United States
Department of
Agriculture

Forest
Service

June 2007

Draft Environmental Impact Statement

Grizzly Vegetation and Transportation Management Project

Three Rivers Ranger District, Kootenai National Forest
Lincoln County, Montana

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Draft Environmental Impact Statement

Grizzly Vegetation and Transportation Management Project

Three Rivers Ranger District, Kootenai National Forest
Lincoln County, Montana

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Abstract: This Draft Environment Impact Statement (DEIS) documents the detailed analysis of three alternatives, including the No Action Alternative, which were developed for the Grizzly project. Alternative 1 is the No Action Alternative. Alternative 2 is the proposed action and includes timber harvest and other fuels reduction treatments, pre-commercial thinning, watershed rehabilitation (decommissioning) work, and transportation system changes. Alternative 3 includes these activities, but addresses public issues related to grizzly bear habitat, roadless area impacts, invasive weeds and soils impacts, and fuels reduction activities. Alternative 2 is the agency's preferred alternative. Both alternatives would require a project specific amendment to MA 12 Open Road Density Standard.

Reviewers should provide the Forest Service with their comments during the review period of the DEIS. This will enable the Forest Service to analyze and respond to the comments at one time and to use information acquired in the preparation of the final environmental impact statement, thus avoiding undue delay in the decision-making process. Reviewers have an obligation to structure their participation in the National Environmental Policy Act process so that it is meaningful and alerts the agency to the reviewer's position and contentions (Vermont Yankee Nuclear Power Corp. v. NRDC, 435 U.S. 519, 553 (1978)). Environmental objections that could have been raised at the draft stage may be waived if not raised until after completion of the final environmental impact statement (City of Angoon v. Hodel (9th Circuit, 1986) and Wisconsin Heritages, Inc. v. Harris, 490 F. Supp. 1334, 1338 9E.D. Wis. 1980). Comments on the DEIS should be specific and should address the adequacy of the statement and the merits of the alternatives discussed (40 CFR 1503.3).

Comments on this DEIS should be sent to Mike Herrin, District Ranger, Three Rivers Ranger District, 1437 N. Highway 2, Troy, Montana 59935; or by facsimile (406) 295-7410, or hand-delivered between the hours of 7:30 a.m. and 4:00 p.m. Monday through Friday. In accordance with 36 CFR 215.5, as published in the Federal Register, Volume 68 no. 107, June 4, 2003, comments must be postmarked or received 45 days from the date the Notice of Availability is published in the Federal Register. Only those who submit written comment in response to a DEIS, or provide comments or otherwise expressed interest in a particular proposed action by the close of the comment period will be accepted as appellants following release of the Grizzly Vegetation and Transportation Project Final EIS and Record of Decision. For appeal eligibility, each individual, or representative from each organization, submitting comments must either sign the comments or verify their identity upon request. Comments must be specific to the proposed activities and area being analyzed. They should include: (1) name, address, telephone number, and organization represented, if any; (2) title of the document on which the comment is being submitted; (3) specific facts and supporting reasons for the Responsible Official to consider; and (4) signatures.

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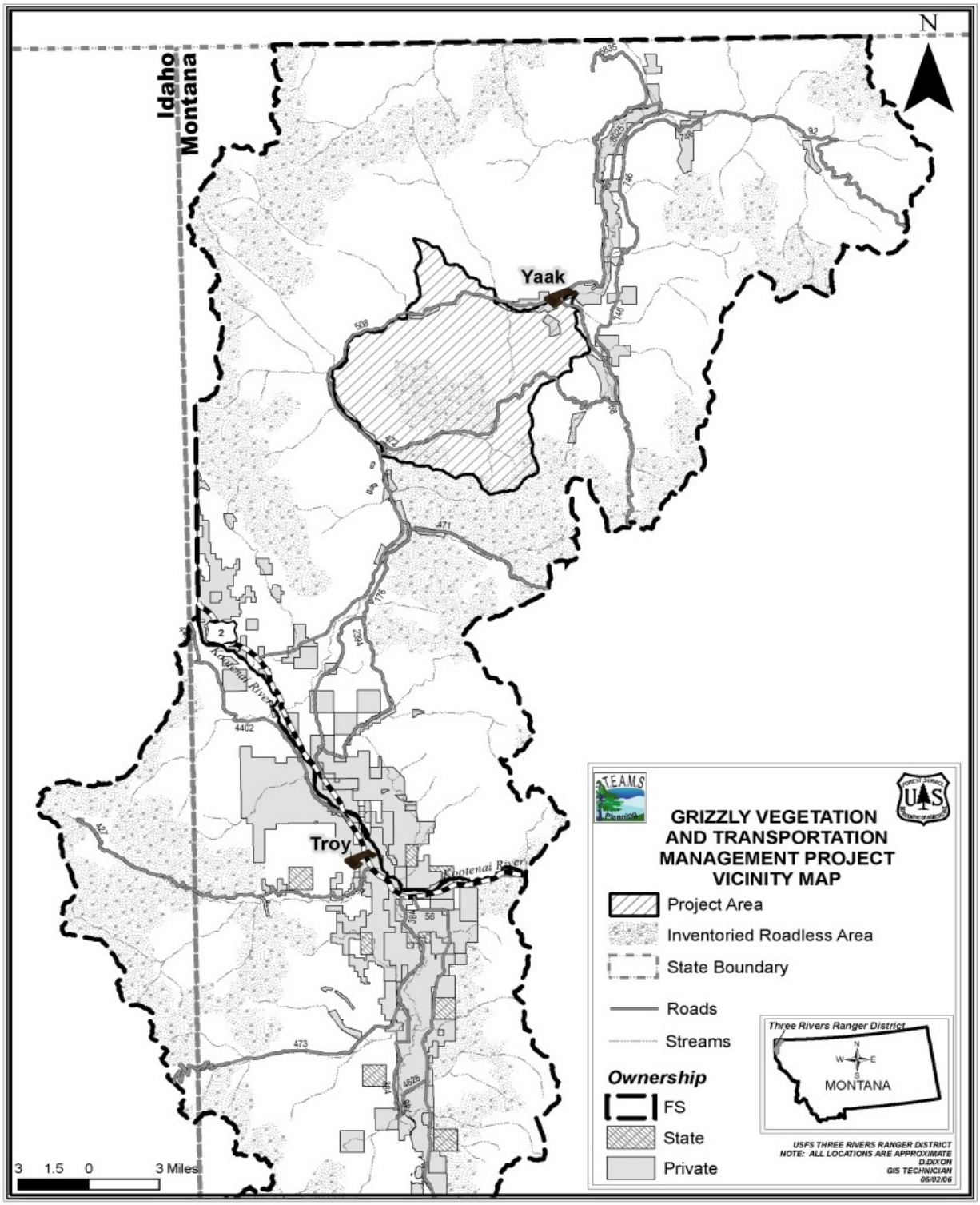

Figure 1. Vicinity map

Summary

The Grizzly Vegetation and Transportation Project proposes timber harvest, prescribed burning, road maintenance, and transportation management actions to meet Forest Plan standards and guidelines, and to move towards more resilient, fire-adapted vegetation characteristics. This section includes the highlights of each chapter to briefly summarize the key points and findings.

Project Area Description

The project area is approximately 44,400 acres, located approximately 18 miles northeast of Troy, Montana, and is bordered on the west and north by the Yaak River, south by Roderick Mountain and east by the Sheepherder-Roderick Butte ridge. Major drainages within the project area include Burnt Creek, Grizzly Creek, Pheasant Creek, and Cool Creek (see Vicinity Map page iv).

Purpose of and Need for Action

The need for action, and the purpose for the proposed actions was identified through the review of existing conditions, comparison of desired conditions as embodied in the Forest Plan standards and guidelines, and management direction provided in the Forest Plan, the Northern Region Overview, the National Fire Plan and the Healthy Forests Restoration Act of 2003. The specific elements that the proposed action addresses are:

- **Vegetation Restoration** - manage for diverse and sustainable vegetative conditions characteristic of natural fire regimes, enhancing habitat and forage for diverse wildlife species, retaining and promoting large tree health and vigor (Forest Plan, p. II-1, Goals 5 and 7).
- **Road and Trail Management** - manage roads to provide adequate grizzly bear habitat and meet public needs (Forest Plan, II-1, Goals 3 and 5).
- **Watershed Rehabilitation** - stabilize roads to prevent soil loss, maintain water quality, and reduce adverse effects to aquatic habitat (Forest Plan, p. II-1, Goal 2, and p. II-2, Goal 13).
- **Fuels Management** - reduce stand density, and ladder and ground fuels to lessen undesirable effects from wildfire and reduce the risk of large, stand-replacing fires (Forest Plan, p. II-2, Goal 17).
- **Timber Production** - provide timber volume and wood products responsive to National and Regional needs, supporting local and regional economies. (Forest Plan, pp.II-2 to 3, Goals 1 and 16).

Key Issues

The public was provided with opportunities to comment on both the development of management actions for this project; first during the landscape assessment phase in the spring of 2005, and again during the scoping period of the proposed action in June, 2006. Key issues pertaining to the proposed action that warranted development of alternative actions were identified, and are listed below.

Issue 1) Grizzly Bear Disturbance and Displacement

The public expressed concern that the proposed activities would cause grizzly bear disturbance, reduce security, and displace grizzly bears from the areas of proposed activity. Increased

movement of the bears could lead to higher risk of mortality (hunters, vehicles, human interactions).

Issue 2) Regeneration Harvest Units Greater Than 40 Acres

Proposed units 49 and 50 would create an opening approximately 126 acres. The public expressed concern that these large clearcuts would set a precedent for future large clearcuts.

Issue 3) Grapple Piling Impacts on Soil and Weed Infestation

The public expressed concern that grapple piling causes excessive soil displacement and removal of vegetation, exposing mineral soils and increasing risk of erosion and weed invasion.

Issue 4) Effects on Potential Future Wilderness Consideration

Concerns were expressed that activities in units 57 and 57a could reduce future potential wilderness consideration, and could impact grizzly bears through disturbance and displacement.

Issue 5) Fragmentation

Public concern was expressed that harvesting units 40, 41 and 60 would increase fragmentation of the surrounding large patches of fire adapted tree species.

Issue 6) Fuels Treatments along Long Meadows Road (593)

Concerns were expressed that fuels reduction treatments in the recent Obermayer Project did not address protection of the escape route to the west from the Yaak area.

Alternatives Considered in Detail

Detailed descriptions of all the alternatives considered are displayed in Chapter 2 of this DEIS.

Alternative 1

Alternative 1 is the No Action Alternative. This alternative is a "status quo" strategy that allows current activities and policies, such as recreation administration, road maintenance, and fire suppression to continue. This alternative provides a baseline for comparison of environmental consequences of the other alternatives to the existing condition (36 CFR 1502.14) and is a management option that could be selected by the deciding official.

Alternative 2

Alternative 2 is the proposed action. It includes vegetation, road, and trail management actions to meet the purpose and need. The proposed action would not reduce existing levels of public motorized access. Roads identified for active or passive decommissioning and intermittent stored service are currently closed to public motorized access or are impassable due to vegetation growth. Table S-1 provides a summary of the proposed activities in Alternative 2. Refer to Chapter 2 in the DEIS for more details.

