all attractants be kept unavailable to bears.

CUMULATIVE EFFECTS

Measurement Indicators
Cumulative effects in the context of a Biological Assessment involve determining the impacts of the proposed activity in combination with past, present, and reasonably foreseeable future state and private activities and past and ongoing federal actions. In a biological sense, the topic is broader; it involves addressing the impacts of the proposed activity along with other factors affecting the population. Because both are difficult to do and suitable measurement indicators are lacking, a qualitative statement is typically made.

Discussion
No new state activities are proposed for the analysis area at this time. Private activities can be predicted in most of the analysis area because the preponderance is in public ownership. In addition, much of it is designated Wilderness where only certain types of uses are allowed.

Big game hunting seasons regulated by the Montana Department of Fish, Wildlife and Parks will continue in the analysis area and surrounding region. A backcountry season begins on September 15 adjacent to the analysis area in Hunting District 316. It results in a comparatively large influx of people into a portion of the Absaroka Beartooth Wilderness. The general hunting season begins on October 26 and ends on November 30. The potential for conflicts between bears and people in this context of these events is high.

Firewood cutting is a popular activity in the non-Wilderness portion of Bear Creek. It is a source of personal and commercial firewood for residents of Gardiner and the upper Yellowstone Valley.

Private pursuits also include recreational activities compatible with non-Wilderness and Wilderness regulations. The mountain scenery in the area attracts backcountry travelers. The lakes and streams are popular for fishing. Indications are that recreational use will increase in subsequent years. Many of the backcountry users are armed, due to worries over bear attacks.

There is private property around the town site of Jardine. The commercial hard rock mine is currently inoperative and its future is uncertain. Much of the former mine property is potentially for sale. New ownership will determine the future use of these properties. Subdivision and residential development are possible.

Concern has been expressed over the future of the Yellowstone grizzly bear in the broader biological context of cumulative effects (Mattson and Reid 1991, pp. 364-370, USFWS 1993). Several important food sources for the grizzly bear may be in jeopardy. One is the whitebark pine; it is susceptible to a blister rust, which is causing mortality of these trees (Mattson and Jonkel 1989, pp. 223-236). Another is the spawning Yellowstone cutthroat trout in the area of Yellowstone Lake. This population is being reduced by an aggressive introduced predator, the lake trout (Varley and Shullery 1995, pp. 18-19). Climate change may negatively affect grizzly bears' foraging opportunities (Picton et al. 1985, pp. 129-135). The number of visitors to the GYA is increasing, including backcountry visitors. This increases the risk of bear/human encounters. Urbanization of private agricultural land is reducing the defacto buffer these properties once created around public land. Demand for natural resource commodities like timber and minerals continues. All of these factors in combination will influence the viability of the Yellowstone grizzly in the future. However, isolating the respective effects of these factors and assessing their synergism is difficult to impossible.

Conclusion

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. The cumulative effects of the proposed action were assessed by gauging the risks or benefits it affords relative to other activities.

Human activities that present a risk to grizzly bears occur in the analysis area. 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 Yellowstone grizzly population.

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. The focus is to keep attractants unavailable, and prevent 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. In addition, the quantity and distribution of human use in Bear Creek would not change substantially because of this project. Core (secure) habitat would not decrease. Road density would decrease in a portion of the analysis area. There will be no new roads open to the public at the end of the project. 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 would not be intended or desired. The layout of the sale units would meet Forest Plan standards designed to accommodate the habitat needs of grizzly bears.

Residential development in grizzly bear habitat can have significant negative effects on bear populations because of the increased risk of conflicts between bears and humans. Because it also involves a permanent human presence, there are the associated factors of bear displacement and a general loss of habitat. Consequently, the ultimate disposition of private property around Jardine is an important issue in the context of preventing grizzly bear mortalities. However, the future of these properties has not been determined. Potential development combined with the proposed timber harvesting is not expected to negatively affect the viability of the Yellowstone grizzly bear population. This is due in part to the temporal and spatial separation of the two activities; the proposed harvest area and the private property are separated by several miles and harvesting may occur over the next three years while development on the private land is not scheduled or even an inevitability. In addition, for all the reasons described in this analysis, effects of the federal imitative to harvest timber in Darroch and Eagle Creek would be ostensibly benign for grizzlies, although the same cannot be said for subdivision and residential development on private land.

IMPACTS TO THE GRAY WOLF

Measurement Indicator

Because the gray wolf is regarded as a non-essential experimental population in this area under the Endangered Species Act, it does not have the status of an endangered species. Under the constraints this evokes, impacts to dens are the primary concern in assessing project effects. Impacts to individual wolves are also a consideration. Population viability was assessed using prescribed population recovery standards.

Discussion
Historically, the former range of the Northern Rocky Mountain subspecies of the gray wolf extended from Canada into the northern two-thirds of Wyoming. Declines in ungulate populations and human wolf control efforts to reduce livestock/wolf conflicts led to their near eradication in the 1920s. Prior to reintroduction, gray wolves had been reported in the YNP area, but sustained pack activity had not been documented (USFWS 1987).

The GYA has been designated as a recovery area for the gray wolf (USFWS 1987) and reintroduction began in 1995. It has been estimated that YNP's northern winter range could support about 75 wolves or about 9 packs (Garten et al. 1990, p. 7). They could also overlap with the territories of an additional 3 to 4 packs (Singer 1990, pp. 15-21). The analysis area could be located within one or more territories of these packs.