Table S-1. Alternative 2 summary

Proposed Vegetation Treatments	Acres	Volume (MBF)
Clearcut with Reserves	384	4,775
Seedtree with Reserves	159	2,037
Commercial thinning	509	2,578
Salvage	170	225
Release	84	357
Precommercial thinning	515	0
Ecosystem Burning	250	0
Wildlife Burning	468	0
Total	**2,539**	**9,972 MBF (9.97 MMBF)**
Proposed Logging Systems	**Acres**	**Volume (MBF)**
Tractor Harvest	606	5,114
Tractor/Winter Harvest	158	1,406
Skyline	274	1,690
Skyline/Helicopter	86	817
Helicopter	182	945
Proposed Fuels Treatments		**Acres**
Grapple Piling/Burn Piles		692
Spot Grapple Piling/Burn Piles		20
Hand Piling/Burn Piles		5
Underburning		191
Jackpot burning		38
Lop and scatter		880
Yard tops		1,306
Proposed Road and Trail Management		**Miles**
Decommissioning (passive)		16.9
Intermittent Stored Service (watershed work included)		22.6
Designate open to motorized use		65.5
Designate trails for nonmotorized use		38.8
Temporary Road construction		2.1
Proposed Watershed Rehabilitation		**Miles**
Decommissioning (active)		27.6
Decommissioning (convert to trail)		2.4
Implementation of Best Management Practices		54.5
Proposed Fuels Management (resulting from vegetation treatments)		Acres
Thinning to reduce stocking, fuel ladders		898
Reduce fuel loading by removing lodgepole pine		923

Proposed regeneration harvesting of units 49 and 50 would result in an opening size of approximately 126 acres. Regional Forester review and approval is necessary for openings exceeding 40 acres. The review of this action would occur prior to a decision on this project.

Alternative 3

The alternative strategies (identified in **bold** below) were developed to address issues raised by the public. The following modifications to the proposed action were identified to be included in this alternative.

Design harvest units to meet Management Area 11 guidelines of 20-acre opening sizes.

- Unit 49 would be changed to 20 acres, skyline yarding from road 902Y, lop and scatter,
- Unit 50 would be reduced to two units, 20 acres each, with 600 feet distance between units to provide a travel corridor. Units would be skyline and/or helicopter harvested.

Identify units with grapple piling that could be treated with other fuels reduction methods (prescribed burning, whole tree yarding, yarding tops, lopping and scattering) to reduce soil disturbance.

- Unit 17 (below road 6084A), 20, 36, 37, 45 would be underburned
- Fuels treatment in Unit 50 would be lop and scatter
- Fuels treatment in Units 15, 31, 42, 43 would be lop and scatter

Drop units that would increase disturbance and displacement for Grizzly Bears, minimize activities that may reduce future wilderness consideration, and reduce fragmentation.

- Drop Units 40 and 60 to minimize disturbance and displacement
- Drop 57, 57a to reduce disturbance, displacement and to minimize impacts to future wilderness consideration

Identify additional fuels treatment opportunities along the Long Meadows Road.

- Implement defensible space treatment Unit 61 along Long Meadows Road. Understory trees that provide fuel ladders into the overstory would be removed, and slash would be piled and burned. The majority of trees removed would be six inches in diameter or less. Incidental removal of larger diameter trees (up to 12 inches diameter) would occur only where necessary to protect larger diameter trees.

A summary of the actions included in alternative 3 is displayed in Table S-2.

Forest Plan Amendment - MA 12 Open Road Densities

Both Action Alternatives would utilize roads within Management Area 12 that would increase open road density standards when used for the proposed action. A project-specific amendment would be necessary to meet Forest Plan standards for these areas. Refer to Chapter 2 for a complete description of the proposed amendment.

Table S-2. Alternative 3 summary

Proposed Vegetation Treatments	Acres	Volume (MBF)
Clearcut with Reserves	317	4,089
Seedtree with Reserves	102	1,365
Commercial thinning	509	2,578
Salvage	171	227
Defensible space treatment	25	125
Release	0	0
Precommercial thinning	515	0
Ecosystem Burning	250	0
Wildlife Burning	468	0
Total	**2,357**	**8,384 MBF (8.38 MMBF)**
Proposed Logging Systems	**Acres**	**Volume (MBF)**
Tractor Harvest	534	4,087
Tractor/Winter Harvest	158	1,406
Skyline Harvest	315	2,121
Helicopter	117	769
Proposed Fuels Treatments		**Acres**
Grapple Piling/Burn Piles		203
Spot Grapple Piling/Burn Piles		20
Hand Piling/Burn Piles		5
Grapple and Hand Piling/Burn Piles		25
Underburning		393
Jackpot burning		38
Lop and scatter		998
Yard tops		1,124
Proposed Road and Trail Management		**Miles**
Decommissioning (passive)		16.9
Intermittent Stored Service (watershed work included)		22.6
Designate open to motorized use		65.5
Designate trails for non-motorized use		38.8
Temporary Road construction		1.9
Proposed Watershed Rehabilitation		**Miles**
Decommissioning (active)		27.6
Decommissioning (convert to trail)		2.4
Implementation of Best Management Practices		49.4
Proposed Fuels Management (resulting from vegetation treatments)		**Acres**
Thinning to reduce stocking, fuel ladders		753
Reduce fuel loading by removing lodgepole pine		886

Alternative Comparison

Tables S-3 and S-4 display a comparison of the alternatives considered in detail. The environmental effects of each alternative are expressed by the indicator values. A complete discussion of the environmental effects is disclosed in Chapter 3.

Table S-3. Alternative comparison table - purpose and need

Indicator	No Action	Alt. 2	Alt. 3
Vegetation Restoration			
Acres of restoration of white pine or western larch	0	543	443
Acres of restoration of fire regime vegetation characteristics	0	1086	986
Acres of aspen enhancement	0	84	0
Acres of ecosystem and wildlife burning	0	718	718
Road and Trail Management			
Miles of Intermittent stored service for Grizzly habitat improvement	0	22.6	22.6
Motorized route designation Road miles designated open motorized Trail miles designated non-motorized	 0 0	 65.5 38.8	 65.5 38.8
Miles Decommissioned (passive)	0	16.9	16.9
Watershed Rehabilitation			
Miles Decommissioned (active)	0	30	30
Miles of Best Management Practices implemented	0	54.5	49.4
Fuels Management			
Acres thinned to reduce stocking	0	898	753
Acres treated to reduce fuel loading	0	923	886
Fire Hazard ratings Very High/High Moderate Low	 45% 55% 0%	 6% 25% 69%	 6% 25% 69%
Timber Production			
Million board feet of timber produced	0	9.97	8.38

Table S-4. Alternative comparison - issue indicators

Indicator		No Action	Alt. 2		Alt. 3	
Grizzly Bear Disturbance And Displacement (BMU 11/14)						
Measure	Standard	Existing	During Activity	Post Activity	During Activity	Post Activity
Percentage of secure core habitat	55% or greater	52 / 56	54 / 55	55 / 56	54 / 55	55 / 56
Open Motorized Route density (OMRD)	33% or less	28 / 28	28 / 29	28 / 28	28 / 29	28 / 28
Total Motorized Route density (TMRD)	26% or less	29 / 26	27 / 26	26 / 26	27 / 26	26 / 26
Habitat Effectiveness (HE)	70% or greater	74 / 76	70 / 76	74 / 76	71 / 76	74 / /76
Open Road Density (ORD)	0.75 mi/sq. mi. or less	0.44 / 0.57	0.48 / 0.58	0.48 / 0.57	0.48 / 0.58	0.48 / 0.57
Regeneration Harvest Units Greater Than 40 Acres						
Number and size of regeneration harvest openings greater than 40 acres		0/0	1/126		0/0	
Number and size of regeneration harvest openings in MA 11 greater than 20 acres		0/0	1/126		0/0	
Grapple Piling Impacts on Soil and Weed Infestation						
Acres treated with grapple piling		0	712		223	
Acres treated with alternative fuels treatments		0	1,114		1,421	
Effects on Potential Future Wilderness Consideration						
Effects to roadless area characteristics						
Natural integrity		No change	Improved		Improved	
Apparent naturalness		No change	Improved		Improved	
Remoteness		No change	Short term impact		Short term impact	
Solitude		No change	Short term impact		Short term impact	
Special features		No change	No change		No change	
Manageability		No change	No change		No change	
Fragmentation						
Number of units/acres treated in units 40, 60		0/0	2/57		0/0	
Fuels Treatments Along Long Meadows Road 593						
Acres treated along Long Meadows Road		0	163		189	

Chapter 1 - Purpose of and Need for Action

Introduction

The Three Rivers Ranger District of the Kootenai National Forest (Kootenai NF or KNF) is proposing the Grizzly Vegetation and Transportation Management Project. The project area is approximately 44,400 acres, located approximately 18 miles northeast of Troy, Montana. The legal description is T34 and 35N, R31-33W, and is bordered on the west and north by the Yaak River, south by Roderick Mountain and east by the Sheepherder-Roderick Butte ridge. Major drainages within the project area include: Burnt Creek, Grizzly Creek, Pheasant Creek, and Cool Creek (see vicinity map, page iv).

The Grizzly Ecosystem Assessment at the Watershed Scale (EAWS; USDA Forest Service 2004) was completed in 2004 to evaluate the existing condition of vegetation, watershed conditions, and grizzly bear habitat. The assessment identified a variety of resource conditions that do not meet desired conditions as identified in the Forest Plan (refer to existing condition sections by resource in Chapter 3 for details). Throughout the Forest Plan, the desired conditions are embodied in the management direction goals, objectives, and management area standards and guidelines. In addition, the "Analysis of the Management Situation" (AMS; USDA Forest Service 2003), which was completed during the recent Forest Plan revision process, identified several key vegetation characteristics that do not represent the desired conditions.

This draft environmental impact statement (DEIS) discloses the direct, indirect, and cumulative environmental impacts and any irreversible commitment of resources that would result from the actions proposed to address healthy forest restoration, road and trail management, watershed rehabilitation, fuels management and timber production. This document is prepared according to the format established by Council on Environmental Quality (CEQ) regulations to implement the National Environmental Policy Act (NEPA) found in 40 CFR 1500-1508.

Chapter 1 discusses the purpose of and need for the project, the summary of the proposed action, Forest Plan direction, and the decision to be made. **Chapter 2** describes the public involvement process including key issues that were identified. The proposed action is described in detail and alternatives to the proposed action resulting comments on the proposed action are described (including taking no action). Features designed to reduce and monitor the effects of the proposed project are also described in this chapter. A summary comparison of the alternatives and their effects is provided. **Chapter 3** describes the natural and human environments potentially affected by the proposed action and alternatives, and discloses anticipated potential effects. **Chapter 4** contains a glossary, the list of preparers and literature cited. **Appended** materials in this document include additional information and analyses.

Purpose of and Need for Action

The need for action is determined by the extent and intensity of differences between the existing and desired conditions. Where there is little difference between these two conditions, the need for action is low. However, the need for action in this analysis area is compelling, given that conditions are different than what is desired to meet objectives. Based on the comparison between the desired condition, and existing conditions, the management direction provided in the Forest Plan, the Forest Plan revision AMS, the Northern Region Overview, the National Fire Plan and the Healthy Forests Restoration Act of 2003, the following objectives were identified to develop the proposed action.

- **Vegetation Restoration** - manage for diverse and sustainable vegetative conditions characteristic of natural fire regimes, enhancing habitat and forage for diverse wildlife species, retaining and promoting large tree health and vigor (Forest Plan, p. II-1, Goals 5 and 7).
- **Road and Trail Management** - manage roads to provide adequate grizzly bear habitat and meet public needs (Forest Plan, II-1, Goals 3 and 5).
- **Watershed Rehabilitation** - stabilize roads to prevent soil loss, maintain water quality, and reduce adverse effects to aquatic habitat (Forest Plan, p. II-1, Goal 2, and p. II-2, Goal 13).
- **Fuels Management** - reduce stand density, and ladder and ground fuels to lessen undesirable effects from wildfire and reduce the risk of large, stand-replacing fires (Forest Plan, p. II-2, Goal 17).
- **Timber Production** - provide timber volume and wood products responsive to contribute to the local and regional economies (Forest Plan, pp.II-2 to 3, Goals 1 and 16).

Vegetation Restoration

Vegetation communities today are different than historically, when more frequent fire return intervals and other natural disturbances created a diversity of forest structure, composition, and function. The Grizzly Landscape Assessment identified specific areas where these vegetation conditions occur. Within the Burnt Creek/Clark Mountain, Lang Creek/Cool Creek, and Whitetail areas, past wildfires resulted in extensive areas dominated primarily by lodgepole pine, with minor amounts of more fire resilient species. The lodgepole pine is experiencing widespread mortality, increasing fuel loadings, and shade tolerant/drought intolerant species dominate the understory. Forest species composition and structural diversity that are resultant from characteristic mixed severity fire are lacking in much of the area due to fire suppression, large scale past fire events, and previous management practices. The desired conditions are to have vegetation composition and structure that is characterized by mixed severity fire disturbances, including large fire-adapted species, more open stands with less shade intolerant species in the understory, and stand conditions that allow for low to mixed severity fire occurrence. These desired conditions are consistent with the National Fire Plan and Healthy Forest Restoration Act objectives of restoring ecosystem functions and fire-adapted ecosystems, while reducing potential wildfire risk.

There is a need to continue management practices that increase the amount of resilient vegetation characteristics, including: increasing the dominance of western larch, ponderosa pine and western white pine; reducing overall density of stands to promote large tree growth; enhancing aspen stands by reducing conifer competition; and reintroducing fire in winter range and foraging areas to reduce conifer competition and reinvigorate understory vegetation growth.

There is a need to restore species at risk (Northern Region Overview; USDA Forest Service 1998)*, especially western white pine, western larch and aspen, all species that have declined in abundance due to past management and fire suppression.*

Road and Trail Management

The number of roads on the landscape currently does not provide a minimum of 55 percent core grizzly bear habitat, and does not meet standards for total motorized road densities in Bear

Management Unit (BMU 11)[1]. There are many roads within the planning area that were constructed prior to 1960 that do not meet current management standards, are not necessary for management access, and are contributing to resource damage. A project-specific roads analysis process (FSM 7703) identified opportunities to reduce densities by removing roads from the transportation system that are not needed for management purposes. Also, several roads and trails have been identified to be designated for motorized or non-motorized use to meet the Travel Management Rule (36 CFR 212).

There is a need to reduce total motorized road densities, as well as open motorized road densities to meet grizzly bear habitat needs, as well as to identify appropriate designated uses in accordance with the final Travel Management Rule of 2005.

Watershed Rehabilitation

Roads are the single largest source of management-related sediment in most streams in the Yaak River basin. Recent sediment source surveys in the project area have identified sites where sediment from roads is entering streams and stream crossings where culverts are not adequate to sustain high flows. In addition, there are areas of unstable fill slopes that are contributing to sediment delivery. Many of these roads have been identified as not being necessary for management purposes.

There is a need to stabilize roads in order to minimize their impact on the watershed condition. Specific sediment production concerns are existing unstable failures, undersized culverts, lack of cross drainage, and unstable fills. Road conditions in upper Burnt Creek present a particularly high risk for water quality. Road failures in this area are contributing sediment to Burnt Creek. Other roads with sediment sources or road/stream crossing at risk have been identified in Lang Creek, Cool Creek, Pheasant Creek, Gus Creek, Little Creek, and unnamed Yaak River tributary watersheds.

Fuels Management

Stand conditions throughout the analysis area have high densities of understory vegetation creating fuel ladder conditions and competition with desired overstory trees. Many stands also have high numbers of dead and dying lodgepole pine, which are contributing to high fuel loads. Stand conditions do not currently represent characteristics representative of mixed-severity fire disturbances of large, fire-adapted species in more open-grown forest structure.

There is a need to reduce existing fuel loadings, as well as to reduce overall stand densities and promote more open-grown forest structure and a greater proportion of large fire-adapted species to allow for future reintroduction of fire.

Timber Products

Availability of timber products for local and regional markets has been reduced in recent years, causing reductions in job opportunities, and closure of local mills. To support a viable industry, wood products from a variety of sources should be available.

[1] as specified by the biological opinion on the Kootenai Forest Plan amendment for motorized access in the Cabinet-Yaak grizzly bear recovery zone (USDI Fish and Wildlife Service 2004).

There is a need to provide local employment related to forest management and restoration activities and to supply forest products to support this segment of the local and regional economy dependant on forest products.

Management Direction -Desired Conditions

The Kootenai National Forest Plan (USDA Forest Service 1987) provides the overarching direction for management activities on the Kootenai National Forest. Forestwide management goals, as well as specific management area direction represent the desired future condition that management actions are designed to achieve. The following list identifies the Forest Plan goals that are specific to this project (see Forest Plan pp. II-1 to II-2).

1987 Forestwide Management Direction Goals (numbers correspond to Forest Plan Goals)

1. Provide a sustained yield of timber volume responsive to national and regional needs, scheduled to encourage a stable base of economic growth in the dependent geographical area.

2. Construct the minimum number of roads necessary to permit the efficient removal of timber and mineral resources. Construct and reconstruct roads only to the minimum standards necessary to prevent soil loss, maintain water quality, minimize safety hazards for a reasonable and prudent Forest user, and provide access for fire protection where needed to meet management area goals.

3. Maintain a balance of open and closed roads to continue present levels of motorized access, insure big-game habitat security, insure grizzly bear security to met recovery goals, and reduce road maintenance costs.

5. Maintain or enhance sufficient grizzly bear habitat to meet the population recovery goals established in the grizzly bear recovery plan.

7. Maintain diverse age classes of vegetation for viable populations of all existing native, vertebrate, wildlife species, including old-growth timber in sufficient quality and quantity to maintain viable populations of old-growth dependent species and to maintain habitat diversity representative of existing conditions.

8. Manage for sufficient snags and snag replacement trees to maintain viable populations of snag-dependent species.

13. Maintain or enhance fisheries habitat.

16. Harvest the maximum amount of high risk lodgepole pine marketable, to minimize losses from the mountain pine beetle.

17. Use prescribed fire to simulate natural ecological processes, prevent excessive natural and activity fuel buildups, create habitat diversity for wildlife, reduce suppression costs, and maintain ecosystems.

Forest Plan Revision - Analysis of the Management Situation (AMS)

The Kootenai National Forest is in the process of revising its Forest Plan. As part of the revision process, the Forest released an AMS to describe the current conditions and management situation of the Forest. The following information from the AMS is relevant to the Grizzly project area.

Effective fire suppression since the 1930s, the introduction of white pine blister rust, timber harvest, and the building of roads are the major causes of deviation from historic disturbance and vegetation patterns. These changes from historic conditions lead to further changes in disturbance and successional processes, making it difficult to provide for a sustainable ecosystem. Some major changes include: a shift from ponderosa pine and western larch to Douglas-fir on drier habitats; a shift from western white pine and western larch to Douglas-fir, grand fir, and hemlock on moister sites; and an increase in shade-tolerant, drought-intolerant tree species (AMS, USDA Forest Service 2003, pp. 28-29).

Related to the changes identified in vegetation, these changes also have affected the risk of fire, as well as the increased numbers of structures and communities within the urban interface that are "at risk" (AMS, USDA Forest Service 2003, pp. 30-31).

The AMS identified that native aquatic species are in decline, and there is a need to establish direction that recognizes and emphasizes watershed restoration activities (AMS, USDA Forest Service 2003, pp. 37-38).

Access and Recreation were also identified in the AMS as a topic for revision, related both to watershed restoration impacts to access, and the need to meet existing Travel Management rules (AMS, USDA Forest Service 2003, pp. 41-42).

National Fire Plan

The National Fire Plan provides national direction for hazardous fuels reduction, restoration, rehabilitation, monitoring, applied research, technology transfer; and established the framework for a 10-Year Comprehensive Strategy. The four principle goals and implementation outcomes of the 10-Year Comprehensive Strategy pertaining to the National Fire Plan include:

- *Improve Fire Prevention and Suppression*—Losses of life are eliminated, and firefighter injuries and damage to communities and the environment from severe, unplanned, and unwanted wildland fire are reduced.
- *Reduce Hazardous Fuels*—Hazardous fuels are treated, using appropriate tools, to reduce the risk of unplanned and unwanted wildland fire to communities and to the environment.
- *Restore Fire-Adapted Ecosystems*—Fire-adapted ecosystems are restored, rehabilitated and maintained, using appropriate tools, in a manner that will provide sustainable environmental, social, and economical benefits.
- *Promote Community Assistance*—Communities at risk have increased capacity to prevent losses from wildfire and the potential to seek economic opportunities resulting from treatments and services.

The Healthy Forest Restoration Act directs Agency personnel to improve forest conditions though fuels reduction activities. The Healthy Forest Initiative provides administrative reform to aid in accomplishing this task.

Summary of the Proposed Action (Alternative 2)

The proposed action (Alternative 2) includes vegetation, road, and trail management actions to meet the purpose and need, and is summarized below. Detailed descriptions of the proposed action, including specific design features to protect resources, are displayed in Chapter 2, under Alternatives Considered in Detail. The proposed action would not reduce existing levels of public motorized access. Roads identified for active or passive decommissioning and intermittent stored service are currently closed to public motorized access or are impassable due to vegetation growth.

Key vegetation restoration elements include:

- Restoration of western white pine, and western larch
  - Regeneration harvest on approximately 216 acres that currently are either dominated by decadent lodgepole pine or shade-tolerant species, planting to western white pine, western larch;
- Restoration of low and moderate intensity fire regime vegetation characteristics, including large tree components
  - Commercial thinning of 509 acres that currently have higher than desired numbers of trees in the understory to reduce stand densities, improve species composition, and regeneration harvesting of 327 acres to promote a trend towards seral dominated, resilient forest types with large diameter overstory trees
- Enhancement of aspen habitat
  - Aspen release treatments of 254 acres to reduce conifer competition with existing aspen to promote regeneration of aspen
- Ecosystem and wildlife burning
  - Low to moderate intensity prescribed fire treatments of 468 acres to reduce the number of conifer trees in key winter range and grizzly bear forage areas, and 250 acres to reduce competition on dry site ponderosa pine cover types
- Precommercial thinning
  - Precommercial thinning of 515 acres to reduce competition, promote desired species, and enhance growth and vigor in existing plantations
- Timber Products
  - As a result of the above vegetation restoration activities, approximately 9.97 million board feet of forest products would be available to local and regional markets.

Key road and trail management elements in this proposal include:

- Grizzly bear habitat improvement
  - Intermittent stored service (long-term closure) of 22.6 miles of road needed for future management to improve habitat, and associated critical watershed rehabilitation work
- Motorized access designation
  - Designating 62 miles of currently open roads as open to motorized use by highway legal vehicles
  - Designating 3.5 miles of previously closed roads (902Y, 902Z) as open to motorized use by highway legal vehicles

  - Designating 39 miles of existing trails within grizzly bear habitat for non-motorized use
- Passive decommissioning (abandonment) of 16.9 miles of roads unnecessary for future management

Key watershed rehabilitation elements in this proposal include:

- Active decommissioning 30 miles of roads to reduce sediment delivery, including converting 2.4 miles of road to trail
- Implementing Best Management Practices (BMPs) including drainage improvements, culvert replacements, and erosion control practices on 54.5 miles of roads to reduce sediment delivery on roads needed for management purposes associated with proposed activities

Key fuels management elements in this project (included within vegetation restoration actions above) are:

- Thinning 898 acres of overstocked stands to reduce fuel ladders and decrease competition with desired overstory trees
- Removing dead and dying lodgepole trees on 923 acres to reduce fuel loadings

Proposed Action - additional requirements

Regional Forester Approval - Regeneration opening exceeding 40 acres

Proposed regeneration harvesting of units 49 and 50 would result in an opening size of approximately 126 acres. The vegetation is dominated by lodgepole pine, which is experiencing increasing mortality and blowdown. Due to the steep slopes, continuing mortality and blowdown, it would be less impactive to treat the entire area in one action, rather than spread the treatment over a longer timeframe. It may not be economically feasible to treat smaller portions of the area in the future due to the need for expensive logging systems, and deteriorating timber values.