Recent reintroductions of the gray wolf in YNP raises the potential of project effects on wolf populations. According to 50 CFR Part 17 (November 22, 1994), the reintroduced wolves in YNP are classified as a non-essential experimental population (Section 10j of the Endangered Species Act). Non-essential experimental animals located outside National Wildlife Refuges or National Park lands are treated as if they were only proposed for listing. In other words, although the wolf is an endangered species, it is treated on National Forest lands as if it were proposed for listing. Management direction provided in 50 CFR Part 17 indicates that there are no conflicts envisioned with any current or anticipated management action by the Forest Service or other federal agencies. The same CFR also states that management of wolves in the experimental population would not cause major changes to existing private or public land use restrictions. Land use restrictions on public lands could be used, however, to control human intrusion of den sites when fewer than 6 breeding pairs exist within the experimental area.

Gray wolves are wide-ranging and their distribution is tied primarily to that of their principal prey. Key components of wolf habitat are considered to include a sufficient year-round prey base of ungulates (big game) and alternate prey, suitable and somewhat secluded denning and rendezvous sites, and sufficient space with minimal exposure to humans (USFWS 1987). Key summering areas for ungulates, especially elk, are of particular importance in managing for wolf recovery. During winter periods deer, elk, and moose continue to represent principal prey items for wolves, and wolf distribution is keyed to the winter ranges of these species. In YNP, an established wolf population was predicted to prey on ungulates in the following decreasing order of importance: elk, bison, mule deer, moose, pronghorns, and bighorns (Singer 1990, pp. 15-21). Wolf use of the analysis area could occur during any time of the year.

Gray Wolf Population Viability
Wolves are rapidly recolonizing Montana and nearby states. Recovery or population viability standards are addressed by monitoring pack numbers. The recovery goal for wolves in the three-state recovery area (Montana, Idaho and Wyoming) is 30 packs for 3 years. There are 23 breeding packs and 271 individuals in the Yellowstone area and 43 packs and over 600 wolves in the tri-state area. Because wolf packs are relatively easy to detect, there is confidence in these numbers. The proposed Darroch-Eagle project site is within the territory of at least one of the Yellowstone packs.

It is reasonable to conclude that wolf recovery (reaching prescribed pack numbers) can be equated with viability. Wolves have a high birth rate, are very mobile, and are capable of traveling long distances that can connect them to other populations. There appears to be little reason for concern over long-term species viability of the gray wolf in the tri-state area based on population trends since reintroduction occurred in 1995.

The proposed logging may directly affect ungulates, part of the prey base for wolves, and therefore indirectly affect individual wolves and the viability of the wolf population in the recovery area. However, effects of the project on ungulates have already been discussed in this document and are considered minor. Therefore, based on this evidence and on current wolf pack numbers and population trends in the Yellowstone area, Montana, and the tri-state region, the effects of implementing this project on wolf population viability would not be consequential.

Conclusion
No gray wolf dens have been reported in the analysis area. For the reasons discussed in the previous section on impacts to the prey base for grizzly bears, project implementation would not have any significant effect on principal prey species of the gray wolf.

Wolves dispersing from YNP may use the analysis area. Wolves may avoid the project area during project implementation, but this would not result in any important habitat losses for the gray wolf, or in any adverse effects on wolves in YNP, or the overall viability of the tri-sate wolf population.

IMPACTS TO BALD EAGLES

Measurement Indicators
Impacts to bald eagles were assessed by determining if known or potential nesting sites or foraging areas would be disturbed or if individuals would be directly impacted. Population viability was addressed using prescribed population recovery standards.

Discussion
Bald eagles are year-round residents and winter visitors of the GNF and the surrounding GYA. Suitable bald eagle nesting habitat is available but limited in the analysis area. It is restricted to the lowest elevations along Bear Creek and the Yellowstone River. A bald eagle nest was occupied from 1988 to 1995 along Bear Creek about one mile downstream from Jardine. The higher elevations of the analysis area, including the project site, are poor bald eagle habitat because food is limited. In contrast, the Yellowstone River and the lower reaches of Bear Creek attract bald eagles year-round. Large numbers of bald eagles are frequently seen feeding on gut piles during the late elk hunt (January 1 to February 15) in this area. Foraging on fish and waterfowl is good along the waterways.

Bald Eagle Population Viability
Bald eagle numbers are increasing in the USFS Northern Region. The bald eagle has met recovery criteria in the 7 western states (800 pairs), including Montana. Because bald eagles and their nests are easily detectable, there is strong confidence in this number. The Montana Bald Eagle Management Plan (1994, pp. 12-20) has direction for species recovery, which includes monitoring nesting pairs and nest production to ensure that populations are increasing with recovery goals, and ensuring that the Montana Bald Eagle Management Plan nest protection is applied to all active nests. In the Yellowstone area, the Greater Yellowstone Bald Eagle Management Plan also provides direction for population recovery.

There were 138 active nests in western Montana and 297 active nests in the state in 2001. Recovery criteria have been exceeded at all scales (Youmans 2002, Hillis personal communication). There are currently about 8 nesting pairs on the GNF. All of the nests lie within Zone 18, Greater Yellowstone, although portions of the Forest fall within Zone 38 and Zone 40, the Missouri Headwaters and Bighorn, respectively. The actions of the GNF are consistent with and promote bald eagle recovery.

There are no active bald eagle nests at the project site. The majority of the project site does not contain the type of habitat where bald eagles typically nest in Montana (DEIS p. C-17).

Conclusion
There is no evidence that individual bald eagles or known or potential bald eagle habitat would be impacted by implementing this proposal. Project implementation would not negatively affect the viability of the Yellowstone ecosystem or Montana bald eagle populations.