Regional Forester review and approval is necessary for openings exceeding 40 acres. The review of this action would occur prior to a decision on this project. The potential for exceeding the 40-acre opening size was identified in the scoping notice for the proposed action for public review. Additional public review of the action will occur during the review of the draft environmental impact statement.

Forest Plan Amendment - MA 12 Open Road Densities

The proposed action would utilize roads within Management Area 12 that would increase open road density standards when used for the proposed action. A project-specific amendment would be necessary to meet Forest Plan standards for these areas. Refer to Chapter 2 for a complete description of the proposed amendment.

Project Scope

Section 40 CFR 1508.25 of the NEPA implementing regulations provides guidance in determining the proper scope of an EIS.

Geographic Scope: The Three Rivers RD is preparing this EIS to document the analysis and disclose the environmental effects of a proposed vegetation treatment project on National Forest System lands in the Grizzly project area.

Temporal Scope: The action alternatives would result in timber sales and fuels treatment projects, which would be planned for bid in the fall of 2008. Harvest is expected to be completed by 2011, with slash disposal and reforestation activities completed by 2012. Fuels treatments are anticipated to be accomplished by 2014 if funding is obtained. Typically, work on haul roads using best management practices (BMPs) would be accomplished prior to haul of timber products. Precommercial thinning activities are expected to be accomplished by 2014. The watershed rehabilitation work is dependent on obtaining funds, so timing in uncertain. These dates are tentative, based upon anticipated budgets, work force, weather and other considerations. Actual dates and timing of implementation and accomplishment could vary.

Administrative Scope: Alternatives to the proposed action were developed. The No Action Alternative is also analyzed, and reflects the current status and administrative activities within the project area. The proposed action includes those activities necessary to fulfill the identified purpose and need, as well as all connected actions as described in Chapter 2. Connected actions include temporary road construction, road work on existing roads, slash treatment, and design features described in Chapter 2. Three types of effects are considered in the analysis, pursuant to 40 CFR 1508.7 and 40 CFR 1508.8: direct, indirect, and cumulative effects. These effects are disclosed in Chapter 3.

Decisions to be Made

Given the purpose and need, the deciding official reviews the proposed action, the other alternatives, the environmental consequences, and public comments on the analysis in order to make the following decisions:

- Whether to implement vegetation management activities (harvest treatments, logging methods, road work, slash treatment, reforestation, precommercial thinning), including mitigation measures and design features to protect resources, and if so, the site-specific location of these activities and practices.
- Whether to implement a project specific forest plan amendment for MA 12 Open Road Density.
- Whether to implement ecosystem and wildlife burning practices, including mitigation measures and design features to protect resources, and if so, the selection and site-specific location of activities and practices.
- Whether to implement road and trail management activities to meet project objectives including grizzly bear habitat needs.
- Whether to implement watershed rehabilitation projects, including decommissioning and intermittent stored service work, and, if so, to what extent.
- What, if any, specific project monitoring requirements are needed to assure design features and mitigation measures are implemented and effective, or to evaluate the success of project objectives.

Chapter 2 - Alternatives, Including the Proposed Action

Introduction

This chapter describes the issue and alternative development process (including how public comments help formulate the alternatives); the significant issues, and the alternative descriptions. In this analysis, three alternatives are carried forward and analyzed in detail in Chapter 3 by resource. Tables 3 and 4 display an alternative comparison of purpose and need, and key issues providing a clear comparison for the decision maker and public.

Public Involvement

Proposed Action Development

In the spring and summer of 2004, the Three Rivers Ranger District conducted a broad scale assessment of the Grizzly project area to identify management needs. This assessment characterized trends in the human, terrestrial, and aquatic features, as well as the vegetative conditions and ecological processes. Project area needs identified as important to implement within the next 10 years formulated the proposed action for the Grizzly project.

Also during this assessment, the district requested input from persons and organizations interested in the area. Numerous responses were received with suggestions for management ranging from less intensive management and fewer motorized opportunities, to higher intensity management and increased motorized access. These suggestions were incorporated to the extent possible in the development of the proposed action.

The proposed action (Alternative 2) was designed to avoid cumulative effects with past projects within and adjacent to the analysis area. To reduce the potential for these effects, several areas considered for treatment were not included in the proposed action. Potential harvest units within the Cool and Lang Creek drainages were dropped from consideration to maintain elk habitat security. Within the Whitetail drainage, units were dropped from inclusion in the proposed action to maintain old growth and habitat security, and within the Shine Creek area, units were not included to allow for more hydrologic recovery. In addition, more extensive aspen restoration treatments within inventoried roadless areas were not considered in the proposed action due to continuing controversy regarding management activities in these areas. Chapter 3 includes further discussion regarding cumulative effects.

Proposed Action Scoping

Public involvement on the proposed action was initiated on Friday, June 16, 2006 with the publication of a Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS) in the Federal Register. A letter was mailed to the district mailing list and local residents near the project area on June 15, 2006 explaining the purpose and need and providing details of the proposed action, and initiating the 60-day public notification for exceeding the 40-acre opening size limitation. Several agencies were on the mailing list including U.S. Fish and Wildlife Service, and Montana Department of Fish, Wildlife and Parks, the Lincoln County Air Quality Department, the Montana Department of Environmental Quality (MDEQ) and the Environmental Protection Agency (EPA).

Six comments were received; two from individuals, one from the Yaak Forest Council, one from the Kootenai Tribes of Idaho, one from the Environmental Protection Agency (EPA), and one from the WildWest Institute. A public field trip occurred on August 1, 2006 at the request of the Yaak Forest Council. The interdisciplinary team and 10 local residents visited and discussed the proposed actions.

The concerns of the Kootenai and Salish tribes were solicited through project scoping. In addition, the Confederated Salish and Kootenai Tribe have provided a tribal liaison to work in partnership with the Kootenai NF to review project proposals and provide tribal input. No concerns regarding this project were expressed by these tribal governments.

The U.S. Fish and Wildlife Service, and Montana Department of Fish, Wildlife and Parks were consulted regarding fish and wildlife habitat, and the Lincoln County Air Quality Department was consulted regarding air quality conditions. The Montana Department of Environmental Quality (MDEQ) and the Environmental Protection Agency (EPA) were also contacted through the scoping notice, with EPA submitting comments on the proposal. The Environmental Protection Agency (EPA) and the Kootenai NF are currently developing a total maximum daily load (TMDL) for the Yaak River basin (Yaak TMDL). As part of this process, streams are reviewed for possible impairment; a water quality restoration plan is developed for those that are found to be impaired.

Issue Development

The proposed action was specifically designed to meet the purpose and need, while striving to meet Forest Plan standards and guidelines. Once the proposed action was developed, there were some potential issues identified by the interdisciplinary team that were presented to the public to solicit comments specific to those issues. After review of the public comments, and discussions during the field trip, external issues were also identified.

Resolution of Potential Issues Identified Prior to Scoping

Three potential issues were identified by the interdisciplinary team that was included in the scoping notice to alert the public to these concerns. These issues were:

Grizzly Bear Standards for Total Motorized Road Density (TMRD)

- The proposed action would move towards, but not completely meet USDI Fish and Wildlife Service (USFWS) terms and conditions for Grizzly Bear habitat

Regeneration Harvest Openings exceeding 40-acre size limitation

- Regeneration harvest units 49 and 50 would combine to create an opening of approximately 126 acres in size.

Impacts to Special Interest Area

- Precommercial thinning was proposed in an area designated to protect habitat for Northern Beechfern, a sensitive species

Of the three issues, the Regeneration Harvest Openings issue was carried forward as a key issue due to policy requirements and public interest. Once analysis was initiated, it was determined that the proposed action would meet the requirements of the terms and conditions regarding TMRD. Sensitive plant species surveys were conducted and determined that the proposed actions

would not impact the Northern Beechfern or alter the habitat within the Special Interest Area (see project record).

Issue Categorization

All of the comments received as a result of scoping and the public field trip were reviewed by the interdisciplinary team, District staff, and the District Ranger to identify the issues. A summary was prepared describing the comments and the agency response and disposition of the comment (Appendix A).

The issues were categorized into two types: key issues and other issues. Key issues are defined as those issues directly or indirectly resulting from implementing the proposed action. Other issues are defined as those that are outside the scope of the proposed action; already decided by law, regulation, Forest Plan direction or policy; addressed through project design; or addressed through comparison of effects of the no action and alternative actions. Key issues were then addressed by formulating an alternative to the proposed action (Alternative 3).

Key Issues

The following issues were identified as important to address in an alternative to the proposed action. The interdisciplinary team developed a range of alternative strategies that could be used to address the issue that were responsive to the public comments. The Forest Supervisor approved the strategies to be used for alternative development. Alternative strategies not included in the development of the alternative to the proposed action are discussed in the section entitled "Alternatives Not Considered in Detail." Design features were also identified to specifically address issues raised by the public, and would be implemented for all action alternatives. These design features are listed in the section "Features Common to all Action Alternatives." Finally, issue indicators are identified to show what will be measured in the environmental analysis and to assist in the comparison of alternatives.

Issue 1) Grizzly Bear Disturbance and Displacement

The public expressed concern that the proposed activities would cause grizzly bear disturbance, reduce security, and displace grizzly bears from the areas of proposed activity. Increased movement of the bears could lead to higher risk of mortality (hunters, vehicles, human interactions).

More specifically, concerns include the following: The existing known movement corridor between Grizzly Peak and Sheepherder Mountain could be impacted by harvest activities in Unit 60 and increased traffic on Road 472 (Burnt Dutch Road). Activities within the entire Burnt Dutch drainage could limit movement between the Grizzly and Roderick Inventoried Roadless Areas (IRAs), and could create continual disturbance throughout the entire drainage over a number of years. Harvesting in units 57 and 57a could increase disturbance in an area with little previous activity disturbance. Unit 40 is an isolated unit that has evidence of active bear use, and is adjacent to the Grizzly IRA boundary. Harvesting could increase disturbance. It was suggested that since this is a Priority 1 Bear Management Area, the highest standards should apply.

Alternative Strategies

- Drop Units 40, 60, 57, 57a to reduce grizzly bear disturbance and displacement.
- Close Burnt Dutch road (472) between Grizzly and Sheepherder trailheads, either seasonally (April 1-June 15) or yearlong

Issue Indicators

- Percentage of secure core habitat
- Open Motorized Road Density
- Total Motorized Road Density
- Habitat Effectiveness
- Linear Open Road Density

Issue 2) Regeneration Harvest Units Greater Than 40 Acres

The treatment of proposed units 49 and 50 would create an opening approximately 126 acres. The public expressed concern that these large clearcuts would set a precedent for future large clearcuts. These units are located in Management Area 11, where regeneration units generally should not exceed 20 acres. For this reason, an additional indicator for MA 11 is included.

Alternative Strategies

- Design harvest units to meet Management Area 11 guidelines of 20-acre opening sizes

Issue Indicator

- Number and size of regeneration units greater than 40 acres
- Number and size of units greater than 20 acres in MA 11

Issue 3) Grapple Piling Impacts on Soil and Weed Infestation

The public expressed concern that grapple piling causes excessive soil displacement and removal of vegetation, exposing mineral soils and increasing risk of erosion and weed invasion. Using prescribed burning was suggested as an alternative treatment, as this treatment is considered more ecologically compatible, improves forage production, and promotes aspen regeneration.

Alternative Strategy

- Identify units with proposed grapple piling that could be treated with other fuels reduction methods (prescribed burning, , lopping and scattering)

Issue Indicators

- Acres treated with grapple piling
- Acres treated with alternative fuels treatments

Issue 4) Effects on Potential Future Wilderness Consideration

Concerns were expressed that activities in 57 and 57a could reduce future potential wilderness consideration, and could impact grizzly bears through disturbance and displacement. The public suggested that Road 6100 should be decommissioned instead of intermittent stored service to increase potential for future wilderness consideration. Closing a section of the Burnt-Dutch road 472 was also suggested to improve the potential for future wilderness consideration.

Alternative Strategies

- Drop Units 57, 57a
- Decommission Road 6100

Issue Indicator

- Effects to roadless area characteristics - natural integrity, apparent naturalness, remoteness, solitude, special features and manageability.

Issue 5) Fragmentation

Public concern was expressed that harvesting units 40, 41 and 60 would increase fragmentation of the surrounding large patches of fire adapted tree species.

Alternative Strategies

- Drop units 40, 41, 60

Issue Indicator

- Number of units/acres treated in units 40, 41, 60

Issue 6) Fuels Treatments along Long Meadows Road (593)

Concerns were expressed that fuels reduction treatments in the recent Obermayer Project did not address protection of the escape route to the west from the Yaak area. Commenters suggested that this project address the issue.

Alternative Strategies

- Identify additional fuels treatments adjacent to Long Meadows Road to reduce fuel loading.

Issue Indicator

- Acres treated along Long Meadows road 593 to reduce fuels.

Range of Alternatives

Section 102(2)(e) of the National Environmental Policy Act (NEPA) states that all federal agencies shall "study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflict concerning alternative uses of available resources."

An environmental assessment must "rigorously explore and objectively evaluate all reasonable alternatives" [40 CFR 1502.14(a)]. The courts have established that this direction does not mean that every conceivable alternative must be considered, but that selection and discussion of alternatives must permit a reasoned choice and foster informed decision-making and informed public participation.

The range of alternatives may extend beyond the limits set by the Forest Plan goals and objectives under NEPA; however, the National Forest Management Act (NFMA) requires that the selected alternative fully comply with the Forest Plan unless the plan is amended.

The range of alternatives presented in this chapter was determined by evaluating public and internal comments and the purpose and need for the project. Other influences included Forest Plan goals, objectives, desired condition, and standards and guidelines; federal laws, regulations, and policies; and economic viability. Within these parameters, the alternatives display a range of outputs, treatments, costs, management requirements, mitigation measures, and effects on resources.

In addition to the alternatives considered in detail, the interdisciplinary team examined a number of other alternatives during the analysis process. Although these alternatives contributed to the range of alternatives, they were eliminated from further consideration for the reasons listed below.

Alternatives Considered but Eliminated from Detailed Study

Original Proposed Action

The original proposed action was developed to meet the purpose and need, and to provide a starting point for specific field level assessments providing site-specific design features and for analysis purposes. Upon field review by the resource specialists, the original action was refined into the action included as Alternative 2. The changes included modifying logging systems, minor boundary changes to specific units, and dropping from consideration units due to logging feasibility and soils concerns (numerous wet areas, steep slopes). The specific changes are documented in the description of Alternative 2.

Close Burnt Dutch road (472) between Grizzly and Sheepherder trailheads, either seasonally (April 1-June 15), or close yearlong.

This action was proposed by the public to 1) reduce disturbance and displacement of grizzly bears using a known travel corridor between Grizzly Peak and Sheepherder Peak, and 2) to improve the wilderness characteristics of this area for future wilderness consideration.

The proposed action identified specific actions to meet core habitat requirements, total motorized road density (TMRD), open motorized road density (OMRD), habitat effectiveness (HE) and linear open road density (ORD) requirements. Closure of this road is not necessary to meet the requirements identified in the Biological Opinion terms and conditions.

Changing public access is controversial, and will be addressed at the Forest level in the near future during analysis for motorized route access management. Public input provided during Forest Plan Revision identifies loop road opportunities as highly valued; therefore, this is better addressed at a larger scale with opportunities for the public to comment on the proposal. Retaining current access management on this road now does not preclude the consideration of closing this road in the future. An alternative has been developed to address the increased usage and related disturbance should this road be improved for access to unit 60.

Decommission Road 6100

This action was proposed in public comments to provide for grizzly bear security. Transportation analysis identified this road for future management needs based upon existing management direction. Putting this road into intermittent stored service does not preclude future consideration for decommissioning, should management direction change. Over the next 10 years, this area would provide secure displacement habitat as the road is proposed for intermittent stored service.

Watershed Rehabilitation without Logging

An alternative that considered only rehabilitation activities was considered but eliminated from detailed analysis since precluding harvest activities would not meet the purpose and need for vegetation restoration, fuels management, and provide timber products. Receipts from timber sales provide a funding mechanism to implement watershed rehabilitation activities on roads that otherwise would have to compete for very limited funding.

Maintain MA 12 Open Road Density Standard

An alternative that would not require a project specific amendment was considered but eliminated from detail study. There is only one unit (Unit 17) that would require opening a road during the summer for access in MA 12. There are no currently open roads within MA 12 that could be closed to mitigate this unit that would be socially acceptable. The only roads currently open are main access routes that receive high public use. Effects analysis determined that the increase during project activity to 0.79 miles/square mile (.04 above standard) would not have a significant impact on elk habitat.

Alternatives Considered in Detail

The Forest Service developed three alternatives to be analyzed in detail: no action, the proposed action, and one alternative in response to the significant issues raised by the public.

Alternative 1 (No Action Alternative)

The National Environmental Policy Act (NEPA) requires that an EIS include a "no action" alternative. The No Action Alternative is based on the premise that ecosystems change, even in the absence of active management. It is essentially a "status quo" strategy that allows current activities and policies, such as recreation administration, road maintenance, and fire suppression to continue. This alternative provides a baseline for comparison of environmental consequences of the other alternatives to the existing condition (36 CFR 1502.14) and is a management option that could be selected by the deciding official. Under this alternative, management actions in the project area would be limited to the ongoing and reasonably foreseeable actions listed in Chapter 3.

Activities Common to Alternatives 2 and 3

Many of the activities are common to both action alternatives (noted where included only in one alternative). They are described in this section, and then each action alternative is discussed in the next section with specific information related to each action alternative. Appendix B includes the specific Access Management Plan, and Appendix C includes alternative-specific unit summaries. Alternative maps are included in the Map Appendix.

Design Features

The following design features were identified during the review of public comments and development of the key issues. These features would be implemented as part of either of the action alternatives to address public concerns and issues identified.

Grizzly Bear Disturbance and Displacement

- Roads 902B, 903, 6840, 6840B and 6715B would be placed in intermittent stored service with associated watershed rehabilitation work completed prior to initiation of any harvest or road reconstruction activities to offset changes to core habitat.
- All existing gated roads would have public access restricted during harvest operations, with the gate to be locked at night and during weekends while harvest activity occurs to limit disturbance and protect resources.
- Road improvements and harvest activities on Road 472 associated with units 55c-g and 60 (Unit 60 dropped in Alternative 3) would be required to be completed prior to initiation of activities associated with Units 31-50, 55, 55a-b, 57 and 57a (57, 57a dropped in Alternative 3) in the southern portion of the project area (Burnt Creek drainage). Once these units are completed, the corridor would be available for displacement habitat while all remaining

activities in Units 31-50, 55, 55a-b, 57 and 57a (57, 57a dropped in Alternative 3)are completed.

- Helicopter harvesting of units 34, 50, 57, and 57a would all be completed within one season.
- No harvest or road related activities would occur during spring bear season April 1-June 15.
- Fall burning is desirable for burn units G, H, and I to promote huckleberry production, increase vegetation response, and coincide with natural ecosystem functions.
- Decommissioning activities on the 6100 and 6132 road systems would not be implemented until one year after all harvest and associated activities are completed in the Burnt Creek drainage.
- Harvest and related activities would not commence in Units 15, 17, 18 and 20 until one year after all activities in the Obermayer project are completed (for big game displacement).
- Seeding for erosion control and watershed improvements along open roads will use a seed mix that does not contain clover.

Soil and Weed Impacts

- In all harvest units, require yarding tops to reduce residual activity fuels on site to minimize impacts of additional fuels reduction and site preparation treatments proposed (grapple piling, underburning).
- The Timber Sale contract will require removal of non-sawlog material to the landing using provisions C2.2 and C2.11 to reduce ground disturbance associated with grapple piling.
- In all grapple pile units, minimize live vegetation removal during piling operations by removing only activity-created fuels and existing down dead material that exceeds desired fuel loading.
- Noxious weed treatments consistent with the Herbicide Weed Control Decision (USDA Forest Service 1997) to be included are:
    - pretreatment on roads with current access for boom truck or ATV
    - treatment after reconstruction activities, prior to access for harvest operations or immediate harvest activity in same season as reconstruction, with weed treatment following
    - post treatment on all roads used for harvest activities
    - requiring treatment on roads to be decommissioned where access is available during operations
    - seeding with weed-free seed mix as part of all decommissioning actions
- Utilize existing skid trails where possible, restrict skidding equipment to designated skid trails and rehabilitate skid trails (scarify, seed, place slash) at completion of activities in Units 1, 2, 3, 11, 12, and 12a.
- Units 1, 2, 3 and 4 would require reclaiming existing excavated skid trails to contour after activities.
- Units 13, 13a, 15, 18 and 20 would be restricted to winter harvest operations (skidding only on frozen ground (CT6.4#) to minimize soil impacts. For units 18 and 20, additional restoration of existing skid trails would occur to reduce overall detrimental disturbance.
- Units 3 and 40 (Unit 40 dropped in Alternative 3) would require a restricted operating season restricted to the driest time of year (August 1 to September 15), and leave islands (Special Treatment Areas) would be delineated on the ground to protect wet areas.

- Special Treatment Areas would be delineated in Units 40, 43, 45, 49, 50, and 60 (Units 40 and 60 dropped in Alternative 3) to prohibit machinery on slopes greater than 40 percent. Designated skid trails would be placed to avoid any sustained slopes greater than 35 percent.

Effects on Potential Future Wilderness Consideration

- No slashing in burn units G, H, and I to reduce signs of human activity (stumps).

Other resource concerns

- Snag and live replacement tree retention: Retain all existing snags unless they present a safety hazard; if less than 6 snags are available, retain live trees to meet the minimum of 6 per acre; retain additional live trees (6 to 8 per acre) for future snag recruitment. Species preference for live retention trees - western larch, ponderosa pine, western white pine, Douglas-fir, with minimum diameters greater than 10 inches. Trees with apparent cavities, stem decay, or other defects should be designated where possible. (Units 55, 55a-g manage for retention of a minimum of 4 snags per acre due to adjacency to open road).
- Coarse Woody Debris (CWD) - where available, retain an average of 15-32 tons per acre, consisting of 20-30 pieces per acre, 15 inches or greater in diameter and at least 12 feet long in all regeneration harvest units.
- Goshawk nest sites: Should a nest be discovered during activities, no activities would be permitted within 40 acres of nest site, and provide a 300-acre, no-activity buffer around nest during nesting season (April 15-August 15).
- Wet areas and rocky, talus areas would be avoided or excluded from harvest units.
- Leave islands would be designated to protect sensitive species and wet areas in units 3 and 40 and operations would be limited to the dry period of the year, August 1-September 15 (Unit 40 in alternative 2 only).
- A 200-foot, fuels reduction zone would be implemented along the Long Meadows road within unit 17, where slashing and piling the majority of understory trees and fuel ladders would occur.
- Best Management Practices (Appendix D) would be applied prior to hauling of timber on the following road systems: 902, 6084C, 8021 and 8021B. All other road systems with BMP work identified (See Appendix B - Access Management Plan) would complete BMP work prior to contract activities completion.
- In units 50 and 60 (Unit 60 dropped in Alternative 3), retain non-lodgepole pine overstory, and advanced regeneration adjacent to road 472 where possible to minimize visual impacts.
- In all units adjacent to open roads, design skid trails and cable corridors to minimize visual impacts, and minimize impacts to understory vegetation. Landings should be placed off of road 472 where possible, or rehabilitated after activity to minimize visual impacts.