IMPACTS TO THE LYNX

Measurement Indicators
No specific Forest Plan standards (USDA 1987) are available for effects analysis for lynx habitat. Acres of denning and foraging habitat are usually quantified using standards developed by Whitney and Krager (1998). The Canada Lynx Conservation Assessment and Strategy (Ruediger et.al. 2000, 7-1 to 7-17) also provides these project standards for conservation measures in lynx habitat:

1. Timber Management
   - Timber management shall not change more than 15 percent of lynx habitat within a Lynx Analysis Unit (LAU) to an unsuitable condition within a 10-year period.
   - Precommercial thinning will be allowed only when stands no longer provide snowshoe hare habitat.
   - In aspen stands within lynx habitat, apply harvest prescriptions that favor regeneration of aspen.
   - If more than 30% of lynx habitat within a LAU is currently in unsuitable condition, no further reduction of suitable conditions shall occur as a result of vegetation management by Federal agencies.
2. Landownership
   - Develop and implement specific management prescriptions to protect/enhance key linkage areas.
   - Evaluate proposed land exchanges, land sales, and special use permits for effects on key linkage areas. Key linkage areas are considered critical areas for lynx habitat. Usually the factors placing connectivity at risk are highways or private land developments.
3. Recreation Management
   - In lynx habitat, ensure that federal actions do not degrade or compromise landscape connectivity when planning and operating new or expanded recreation developments.
   - Design trails and roads to direct winter use away from diurnal security habitat.
4. Livestock Grazing
   - Do not allow livestock use in openings created by fire or timber harvest that would delay successful regeneration of the shrub and tree components.
   - Manage aspen stands to ensure long-term viability of clones.
   - Within the elevation range that encompasses forested lynx habitat, shrub steppe habitats should be considered as integral to the lynx habitat matrix and should be managed to maintain or achieve mid-seral or higher condition.
   - Within lynx habitat, manage livestock grazing in riparian areas and willow to maintain or achieve mid-seral or higher condition to provide cover and forage for prey species.

Discussion
Lynx are found from the coast of western Alaska to the eastern islands of Canada and throughout the mountains of the western United States. Their distribution is tied to that of boreal forests. Lynx habitat in the western mountains consists primarily of two types of forests with very different structures, reflecting opposite ends of the stand age gradient. Lynx require late succession forests with large amounts of deadfall that provide cover and sites for denning. They also need early succession forests with high numbers of snowshoe hare, their principal prey. Forests for foraging may result from several forms of disturbance including fire, timber harvest, disease and wind throw (Koehler and Aubry 1994, In: Ruggiero et al. pp. 86-89).

Lynx are believed to exist in northwest Wyoming and southwest Montana, but at low densities (Ruediger 1994, pp. 6-8). Specifically, they are thought to occur in YNP, but their existence and breeding status are unknown. Sightings have been reported over the park's history, but little physical evidence substantiates these claims and it is usually impossible to verify their reliability (Consolo Murphy 1994, pp. 1-2). However, lynx, including females with young, have recently (2002-2003) been documented in YNP (Potter, personal communication).

Little information is available on lynx in the GYA, and even less is known of the specific impact of various types of projects on this species. However, there is evidence that they are particularly vulnerable to human activities. There are several reasons for this including low population density, low reproductive rates, large home ranges, and an intolerance of human presence. Low reproductive rates and low population densities suggest that mortality will be additive and not compensatory; in other words, mortality generated by humans will add to, not replace natural mortality (Ruediger 1996, pp. 1-7).

It is well-documented that lynx populations are closely linked to those of snowshoe hare. Distribution and abundance of snowshoe hares probably determine lynx distribution and abundance. Managing for lynx involves managing for these lagomorphs (Koehler and Aubry 1994, In: Ruggiero et al. pp. 74-76).

Although habitat modification at the project level can influence local snowshoe hare numbers, some factors influencing hare populations operate at a spatial and temporal scale beyond the control of managers. It has been reported that snowshoe hares in some parts of their range follow a 10-year population cycle, and lynx population trends closely follow those of the hare. The exact reasons for the cyclic hare population phenomenon are not known. Various theories have been presented, including lunar influences, varying weather patterns, habitat effects related to fire cycles and migration from areas of especially productive habitat (Hatler 1988, pp. 20-21). The pattern is much stronger in northern than southern regions, where patchiness of suitable habitat and the presence of predators and competitors keeps the populations more stable and at lower levels. In the western mountains of the United States, this cyclic pattern is either subdued or absent (Koehler and Aubry 1994, In: Ruggiero et al. pp. 74-94).

The number of snowshoe hares in a given area and the size of their home ranges are directly dependent on the quality of the habitat. Most hare species seek landscapes with open vegetation to give them many options for flight from predators. By contrast, snowshoe hares use hiding cover as a predator avoidance strategy. As a result, second-growth stands with dense brush understory and a high density of saplings are considered optimum habitat (Giusti et al. 1992, pp. 296-303). They also use open areas where they feed at night before returning to the protection and cover of timbered areas during the day. Because they use both cover types, they are often associated with transition zones between different succession stages of forests. Giusti et al. (1992, pp. 296-303) reported that forest edges are commonly the areas of greatest activity and highest concentration of snowshoe hares.

The diet of snowshoe hares also reflects habitat selection. Diet consists of small twigs or seedlings 0.25 inches in diameter or less. Lodgepole pine and Douglas fir are more often a food source than the true firs or spruce (Giusti et al. 1992, pp. 296-303).