Timber Harvest

Commercial Timber Harvest

Commercial timber harvest provides the most economical method for reducing stand densities, reducing fuel loadings, and changing species composition by removing biomass, while achieving an economic benefit from the sale of timber products. All commercial treatments would leave snags, live green trees, coarse woody debris, and aspen. Logging systems used to accomplish the harvesting would include tractor, skyline, and helicopter. Where access is available and slopes are generally less than 40 percent, tractor systems would be used. Where slopes exceed 40 percent and road access is available, skyline systems would be used. Where slopes are greater

than 40 percent and/or road access is not available, helicopter systems would be used. The following harvest methods are proposed.

Regeneration Harvests

The following types of regeneration harvest remove a majority of the trees with the goal of regenerating a new stand.

Clearcut with Reserves - this treatment entails the removal of the majority of the standing trees on a site, retaining western larch, western white pine and other species (on average approximately 6 to 8 trees per acre) to provide long-term structure, and snag and coarse woody debris recruitment. These reserve trees would be retained singularly and in clumps where feasible. Planting of western white pine, western larch, and/or ponderosa pine following harvest would ensure regeneration success and establishment of resilient, fire-adapted species. Stands identified for this treatment are either comprised primarily of shade tolerant species (grand fir, western red cedar, hemlock) that are exhibiting poor growth, increasing disease and decay, and not meeting desired vegetation conditions, or are stands comprised primarily of even-aged lodgepole pine that is experiencing mortality due to mountain pine beetle, or is at high risk of mountain pine beetle infestation. These stands are currently exhibiting increasing mortality and blowdown, increasing fuel loadings.

Seed Tree with Reserves - this treatment is similar to clearcut with reserves, except that additional reserve trees would be retained to provide seed sources for natural regeneration of desired species (average approximately 8 to 12 trees per acre). Planting of western white pine, western larch, and/or ponderosa pine following harvest would ensure regeneration success and establishment of resilient, fire-adapted species. Stands proposed for this treatment have some characteristics of mixed-severity, fire-adapted vegetation, but have higher amounts of high-risk lodgepole pine or shade tolerant species than desired or typical of this fire regime.

Intermediate Harvests

The following types of intermediate harvest remove a portion of the trees to maintain manageable stand conditions. Where aspen is located within intermediate harvest units, conifers would be removed adjacent to aspen to reduce conifer competition.

Thinning - removes dead and dying trees and trees that are in lower canopy positions, are less vigorous, or are at high risk of insect or disease. The residual stand composition is dominated by a greater percentage of fire-adapted species and is more similar to a stand influenced by a moderate severity fire regime, with residual stand densities between 60 to 100 square feet of basal area per acre, and fewer trees in the lower canopy levels to minimize fuel ladders and competition.

Salvage - removes trees that are either dead or dying due to insect infestations or declining health and vigor. Species removed is primarily lodgepole pine; however, incidental amounts of other species may be removed to promote health of remaining trees. Some smaller diameter live trees would be removed to reduce competition and fuels ladders adjacent to desired trees to be left. The residual stand would retain approximately 70 to 100 square feet of basal area per acre, and would retain the majority of existing fire-adapted species (western larch, ponderosa pine, larger diameter Douglas-fir).

Aspen Release - removes primarily Douglas-fir, Engelmann spruce, grand fir, western red cedar and subalpine fir that are competing with aspen, reducing growth and vigor of the aspen component. The majority of the conifers would be removed within approximately 50 to 100 feet

of aspen/birch clumps to improve growth and vigor of these species. Aspen trees would not be cut in any treatments, except where necessary to allow safe operations for workers. Removal of competing conifers is an effective treatment for regeneration of aspen, where clones are healthy and are suckering (as they are here) due to competitive stress of competition (Shepperd et al. 2006).

Precommercial Thinning - cuts trees less than 7 inches in diameter, adjacent to desired trees to reduce density, improve growth of desired trees, and favor species composition of fire-adapted species (western larch, ponderosa pine, Douglas-fir).

Fuels Treatments

The following fuels treatments are designed to reduce existing ground and ladder fuels, as well as those created from logging slash.

Slashing - removal by cutting using chainsaws or mechanical equipment of trees less than seven inches in diameter. The purpose of this treatment is to remove small trees damaged during harvest operations, and to remove less desirable tree species, minimizing competition for residual and planted trees. This treatment would occur in all clearcut and seedtree harvest units, as well as Unit 17 within the fuels reduction zone along the Long Meadows road, and Unit 61 in Alternative 3.

Grapple piling/pile burning - after harvest operations, residual slash and debris is piled using excavators to reduce fuels accumulations, and to prepare the sites for planting (where necessary). Slash is placed into piles, which are then burned during the fall, when burning conditions are favorable. Sufficient down woody material is retained on site to meet objectives for soil nutrient and habitat needs. Spot grapple piling is similar, conducted only in areas of concentrated slash.

Hand pile/pile burning - slash would be piled by hand adjacent to private property, and piles would burned when weather conditions permit.

Yarding tops - removal to the landing of the limbs attached to the tops of trees to reduce activity fuels accumulations.

Lopping and scattering - cutting of residual activity slash and dispersing across the unit to ensure that slash is less than two feet off the ground to encourage deterioration of the slash, and reduce fuel loadings.

Prescribed Burning (underburn, ecosystem and wildlife burns) - burning would be used to reduce fuel accumulations, prepare sites for planting, and/or to reintroduce fire to the landscape. Fire intensities would be low to moderate to protect residual overstory trees, maintain large coarse woody debris, and minimize potential soil impacts. Some slashing of small-diameter conifers would be conducted prior to burning to ensure sufficient ground fuels are present, to reduce damage to residual trees, and provide adequate fuel continuity to meet objectives. Within harvest units, fireline would be constructed with mechanical or hand methods. Firelines would be rehabilitated after activities are completed to ensure soils, watershed and noxious weed concerns are addressed.

Jackpot Burning - burning of concentrations of fuels within the unit. These concentrations occur from harvest operations, not from piling activities.

Reforestation

Artificial regeneration (planting) - planting of desired fire-adapted species (western larch, western white pine, Douglas-fir, ponderosa pine) to ensure successful regeneration of site-adapted species. Planting is conducted by hand, digging holes with hand tools to plant seedlings grown in a nursery. Seed is collected from specific zones to ensure seedlings are adapted to specific sites. Where animal damage is likely to occur, netting would be used to minimize damage.

Road and Trail Management

The following road treatments are designed to reduce the density of roads in the project area, reduce watershed sediment sources, and improve grizzly bear habitat needs. These practices were identified through a project-specific Roads Analysis Process. Abandonment and storage terminology was changed from the scoping information to be consistent with Forest policy. Temporary roads would be constructed to provide access for timber harvest, and would be obliterated at the end of harvest activities. No permanent new road construction is planned.

Decommissioning (active) - existing sediment sources would be rehabilitated by removing culverts, contouring and grading slopes, installing ditch intercept water bars, and armoring areas with rock to reduce erosion. Revegetation would occur to minimize erosion. Roads would be closed with earthen berms or recontouring of the road entrance. Portions of road 6132 and 6132D would be converted to trails to improve existing trail access.

Decommissioning (passive; originally proposed as abandonment) - no physical actions are proposed, just removing these roads from the inventory system. These roads are currently stable, with no sediment or resource concerns, and are grown in with trees and other vegetation, and impassable.

Intermittent Stored Service (originally proposed as Storage) - drainage improvement and stabilization actions would occur to reduce watershed impacts, and earthen berms would be constructed to close the roads. These roads would be retained in the inventory and would be available for future management purposes after approximately ten years.

Best Management Practices (BMPs) - a variety of practices designed to reduce erosion and sediment transport, including: installation of drainage structures (ditch relief culverts, drain dips, surface water deflectors, culverts), replacing undersized culverts, stabilizing fill and cut slopes, armoring stream crossings, resurfacing or placing aggregate material on road surfaces, and constructing or cleaning catch basins. These practices would be included in the road maintenance package for timber sales on all roads used for timber harvest.

Temporary Road Construction - a total of approximately 2 miles of temporary road (5 short segments) would be constructed to access several units where existing road access is insufficient. These roads would be obliterated following harvest activities to minimize risk of erosion and weed infestations.

Designation of Roads and Trails - Recent direction requires public involvement in the designation of roads and trails for motorized use. Roads identified as open to motorized highway vehicle use are currently open. Trails identified for designation as non-motorized currently are not specifically identified as non-motorized; however, motorized use has not been occurring.

Monitoring

Monitoring and evaluation compares the end results being achieved to those projected in the Forest Plan. Monitoring is conducted on a sample basis t evaluate the overall progress in implement the Forest Plan, the assumptions on which the Forest Plan is based, and to provide a feedback loop for determining effectiveness of project and mitigation implementation (USDA Forest Service 1987). For this project, monitoring and evaluation would be conducted as described in Appendix E. Those monitoring components not specifically discussed in this appendix tier to the monitoring described in the Forest Plan.

Forest Plan Amendment - MA 12 Open Road Density

Timber harvest access for unit 17 would require opening roads 6084 and 6084A which are currently gated with only administrative access allowed. These roads are in Management Area 12, which currently has an open road density of 0.62 miles per square mile. When these roads are opened for use, the open road density would be approximately 0.79 miles/square mile during project activities, then returning to 0.62 miles/square mile after activities are completed. This action requires a project-specific amendment, which would require approval by the Forest Supervisor prior to a decision to implement this project. All other harvest units proposed in MA 12 are winter harvest, and do not affect the open road density standard.

Activities Specific to Alternatives 2 and 3

This section describes actions specific to each action alternative. Refer to Map Appendix for maps and Appendix C for alternative specific tables.

Alternative 2

Table 1 displays a summary of proposed treatments to meet the purpose and need. The proposed action originally presented to the public in June, 2006 during scoping was designed to meet the purpose and need for this project. Following further field verification by resource specialists on the interdisciplinary team, the following changes were made and carried forward in the analysis as the proposed action.

- Units 1-4 were changed from winter harvest to summer harvest due a lack of sufficient winter conditions. Final unit location and soils review determined that opportunities to improve soil conditions were available during summer, where existing skid trails could be located, used, and rehabilitated.
- Unit 1 was changed to clearcut with reserves, due to a lack of suitable seed trees.
- Unit 4 was changed to seedtree with reserves, due to the availability of suitable seed trees. Fuels treatment was changed to grapple piling due to the high fuel loading in and adjacent to the unit, making it difficult to control burning and retain the seed trees.
- Unit 3 was changed to spot grapple piling and leave island retention to protect wet areas and potential habitat for sensitive species.
- Unit 13 was changed to winter harvesting to protect soils due to subsurface moisture conditions.
- Units 15, 18 and 20 were changed to winter harvesting due to soils concerns.
- Units 31 and 33 were changed to skyline, due to soils concerns. Road 8021C would be opened for harvest access, and then put into intermittent stored service.
- Unit 36 was changed to skyline below road 8021, reducing the length of temporary road needed due to soils concerns.

- Units 3 and 40 would require mechanized equipment to be limited to August 1 to September 15 (driest period of year) unless otherwise agreed to by the district hydrologist for soils.
- Unit 41 was dropped due to steep slopes, soils and operability concerns.
- Unit 46 - above road 902 Y was changed to clearcut with reserves, due to stand conditions, and to skyline due to soils concerns. Below road 902Y was dropped due to soils concerns.
- Unit 47 was changed to thinning, due to stand conditions.
- Unit 48 was dropped due to soils and watershed concerns.
- Unit 50 was changed to Skyline/Helicopter - typographic error in original proposed action.