Several authors have reported on the specific effects of silviculture practices on snowshoe hares. Sullivan and Sullivan (1988, In: Giusti et al. 1992, pp. 296-303) monitored snowshoe hares in thinned and unthinned stands of lodgepole in British Columbia. They found that hare population density increased in thinned stands the first year, presumably because of an increase in food, but the effect was short-lived and the thinned stand was less attractive 2 years after thinning. Giusti et al. (1992, pp. 296-303) stated that snowshoe hares favored clear-cut blocks adjacent to areas of pole-size timber for foraging. Hatler (1988, pp. 20-21) stated that definitive statements are not possible on this subject for many parts of the range of snowshoe hare because of a lack of data. In his opinion, much more work is needed to understand the ecology of this species, and he feels that these data would also be an important way to advance our understanding of lynx. Recent surveys on the Gardiner District demonstrated a widespread distribution of lagomorphs. They appeared to be most closely associated with 30 to 50-year-old clear-cuts that have been thinned and some stands of mature lodgepole and spruce-fir. They were proportionally less abundant in clear-cuts < 30 years old (Zimmer, unpublished data).

There are 87,186 acres in the 2 involved LAUs. This includes 43,171 acres of suitable lynx habitat. Suitable habitat is divided between the 2 LAUs as follows: 26,483 acres (47 %) in the Sheep Mountain LAU and 16,688 (54 percent) in the Ash Mountain LAU. Project implementation would reduce the amount of suitable lynx habitat in the Sheep Mountain LAU by 58 acres and 137 acres in the Ash Mountain LAU, which is a < 1 percent reduction in each. About 47 acres of primary denning habitat would be affected, along with 195 acres of optimal foraging habitat (the 2 types of habitat are not mutually exclusive and reported acres of effected habitat are not additive). In the long-term, the areas logged as part of this proposal would become optimal lynx foraging areas as the conifer regeneration matures into the prime succession stage for snowshoe hare habitat. This would occur about 25 to 50 years post-harvesting (Table 12).

Implementing this proposal would not compromise standards detailed in the Canada Lynx Conservation Assessment and Strategy (Ruediger et.al. 2000). For example, one standard states that if more than 30% of suitable lynx habitat within a LAU is currently in unsuitable condition, no further reduction of suitable conditions can occur as a result of vegetation management by Federal agencies (Table 12). This proposal is well within this standard. A total of 1,482 acres (5.59%) of the Sheep Mountain LAU have been altered since 1990 and 899 acres (5.38%) in the Ash Mountain LAU. In addition, management actions cannot change more than 15% of lynx habitat within a LAU to an unsuitable condition within a 10-

year period. Disturbances since 1990 (1,482 acres) plus the proposed action (58 acres) will alter a total of 1,540 acres (5.8% of suitable habitat) in the Sheep Mountain LAU. Similarly, disturbances since 1990 (899 acres) plus the proposed action (137 acres) will alter a total of 1,036 acres (6.2%) in the Ash Mountain LAU (Table 12). Again, this is well within the prescribed standard.

Table 12. Summary of Potential Project Effects to Lynx Habitat (acres).

	Sheep Mountain (West) Lynx Analysis Unit Compartments 304 & 305		Ash Mountain (East) Lynx Analysis Unit Compartments 306	
Total Acres	56,190		30,996	
Total Acres Affected	58		137	
Suitable Habitat				
	Current	**After Timber Harvest**	**Current**	**After Timber Harvest**
Conifer	17,155 (31%)	1,7097 (30%)	15,778 (51%)	15,641 (50%)
Aspen	536 (1%)	No Change	84 (0%)	No Change
Willow	64 (0%)	No Change	0 (0%)	No Change
Sagebrush	8,786 (16%)	No Change	826 (3%)	No Change
Total Acres of Suitable Habitat	26,541 (47%)	26,483 (47%)	16,688 (54%)	16,551 (53%)
Acres of Suitable Habitat Rendered Unsuitable since 1990	1,482 (5.58% of suitable)		899 (5.38% of suitable)	
Total Acres of Suitable Habitat Rendered Unsuitable since 1990 (past disturbance and proposal).		1,540 (5.8% of suitable habitat)		1,036 (6.2% of suitable habitat)
Denning Habitat				
	Current	**After Timber Harvest**	**Current**	**After Timber Harvest**
Primary	2,039	2,018 (-21 acres)	2,998	2,972 (-26 acres)
Secondary	7,441	No Change	6,373	No Change
Optimal Foraging Habitat				
Young Conifer	809	No Change	1,323	No Change
Mature conifer	3,042	2,984 (-58 acres)	3,557	3,420 (-137 acres)
Created by Harvesting (long-term)		58 Acres		137 Acres

Canada Lynx Population Viability

Very little is known about lynx in the Yellowstone area, and data is insufficient to determine population status and trend. For this and other reasons, no recovery standards are currently available to assess population viability. With this dearth of information, meeting habitat maintenance standards is the acceptable protocol. The actions proposed in this project are fully compatible with those standards.

Conclusions

Suitable lynx foraging and denning habitat is found in the analysis area, but confirmed sightings have not been reported. Current high 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. Major project activities are temporally limited to a 3-year period and spatially limited to the 195 acres proposed for harvesting. In this context, the proposal is not consequential for the lynx.

Conservation measures in The Canada Lynx Conservation Assessment and Strategy (Rudiger et al. 2000) direct that if more than 30% of suitable lynx habitat within a LAU is currently in unsuitable condition, no further reduction of suitable conditions can occur as a result of vegetation management by Federal agencies. A total of 5.59% of the Sheep Mountain LAU have been altered since 1990 and 5.38% in the Ash Mountain LAU. In addition, management actions cannot change more than 15% of lynx habitat within a LAU to an unsuitable condition within a 10-year period. Disturbances since 1990 plus the proposed action will alter a total of 5.8% of suitable habitat in the Sheep Mountain LAU and 6.2% in the Ash Mountain LAU. These project consequences are well within the prescribed standards.

Lynx benefit when a diversity of forest succession stages is 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.

Manipulation of aspen stands is not a part of the proposal. Standards for landownership, recreation management, and livestock gazing are not relevant. Therefore, issues of key linkage areas and habitat connectivity are not involved.

DETERMINATION OF EFFECTS

Implementing this project would have “no effect” on the threatened bald eagle. It would be “not likely to jeopardize the continued existence” of the non-essential experimental gray wolf. It would be “not likely to adversely affect” the threatened lynx.

It would be “not likely to adversely affect" the threatened grizzly bear. This finding is commensurate with the constraints outlined for lands on the GNF designated as MA13; areas available for timber harvest, provided grizzly bear habitat objectives are met. This finding is also appropriate in the context of the USFWS amended Biological Opinion for the Gallatin Forest Plan. The project meets the constraints of the IGBC Access Standards.

COORDINATION MEASURES

All individuals involved in implementing this project will adhere to the food storage Special Order that requires attractants be made unavailable to bears.

If a conflict with a grizzly bear occurs during any phase of project implementation, Gardiner District personnel will be notified, and activities will cease until the situation can be assessed.

Improvements made to existing roads to accommodate a mix of logging and public traffic would be conservative; i.e., improvements would address safety concerns only and would not be conducted to achieve improved public access. The design of road safety improvements would meet the minimum requirements and no more.

The following stipulations in Appendix G of the Gallatin Forest Plan (USDA 1987) (Grizzly Bear Management Standards and Guidelines) would apply:

1. Timber environmental analysis will consider GYA grizzly management goals and objectives and describe measures necessary to achieve them. Contracts will include specific measures to protect, maintain and/or improve grizzly habitat and meet grizzly management goals and objectives. Timber sale contracts will include a clause providing for immediate modification or, if needed, the suspension or cancellation of any or all contract activities when such action is necessary in order to prevent confrontation or conflict between humans and the grizzly bear. The contractor’s full cooperation in meeting grizzly management goals and objectives will be a condition to their receiving and holding contracts and will be attained with applicable contract clause and stipulations.
2. Complete a biological review for all projects in occupied habitat. Based on recommendations and findings in the review, design and implement project modification, which will provide compatibility between grizzly bears and other resource management activities without jeopardizing the grizzly populations.
3. Temporary living facilities for timber management contractors will be closely regulated. Food and/or garbage will be made unavailable to bears. Garbage will not be allowed to accumulate and scheduled collection will be required. Requirements will be included in sale contracts.

In addition, the following provisions appear in timber sale contracts that occur in grizzly bear habitat:

1. All food and similar material, as well as ice chests, cooking utensils and food containers must be kept in a closed vehicle that is constructed of solid nonpliable material or must be suspended at least 10 feet above the ground, and 4 feet horizontally from a post or tree; except when food is being eaten or prepared for eating or when similar organic material is being transported.
2. No animals or fowl, other household pets shall be allowed to run at large.
3. Feeding bears for any purpose is prohibited.
4. Any bear activity within or adjacent to the permitted area shall be reported to the Forest Officer in charge within 12 hours of the observation.
5. A camping permit from the Forest Service is required for contractor and all personnel.
6. If protection measures prove inadequate, if other such areas where species of special concern are discovered, or if new species are listed on the Endangered Species List or the Regional Forester's sensitive plant and animal species list, Forest Service may either cancel or unilaterally modify this contract to provide additional protection regardless of when such facts become known. Discovery of such areas by either party shall be promptly reported to the other party and operations will be suspended at the location until the significance or potential significance of the area is determined.

DOCUMENTATION OF INFORMAL CONSULTATION

Marion Cherry, Gallatin Forest Biologist, discussed the proposal and probable finding of "not likely to adversely affect" for the threatened grizzly bear and lynx with Anne Vandehey, USFWS, Helena Office, by phone on November 13, 2003. Anne agreed that this finding seemed appropriate based on her understanding of the project.

Prepared by:

/s/ Dan Tyers
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cc:
Marion Cherry, Gallatin Forest Biologist
Barb Ping, Forest Ecology Group

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APPENDIX 1 - ESTABLISHMENT OF ANALYSIS AREA BOUNDARY

Analysis for determining the effects of the proposed Darroch-Eagle Creek timber sale on threatened and endangered species was conducted at several spatial scales. Analysis area size and placement were species and topic dependent. For example, IGBC standardized methods for delineating analysis area boundaries were employed when assessing effects to grizzly bears.

Specifically, the BMU Subunit was used as the analysis area for identifying the effects to grizzly bears of the proposed action in concert with other activities. The derivation of this analysis area boundary and the rationale for using it in the Darroch-Eagle Timber Sale project evaluation originate from the IGBC standards.

The Need for Standardized Analysis Areas in the GYA

An unbiased approach to selecting analysis areas is important because boundary placement can dramatically affect the outcome of project-specific analyses. This is true, in part, because the relative effects of a single activity will vary inversely to analysis area size, and will reach maximum impact at a size equal to the activity's area of influence. As an expression of this, analysis area boundaries can be drawn for maximum inclusion of pristine, unroaded habitat, thus neutralizing the effects of projects involving road construction or habitat manipulation.