Table 1. Alternative 2 summary

Proposed Vegetation Treatments	**Acres**	**Volume (MBF)**
Clearcut with Reserves	384	4,775
Seedtree with Reserves	159	2,037
Commercial thinning	509	2,578
Salvage	170	225
Release	84	357
Precommercial thinning	515	0
Ecosystem Burning	250	0
Wildlife Burning	468	0
Total	**2,539**	**9,972 MBF (9.97 MMBF)**
Proposed Logging Systems	**Acres**	**Volume (MBF)**
Tractor Harvest	606	5,114
Tractor/Winter Harvest	158	1,406
Skyline	274	1,690
Skyline/Helicopter	86	817
Helicopter	182	945
Proposed Fuels Treatments		**Acres**
Grapple Piling/Burn Piles		692
Spot Grapple Piling/Burn Piles		20
Hand Piling/Burn Piles		5
Underburning		191
Jackpot burning		38
Lop and scatter		880
Yard tops		1,306
Proposed Road and Trail Management		**Miles**
Decommissioning (passive)		16.9
Intermittent Stored Service (watershed work included)		22.6
Designate open to motorized use		65.5
Designate trails for nonmotorized use		38.8
Temporary Road construction		2.1
Proposed Watershed Rehabilitation		**Miles**
Decommissioning (active)		27.6
Decommissioning (convert to trail)		2.4
Implementation of Best Management Practices		54.5
Proposed Fuels Management (resulting from vegetation treatments)		Acres
Thinning to reduce stocking, fuel ladders		898
Reduce fuel loading by removing lodgepole pine		923

- Road 8021 was incorrectly identified as proposed for intermittent stored service on the proposed action. This road would return to existing status of gated with administrative access after the project is completed. Best management practices would be implemented.
- Roads 903A and 903B were incorrectly identified as Intermittent Stored Service. These roads have been identified in a previous decision to be decommissioned.
- Roads 902Y and 902Z, which are currently gated at their junction with Road 902, would become open to public access on a portion of each road after harvest activities are competed due to changes in access management needs (refer to Alternative 2 map in the Map Appendix).

Regional Forester Approval - Regeneration Opening exceeding 40 acres

Alternative 2 proposes two units (Units 49 and 50) for clearcutting with reserves. These two units in combination would result in a regeneration opening approximately 126 acres in size. The vegetation is dominated by lodgepole pine, which is experiencing increasing mortality and blowdown. Due to the steep slopes, continuing mortality and blowdown, it would be less impactive to treat the entire area in one action, rather than spread the treatment over a longer timeframe. It may not be economically feasible to treat smaller portions of the area in the future due to the need for expensive logging systems, and deteriorating timber values.

Alternative 3

The alternative strategies were reviewed by the interdisciplinary team, the District Ranger and district resource staff, and the Forest Supervisor. The following modifications to the proposed action were identified to be included in this alternative.

Design harvest units to meet Management Area 11 guidelines of 20-acre opening sizes.

- Unit 49 would be changed to 20 acres, skyline yarding from road 902Y, lop and scatter;
- Unit 50 would be reduced to two units, 20 acres each, with 600 feet distance between units to provide a travel corridor. Units would be skyline and/or helicopter harvested.

Identify units with proposed grapple piling that could be treated with other fuels reduction methods (prescribed burning, whole tree yarding, yarding tops, lopping and scattering) to reduce soil disturbance.

- Unit 17 (below road 6084A), 20, 36, 37, 45 would be underburned
- Fuels treatment in Unit 50 would be lop and scatter
- Fuels treatments in Units 15, 31, 42, 43 would be lopped and scattered

Drop units that would increase disturbance and displacement for Grizzly Bears, minimize activities that may reduce future wilderness consideration, and reduce fragmentation.

- Drop Units 40 and 60 to minimize disturbance and displacement,
- Drop 57, 57a to reduce grizzly bear disturbance, displacement and to minimize impacts to future wilderness consideration.

Identify additional fuels treatment opportunities along the Long Meadows Road.

- Implement defensible space treatment Unit 61 along Long Meadows Road. Understory trees that provide fuel ladders into the overstory would be slashed, and slash would be piled and burned. The majority of trees removed would be six inches in diameter or less. Incidental removal of larger diameter trees (up to 12 inches diameter) would occur only where necessary to protect larger diameter trees.

A summary of the actions included in alternative 3 is displayed below. Specific unit treatments are described in Appendix C, and a map of this alternative is included in the Map Appendix.

Table 2. Alternative 3 summary

Proposed Vegetation Treatments	**Acres**	**Volume (MBF)**
Clearcut with Reserves	317	4,089
Seedtree with Reserves	102	1,365
Commercial thinning	509	2,578
Salvage	171	227
Defensible space treatment	25	125
Release	0	0
Precommercial thinning	515	0
Ecosystem Burning	250	0
Wildlife Burning	468	0
Total	**2,357**	**8,384 MBF (8.38 MMBF)**
Proposed Logging Systems	**Acres**	**Volume (MBF)**
Tractor Harvest	534	4,087
Tractor/Winter Harvest	158	1,406
Skyline Harvest	315	2,121
Helicopter	117	769
Proposed Fuels Treatments		**Acres**
Grapple Piling/Burn Piles		203
Spot Grapple Piling/Burn Piles		20
Hand Piling/Burn Piles		5
Grapple and Hand Piling/Burn Piles		25
Underburning		393
Jackpot burning		38
Lop and scatter		998
Yard tops		1,124
Proposed Road and Trail Management		**Miles**
Decommissioning (passive)		16.9
Intermittent Stored Service (watershed work included)		22.6
Designate open to motorized use		65.5
Designate trails for non-motorized use		38.8
Temporary Road construction		1.9
Proposed Watershed Rehabilitation		**Miles**
Decommissioning (active)		27.6
Decommissioning (convert to trail)		2.4
Implementation of Best Management Practices		49.4
Proposed Fuels Management (resulting from vegetation treatments)		**Acres**
Thinning to reduce stocking, fuel ladders		753
Reduce fuel loading by removing lodgepole pine		886

Alternative Comparison

Tables 3 and 4 display a comparison of the alternatives considered in detail. The environmental effects of each alternative are expressed by the indicator values. A complete discussion of the environmental effects is disclosed in Chapter 3.

Table 3. Alternative comparison table - purpose and need

Indicator	No Action	Alt. 2	Alt. 3
Vegetation Restoration			
Acres of restoration of white pine or western larch	0	543	443
Acres of restoration of fire regime vegetation characteristics	0	1086	986
Acres of aspen enhancement	0	84	0
Acres of ecosystem and wildlife burning	0	718	718
Road and Trail Management			
Miles of Intermittent stored service for Grizzly habitat improvement	0	22.6	22.6
Motorized route designation Road miles designated open motorized Trail miles designated non-motorized	 0 0	 65.5 38.8	 65.5 38.8
Miles Decommissioned (passive)	0	16.9	16.9
Watershed Rehabilitation			
Miles Decommissioned (active)	0	30	30
Miles of Best Management Practices implemented	0	54.5	49.4
Fuels Management			
Acres thinned to reduce stocking	0	898	753
Acres treated to reduce fuel loading	0	923	886
Fire Hazard ratings Very High/High Moderate Low	 45% 55% 0%	 6% 25% 69%	 6% 25% 69%
Timber Production			
Million board feet of timber produced	0	9.97	8.38

Table 4. Alternative comparison - issue indicators

Indicator		No Action	Alt. 2		Alt. 3	
Grizzly Bear Disturbance And Displacement (BMU 11/14)						
Measure	Standard	Existing	During Activity	Post Activity	During Activity	Post Activity
Percentage of secure core habitat	55% or greater	52 / 56	54 / 55	55 / 56	54 / 55	55 / 56
Open Motorized Route density (OMRD)	33% or less	28 / 28	28 / 29	28 / 28	28 / 29	28 / 28
Total Motorized Route density (TMRD)	26% or less	29 / 26	27 / 26	26 / 26	27 / 26	26 / 26
Habitat Effectiveness (HE)	70% or greater	74 / 76	70 / 76	74 / 76	71 / 76	74 / /76
Open Road Density (ORD)	0.75 mi/sq. mi. or less	0.44 / 0.57	0.48 / 0.58	0.48 / 0.57	0.48 / 0.58	0.48 / 0.57
Regeneration Harvest Units Greater Than 40 Acres						
Number and size of regeneration harvest openings greater than 40 acres		0/0	1/126		0/0	
Number and size of regeneration harvest openings in MA 11 greater than 20 acres		0/0	1/126		0/0	
Grapple Piling Impacts on Soil and Weed Infestation						
Acres treated with grapple piling		0	712		223	
Acres treated with alternative fuels treatments		0	1,114		1,421	
Effects on Potential Future Wilderness Consideration						
Effects to roadless area characteristics						
Natural integrity		No change	Improved		Improved	
Apparent naturalness		No change	Improved		Improved	
Remoteness		No change	Short term impact		Short term impact	
Solitude		No change	Short term impact		Short term impact	
Special features		No change	No change		No change	
Manageability		No change	No change		No change	
Fragmentation						
Number of units/acres treated in units 40, 60		0/0	2/57		0/0	
Fuels Treatments Along Long Meadows Road 593						
Acres treated along Long Meadows Road		0	163		189	

Chapter 3 - Affected Environment and Environmental Consequences

Introduction

Chapter 3 describes the environment (including its human elements) in and around the project area, and discusses the environmental consequences that may result from implementation of each of the alternatives. It provides the scientific and analytic basis for the comparison of alternatives presented in Chapter 2. Maps referred to in the analysis are located at the end of this document in Maps Appendix.

The Council on Environmental Quality Regulations recognizes three types of effects:

Direct effects are caused by an action and occur at the same time and place.

Indirect effects are caused by an action but occur later in time or farther removed in distance.

Cumulative effects result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes the other actions (40 CFR 1508.7 and .8). As past actions are already included in the affected environment, the cumulative effects analysis builds upon this existing condition assessment by considering the incremental addition of direct and indirect effects of the proposed action as well as ongoing and reasonably foreseeable actions.

Effects are sometimes displayed in this analysis as “short-term” and “long-term”, mostly related to effects on soils and water quality. The rationale is that in many cases, direct effects of an action will be noticeable for one to five years (short-term) such as when culverts are removed, causing sediment inputs into the stream for some period until vegetation is reestablished and the slope is stabilized. In this example, the “long-term” indirect effect is positive, as this sediment source no longer contributes to sediment inputs, therefore a positive trend of improvement is realized.

Effects analysis and documentation was conducted by resource specialists (Chapter 4, List of Preparers), from which this chapter is based. The specialist reports are summarized here, and are available in their entirety in the project record. At the beginning of each resource section, the specialist report for that resource is cited.

Past Actions

The environmental analysis required under National Environmental Policy Act is forward-looking in that it focuses on the potential impacts of the proposed action that an agency is considering. Thus, review of past actions is required to the extent that this review informs agency decision-making regarding the proposed action (Council on Environmental Quality, Guidance on the Consideration of Past Actions in Cumulative Effects Analysis, June 24, 2005 Memorandum). Specific past actions considered in the affected environment and cumulative effects analysis are summarized below. The past actions summary is not necessarily exhaustive, as records may not exist for all past activities by project. This is particularly true for those actions that predate the passage of the National Environmental Policy Act in 1970. Nonetheless, the effects of such past

actions are accounted for in the assessment of the existing condition, as the current condition assessment necessarily reflects any relevant impacts of such actions.

Timber Harvest

Since 1950, timber harvest in the project area has occurred on 13,460 acres (30 percent of National Forest lands in the project area). Of this total harvest, there have been 7,647 acres of regeneration harvest and 5,813 acres of intermediate harvest (17 percent and 13 percent of National Forest lands, respectively). See Table 5 for a summary of treatment acres by decade. Map M-1 displays regeneration harvest by decade. Only regeneration harvest is displayed as these change stand characteristics and has the highest level of site disturbance.

Table 5. Harvest summary by decade

Decade of Harvest	Regeneration Harvest	Intermediate Harvest	Total Harvest
1950-1959	121	1,130	1,251
1960-1969	1,981	1,309	3,290
1970-1979	2,451	1,693	4,144
1980-1989	1,909	329	2,238
1990-1999	501	323	824
2000-present	286	900	1,186
Total	**7,249**	**5,684**	**12,933**

See Appendix F for a detailed report of past timber sales occurring in the project area, including specific treatments, acres of treatment and decade of treatment by sale.