In addition, an analysis area should be defined by biologically meaningful features that will have known significance to bears; i.e., because the grizzly bear is a wide-ranging species that displays large annual and seasonal variation in habitat use, making determinations about representative analysis areas necessitates consideration of habitat requirements at a broad temporal and spatial scale. In this context, determinations of analysis area boundaries are beyond the scope of individual project assessments and require a concerted, science-based, multi-jurisdictional approach.

In response to these concerns, the IGBC has provided standardized protocols for grizzly bear effects analysis in the GYA, including delineating analysis area boundaries (see below). The rationale for employing the IGBC standardized methods is carefully articulated in various widely disseminated agency reports. As such, a justification for using them as the foundation for effects analysis is generally not reiterated in documents such as the Darroch-Eagle Timber Sale BA. Instead, project-specific analysis documents tier to the IGBC reports.

Establishment of Bear Management Units and Subunits

In 1984, the Yellowstone Ecosystem Management Subcommittee of the IGBC identified the need to develop a cumulative effects assessment process for the ecosystem. The task was to develop methodology to quantitatively and qualitatively assess the cumulative effects of human activity on grizzly bear habitat, habitat use, and mortality in the Yellowstone ecosystem. Results were presented in "A Cumulative Effects Model for Grizzly Bear Management in the Yellowstone Ecosystem" (Weaver et al. 1985). These concepts have been refined, added to, and applied in other documents, including "CEM-a Model for Assessing Effects on Grizzly Bears" (IGBC 1990), "IGBC Taskforce Report-Grizzly Bear/Motorized Access Management" (1998), and "Draft Conservation Strategy for the Grizzly Bear in the Yellowstone Area" (IGBC 2000 and final 2003).

The result of the 1984 task force report was the development of the CEM. It is a model designed to quantify individual and collective effects of land uses and activities in space and through time, and provide an analytical tool for evaluating alternative land use scenarios relative to grizzly bear recover goals and objectives.

The CEM also addresses the scale of analysis as an important factor in cumulative effects assessment. In an area as large and diverse as the PCA, it is necessary to have smaller landscape divisions. Therefore, the IGBC took the approach of dividing the Yellowstone PCA into 18 BMUs, which are further divided into 40 Subunits. The BMU or, if delineated, the subunit provide the basic scale for analysis. This division facilitates:

1. Assessment of the effects of existing and proposed activities on the bear population and bear habitat without having the effects diluted by consideration of too large an area.
2. Addressing unique habitat characteristics and bear activity/use patterns.
3. Identifying contiguous complexes of habitat, which meet seasonal or year-long needs of the grizzly bear.
4. Establishing priorities for areas where land use management needs require CEM application.
5. Evaluating distribution of reproductive females within the PCA. Eighteen BMUs comprised of forty subunits are currently delineated within the PCA.

Derivation of Bear Management Units

BMUs were delineated using grizzly bear radio-location data and topographic features. The entire area within the PCA was stratified into BMUs.

Initially, areas were delineated that had a substantial number of radio-locations during active seasons. Active seasons were considered to be spring (March-May), summer (June-August,) and fall (September-November). Areas of extensive and contiguous substantial use during any season were identified.

All areas with extensive and contiguous 3-season use serve as a core for a BMU. Prominent topographic features between adjacent core areas with 3-season use serve as unit boundaries. Where an area of no use or 1 or 2-season use adjoins an area with 3-season use, a prominent topographic feature close in proximity to the area with 3-season use serves a boundary.

Consequently, some BMUs contain extensive areas of known substantial 3-season bear use. Other units are characterized by virtually no bear use. These minimal use units all occur around the periphery of occupied grizzly habitat. Other units, including the Hellroaring/Bear, have substantial bear use during only 1 or 2 seasons, or have only limited areas of 3-season use.

Derivation of Bear Management Subunits

Subunits provide further landscape resolution as well as finer attunement to grizzly bear habitat use patterns. Subunits are delineated based on seasonal component representation and interspersion. An optimal Subunit corresponds to a contiguous but more or less interspersed area of spring range, within close proximity of significant areas of summer and fall range. A major drainage and portions of intervening ridges typically encompass this complex. On the other hand, some Subunits are distinguished by a uniform lack of high-value seasonal components or by the presence of high-value feeding opportunity during only 1 or 2 seasons. In the latter case, the 1 or 2 seasonal components are too far distant from other seasonal components for a substantial number of bears to efficiently integrate them in yearly ranges.

All IGBC documents establishing protocol for effects analysis involving grizzly bears indicate that the Subunit corresponds to the optimal scale for incorporating information on grizzly bear habitat utilization. As such, the Subunit is the accepted project-specific analysis area in the Yellowstone PCA.

APPENDIX 2 – FEATURES COMMON TO ALL ACTION ALTERNATIVES

This section describes project design features and activities, mitigation measures, and monitoring activities that are common to all action alternatives.

Harvest Operations

Unless waived in writing by the Forest Service, operational restrictions would include the following: 1. July 1 through October 15 would be considered the normal operating season for contractual purposes.

2. No hauling of logs from the sale area would be allowed from Friday at 5 p.m. until midnight Sunday, or 5 p.m. preceding a state or federal holiday to midnight of that same day.

3. All timber sale contract activities would be precluded from the Eagle Creek road system from October 16 to June 30.

4. All timber sale contract activities would be precluded from the Bear Creek road system from December 1 to May 1.

5. All timber harvest activities would be concluded in Units 9 and 14 before August 30 of any given year to mitigate for possible grizzly bear foraging due to the proximity of the whitebark pine zone to these units.

Road Maintenance/Management/Rehabilitation

1. Road Maintenance

The purchaser would be required to pay his/her commensurate share of road maintenance and surface replacement throughout the life of the timber sale. Normal considerations would be applied to log truck hauling to protect existing road structures and surfaces.

2. Seed Mix for Revegetation

The Forest Service would designate the seed mixture to be used in road rehabilitation activities. It would consist of native plant species (C6.601# - Erosion Control Seeding). This seed mixture would be applied to those areas where activity disturbance has exposed high levels of bare soil (such as along the fill and cut slopes of existing roads). Seeding is the responsibility of the contractor and would be accomplished during the first seeding season (generally September 1 through October 30) immediately following activity in an area. Seeding native plant species would reduce the possibility of nonnative species introduction. The purpose of seeding is to reduce erosion potential of a disturbed area.

3. New Road Construction

Where new roads are planned, the locations would be guided by the long-term harvest and transportation plan as required by the Gallatin National Forest Plan, pp. II-22 & II-27. The design of the new roads would be to support short-term use, while maintaining a long-term location. Short-term design principles would include design for log hauling only, with no allowance for mixed commercial and recreation traffic. This would mean fewer turnouts, fewer drainage structures such as ditches and relief culverts, and preservation of slash during construction for restoration after the sale. Construction would be accomplished by the Specified Road Package of the timber sale contract. The constructed road would be managed during the project to preclude public use.

4. **Management of New Roads**

Following the sale, new roads would be open to the public for firewood gathering for up to 2 seasons. They would then be closed. Post-sale treatment would include ripping and seeding, installation of cross drains, and spreading of slash onto the road surface where prescribed. Prism recontouring would not occur. The work would not be accomplished through the timber sale contract because of the length of time before the work is to be done.

5. **Temporary Roads**

Most temporary roads are short in length, are used where the topography and drainage requirements are minimal, and where there is little potential impact. They serve no long-term need, and therefore should return to presale management objectives after project completion. The roads would be managed during the project to preclude public uses, likely with a gate. Upon completion of harvest activities, the purchaser would be required to close the road and burn dozer piles along the temporary road constructed to access Unit 14. The remaining roads would be open to the public for firewood gathering for about 2 seasons, after which they would be closed. The Gardiner Ranger District would be responsible for closing the roads. The costs and treatments would follow the pertinent C-Clauses in the Timber Sale Contract.

6. Existing Roads Currently Closed to Use

These are existing roads that are presently closed to all uses because of either physical barriers or overgrown vegetation.

They are needed for log hauling during the sale and would either receive prehaul maintenance or reconstruction necessary to safely accommodate logging traffic. They would be brought back into service using principles described above. These roads would be managed during the project to preclude public uses, likely with a gate.

Post-sale treatments will return the road to the presale condition or beyond. The principles described above under New Road Construction would be used for these roads. Finally, the roads would be closed to all motorized uses.

7. Existing Roads Currently Open to Use

These include roads that are currently open to public, administrative, or private uses. The roads would receive pre-haul maintenance or reconstruction, depending on their condition and needs, including correction of safety deficiencies. Improvements would be restricted to those needed to correct safety problems; replace failing structures; restore failed surfacing; correct cut/fill failures, grades, or alignments; and reduce sediment production. Work would be designed to be permanent and would be a part of the Specified Road Package.

Post-sale treatments would be used only on gated roads used for administration or private uses. These roads may be scarified and seeded, and rolling drainage dips installed. This work would be accomplished under the Timber Sale Contract.

APPENDIX 3 - DEFINITIONS FOR INTERAGENCY GRIZZLY BEAR COMMITTEE STANDARDS

Road
All created or evolved routes that are > 500 feet long (minimum inventory standard for the Forest Service Route Management System), and are reasonable and prudently drivable with a conventional passenger car or pickup.

Open Road
A roadway without restriction on motorized vehicle use.

Restricted Road
A road on which motorized vehicle use is limited seasonally or yearlong. The road requires physical obstruction (generally a gate) and motorized vehicle use is legally limited. Motorized administrative use by personnel of resource management agencies is acceptable at low intensity levels as defined in existing cumulative effects analysis models. This includes contractors, permittees, and agency employees.

Reclaimed/Obliterated Road
A road that has been treated in such a manner to no longer function as a road or trail. This can be accomplished through one or a combination of several means including: recontouring to original slope, placements of logging slash or forest debris, and planting of shrubs or trees.

Trail
All created or evolved access routes that do not qualify as a road. They are not reasonably and prudently drivable with a conventional passenger car or pickup.

Open Motorized Trail
A trail that is used by motorized vehicles without restriction. Trails used by 4-wheel drive vehicles and motorized trail bikes are examples of this type of access route.

Restricted Motorized Trail
A trail on which motorized use is limited seasonally or year-round.

Secure (Core) Area(s) Criteria
There must not be any motorized use of roads and trails during the nondenning period. Within the core area, restricted roads require closure devices that are permanent, such as tank traps, large boulders, dense vegetation, or the like.

Core areas must not include roads or trails that receive non-motorized, high intensity use as defined in established cumulative effects activity definitions.

Core areas must be a minimum of 0.3 miles from any open road or motorized trail. This will be accomplished by buffering all open roads and motorized trails.

When information is available to do so, consideration should be given to ensure that the core areas meet seasonal bear habitat needs by assuring that spring, summer, fall, and denning habitat within the core areas are representative of these seasonal habitats in the entire analysis area.

Once core areas become established and effective, these areas should remain in place for at least 10 years. This duration is based upon the generation time for a female grizzly bear (i.e., the time it takes a female grizzly bear to replace herself).

Core areas are analyzed based on predetermined seasons that correspond to bear habitat use patterns. The time of year that core areas are generally the smallest varies considerably, often with elevation, which influences access and the type of recreational activity that may be occurring during that season. The seasons are: spring (3/1 to 5/31), summer (6/1 to 8/31), and fall (9/1 to 11/30). The denning season is from 12/1 to 2/29, during which bears are generally not active.

Total Motorized Access Route Density
This includes all open and restricted roads and motorized trails. Density is displayed as a percentage of the analysis area in a defined density category (for example, 20 percent >2.0 miles per mile square).

Open Road and Open Motorized Trail Route Density
This includes all open roads and open motorized trails. Density is displayed as a percentage of the analysis area in a defined density category. Density is a single cumulative total of open motorized trails.

Percentage of Analysis Area in Core Areas
This is the percentage of the analysis area that meets core area criteria. Minimum size and connectivity of patches will be established at the recovery zone level. It is recommended that the minimum size for the core area(s) be that area necessary to support a female grizzly bear for 24 hours of foraging.

APPENDIX 4 - MITIGATION MEASURES FOR THE SHEEP ALLOTMENT PERMIT

Gallatin National Forest Plan
Appendix G of the GNF Plan (USDA 1987) (Grizzly Bear Management Standards and Guidelines) applies. Appendix G stipulations include:

1. The allotment management plan will incorporate GYA grizzly management goals and objectives and specify measures to meet them. Annual Operating Plans will include specific measures to maintain and/or improve grizzly habitat and meet grizzly management goals and objectives. Annual Operating Plans will include a clause providing for immediate temporary modification, or if needed, the suspension or annulment of any or all permitted activities when such action is necessary in order to prevent confrontation or conflict between humans and the grizzly bear. The permittee's full cooperation in meeting grizzly management goals and objectives will be a condition to their receiving and holding permits and will be attained with applicable requirements in the Grizzly Management and Protection Plan of the Annual Operating Plan.

2. The Allotment Management Plan will specify applicable measures to protect in time and space, food production areas vitally important to grizzlies (i.e,. wet alpine and subalpine meadows, stream bottoms, aspen groves, and other riparian areas) used by domestic livestock. These measures will be reflected in the Annual Operating Plans. Habitat management could range from partial to full protection and measures could be either temporary or permanent (MS 1 only). Management options could include exclusion fencing, changing livestock on and off dates, and setting livestock utilization rates at levels compatible with grizzly needs. Range condition objectives will be good to excellent (unless not attainable) in order to achieve range conditions favorable to grizzlies.

3. On sheep allotments where livestock losses due to grizzly bears have been authenticated, management changes will be made for the primary purpose of grizzly bear conservation. Currently, the following options are among those available in areas occupied by the grizzly:
   - Change the season of use, bedding practices, or grazing areas, to avoid known problem areas or other habitat important to grizzlies in time and space.
   - Change the class of livestock from sheep to cattle if the range is suitable for cattle.
   - Relocate sheep from allotments in MS 1.
   - Implement monitoring systems to reduce the probability of grizzly mortality. Monitoring intensity will be recommended in Allotment Management Plans.

4. New and/or vacant sheep allotments will be evaluated utilizing the biological review process before stocking.

5. In the Annual Operating Plan, the District Ranger will specify the appropriate measures for removal or destruction of livestock carcasses to avoid habituation of grizzlies to livestock carrion as food. The intent is to reduce the availability of unnatural food, reduce the likelihood of food association with domestic herds, reduce opportunities for depredation, and reduce the possibility of man/grizzly conflicts.

6. In the event that livestock are preyed upon by grizzly bears, the following procedures will be used:
   - Continue grazing, but immediately move livestock to another area of the allotment.
   - Offer permittee mutually agreeable nonuse for resource protection.
   - Remove livestock from allotment.
   - Relocate grizzly from allotment if determined to be a nuisance (Section IV-MS 2 and 5, Condition A.2 - Bear exhibits a behavior pattern of following sheep after the band has been relocated to another area in the allotment, resulting in two or more attacks on the band).

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Allotment Annual Operating Plan

In addition, clauses in the Annual Operating Plan provide specific direction for managing the allotment. The clauses appear in the permit's Bear Management and Protection Plan and are agreed to by the permittee as a term for issuing the permit. They include:

1. Activities authorized by your permit must be conducted in a manner that will prevent or minimize the opportunity for conflicts with the grizzly bear.

2. Authorized officer may order an immediate temporary suspension of all human activities permitted by this authorization, when such action is necessary in order to prevent confrontation or conflict between humans and grizzly bears. The permittee shall immediately comply with such order.

3. The permittee assumes full responsibility and shall hold the United States harmless from all claims by him/her or by third parties.

4. Livestock losses regardless of cause are to be reported to the Gardiner District as soon as they are found. At that time, the permittee and the Forest Service will jointly determine how to eliminate the attractiveness of the carcass. The objective is to reduce the likelihood of bear/human and/or livestock confrontations.

5. Violations of the above requirements, intentional or negligent acts that result in the injury or death of a grizzly bear, or other violations of the endangered species act, can result in the termination of the permit.

6. If grizzly/sheep conflicts occur in MS 1 areas and cannot be resolved, sheep will be removed from the allotment as a last resort. Movement of sheep to another allotment and/or mutually agreed upon non-use for resource protection will be evaluated. Movements or relocations of the grizzly will generally not be considered.

7. The permittee will adhere to the food storage Special Order.

Note: Figure 1 is identical to Map E-4 in Appendix E.