In 1948, a large blowdown event in the project area initiated a spruce bark beetle epidemic. In response to this epidemic, the Kootenai NF began a major road building and logging effort to harvest the infected spruce. Logging started in the early 1950s and continued to the early 1960s. These areas were generally high elevation, north-facing slopes that did not have existing road access. The remainder of the 1960s saw a modest level of both regeneration and intermediate harvest with some new road construction.

In the late 1960s to early 1970s, the lodgepole pine that had regenerated from the 1889 fire became infested with mountain pine beetle causing widespread mortality. This situation led to a dramatic increase in harvest levels and road construction. Approximately 66 percent of the regeneration harvest in the project area occurred between 1970 and 1989. Table 6 summarizes the past harvest trends and general effects of these actions that are considered in the resource specific cumulative effects analysis. Table 7 identifies recent timber sale activity that is considered as recent and ongoing activities in the cumulative effects analysis.

Since the early 1990s, projects have trended towards treatment of fewer acres each year, retention of more reserve trees for long-term structure and snag replacement, minimal new permanent road construction, increased retention of coarse woody debris and snags within harvest units, and increased soil and water conservation practices to minimize soil disturbance. Approximately 213 acres of these harvests have currently been planted, with the remaining 343 acres planned for the next two to three years. For more detailed information on past harvest and effects to specific resources, please see the affected environment and cumulative effects sections of the Chapter 3 analysis by resource.

Table 6. Past harvest trends, effects

Year	Regeneration Harvest (acres)	Intermediate Harvest (acres)	Activity	Effect
1950s	121	1,130	Treatments focused on both regeneration and intermediate harvest of bark beetle infested spruce stands, regeneration of mountain pine beetle infested lodgepole pine stands, and regeneration of mature mixed-conifer stands. Associated road building involved the development of the main collector roads up many of the drainages in the project area.	Loss of cover, snags, and old growth. Increase in forage. Reduction in riparian habitat from harvest. Detrimental soil disturbance from ground-based skidding, excavated skid trails, and bulldozer piling. Increase in sediment from new road construction. Introduction of weeds, including hawkweed and knapweed. Regeneration of harvested areas has occurred, with the majority of the units ready for precommercial thinning. Vegetation is considered recovered from a hydrologic standpoint, and is providing hiding cover for big game. Generally, these are considered as part of the existing conditions as the effects have decreased over time.
1960s	1,981	1,309		
1970s	2,451	1,693	Treatments focused on regeneration of mountain pine beetle infested lodgepole pine stands, and regeneration of mature mixed-conifer stands. Intermediate harvest included removal of understory lodgepole and shade-tolerant species in some stands, but also removal of larger, dominant trees to recover economic value and to stimulate release of understory trees in other stands. Most of the roads were built during this era. Numerous timber sales were completed in this period. A complete list is found in Appendix F.	
1980s	1,909	329		
1990s	501	323	Timber sales in this period were authorized by a comprehensive Environmental Impact Statement (Upper Yaak EIS). The majority of these timber sales focused on salvage and regeneration of dead and dying lodgepole stands.	Forest Plan standards applied which resulted in designated old growth areas, standards for snags and leave trees, better riparian protection through Riparian Guidelines, water yield guidelines, elimination of bulldozer slash piling, implementation of soil and water conservation practices, better control of broadcast burning prescriptions, and closure of roads to protect grizzly bear habitat. Implementation of Inland Native Fish Strategy (INFS) established Riparian Habitat Conservation Areas around all streams and wetlands, which applied to all current and future sales. These effects are considered as recent past activities, as the effects may still be occurring.
2000-present	286	900	Timber sales since the Upper Yaak EIS have been primarily small sales that responded to natural events, such Dutch Oven Blowdown Salvage. The remaining activities in this period were initiated in the late 1990s, with the contracts being completed in this decade (Table 8).	

Table 7. Recent timber sale activities within the analysis area

Sale Name	Activity	1990s	2000-present	Grand Total
Clay Beaver	Seed Tree Seed Cut With Reserves		2	2
	Understory Burn		2	2
Clay Beaver Total			4	4
Cool Otis	Clearcut With Reserves	96	188	284
	Excavator Piling (Grapple)	192	175	367
	Precommercial Thinning	85		85
	Sanitation (Salvage)	158		158
	Understory Burn	29	40	69
Cool Otis Total		560	403	963
Dutch Oven Blowdown Salvage	Clearcut With Reserves		57	57
	Excavator Piling (Grapple)		77	77
	Sanitation (Salvage)		39	39
Dutch Oven Blowdown Salvage Total			173	173
Grand Total		560	580	1,140

Road Construction

Road construction in the project area occurred primarily in association with access to timber harvest. In the 1950s, the main arterial roads to the upper ends of the drainages were constructed to access spruce salvage logging. Most of the remaining road construction occurred in the 1960s through the 1980s in association with lodgepole pine salvage. The most recent new road construction (permanent road) was under the Cool-Otis timber sale (1996-2002), where 6.7 miles of new road were constructed. Three new roads were constructed (Roads 14121, 902B, and 902G) for a total of 2.9 miles, and two roads were extended (Roads 6715 and 6715B) for a total of 3.8 miles.

Road Management for Grizzly Bear Security

Since the late 1980s, protection measures for the threatened grizzly bear have markedly decreased the amount of road available for motorized public travel and management activities, while increasing security for grizzly bears as well as other wildlife species. The creation of grizzly bear core security areas has resulted in roughly half of the National Forest lands on the district being unavailable to motorized travel during the active bear year. Within the analysis area, roads were closed after the harvests in the 1980s, and have been relatively stable since that time.

Watershed Rehabilitation Work

Several past projects have implemented BMPs and other watershed rehabilitation work. Table 8 displays past activities completed in the analysis area.

Table 8. Past best management practices completed or scheduled

Project (Watershed)	Road	Miles	Work completed	Activities
Cool Otis (Gus Ck)	14121	0.66	1996	11 ditch relief Corrugated Metal Pipes (CMPs) and one 36" CMP
Cool Otis (Pheasant Ck)	6715	0.81	2002	17 ditch relief CMPs, one 48" CMP, and one 57" arch.
Cool Otis (Pheasant Ck)	6715B	3.01	2002	54 ditch relief CMPs, 21drain dips, and 6 Surface Water Deflectors (SWDs)
Cool Otis (Gus Ck)	902B	1.83	1996	15 ditch relief CMPs
Cool Otis (Pheasant Ck)	902G	0.4	1996	Constructed ditch with 7 ditch relief CMPs
Cool Otis	593	3	2002	Aggregate and dust abatement
Cool Otis (Pheasant Ck)	6715	6.72	2002	1.93 miles of aggregate and dust abatement, 22 drain dips, and 2 SWDs
Cool Otis (Pheasant Ck)	902	7.43	1996	36 additional new ditch relief CMPs (18"), seven new 24" CMPs, and one 48" CMP. Dust abatement on whole length. New aggregate from mp 3 - 7.43
Cool Otis (Pheasant Ck)	902G	1	1996	13 additional new ditch relief CMPs, one 24" CMP, and two 36" CMPs
Dutch Oven (Burnt Ck)	472	3.54	2005	One blind drain, four new CMPs, 3 drain dips, and two new drop inlets for existing CMPs
Dutch Oven (Burnt Ck)	902	1.25	2005	5 drain dips, 2 SWDs, and one new ditch relief CMPs
Dutch Oven (Burnt Ck)	902Z	0.39	2005	5 drain dips, replaced one undersized 24" CMP with a 48" squash CMP.
Obermayer Stewardship (Lang Ck)	593	4.42	scheduled 2007	Replaced one ditch relief CMP, installed one open top box culvert, 2 drain dips, and one blind drain
Long Cool One (Lang Ck)	6816	1.02	2006	Installed one ditch relief CMP and one drivable waterbar
Obermayer Stewardship (Lang Ck)	6814	0.8	not scheduled yet	Design includes two blind drains, two drain dips, and four open box top culverts
Obermayer Stewardship (Lang Ck)	6814A	0.81	not scheduled yet	Design includes four drain dips.
Obermayer Stewardship (Lang Ck)	6815	0.93	not scheduled yet	Design includes replacing one undersized 24" CMP with a 42" arch, and out slope 13 existing grades sags for surface water drainage.
South Spread	435	1.5	2000	Dust abatement and aggregate placement
South Spread	5932	1	2000	Replaced two ditch relief CMPs and place .6 miles of aggregate

Ongoing and Reasonably Foreseeable Actions

Reasonably foreseeable actions include those management activities that are ongoing or scheduled to occur within the next 5 years. These activities may occur regardless of which

alternative is selected for implementation. Currently, the only reasonably foreseeable action is the proposed replacement of the ford crossing with a bridge on road 472X. Table 9 identifies those current and foreseeable actions in the project area that are included in the analysis of environmental effects.

Table 9. Ongoing and foreseeable actions

Actions	Description
Ongoing	
Timber Harvest/Fuels Reduction	The Obermayer Fuels Reduction Project will be implementing approximately 952 acres of intermediate harvesting, 24 acres of regeneration harvests, and 12 acres of hand slashing/piling (precommercial thinning) adjacent to private lands in the town of Yaak. These activities are proposed to begin in 2007.
Road Activities	Routine road maintenance (road blading, culvert cleaning, and BMP work, including district and Yaak Headwaters Group projects) is likely to occur as needed on existing roads in the project area. The roads most likely to receive maintenance are those open to vehicle traffic.
Fire Suppression	As currently outlined in the 2004 Kootenai N. F. Fire Management Plan, fire suppression efforts will be made to suppress all fires that may occur within the project area.
Weed Control	Spraying to control weeds is ongoing within the project area under the Kootenai National Forest Herbicide Weed Control Plan Environmental Assessment and associated Decision Notice and Finding of No Significant Effect, 1/97.
Public Actions on National Forest Lands	Recreational activities such as sightseeing, hiking, cross-country skiing, camping, snowmobiling, hunting, and fishing, are ongoing and expected to increase over the next 10 years. Ongoing trail maintenance will occur. Firewood cutting is also predicted to continue to occur along open road.
Actions on Private Lands	Within the project area continued development of private land is expected. Development is expected to include commercial timber harvest, land clearing, home construction, road construction, septic field installation, water well drilling, livestock grazing, and riprap of migrating streambanks.
Foreseeable	
Road Activities	Proposed bridge on Road 472X to replace ford crossing. Provides access to private lands.

Relationship to the Forest Plan

The Forest Plan (USDA Forest Service 1987) and its accompanying Environmental Impact Statement and Record of Decision specify the overall direction by which the resources of the Forest are managed.

The Forest Plan consists of Forestwide and area-specific goals, standards, and guidelines, which provide for land uses with anticipated resource outputs. Forestwide goals and objectives pertinent to the proposed action were discussed in the purpose and need for action in Chapter 1. A description of area-specific goals, standards, and guidelines follow.

The Grizzly project analysis is tiered to and incorporates the Forest Plan in its entirety, as encouraged by 40 CFR 1502.20. This analysis is not a general management plan for the analysis area nor is it a programmatic document; it is a site-specific link between the Forest Plan and the requirements established by NEPA, which involve the analysis and implementation of management practices designed to achieve the goals and objectives specified in the Forest Plan. This analysis will discuss the proposed action and its alternatives in a site-specific manner as required by NEPA.

Forest Plan Management Area Direction

The Forest Plan divided the Forest into management areas (MAs), each of which has its own goals, standards, and schedule of management practices (USDA Forest Service 1987, pp. III-1 to III-126). Refer to Map M-2 for a display of MAs in the project area. Table 10 lists the management areas where actions are proposed.

Table 10. Management area summary

MA	Management Emphasis	Acres	% of Area
2	**Semi-Primitive Non-Motorized Recreation** (Forest Plan pages III-2 through III-7) **Description:** Naturally appearing areas with vegetation cover ranging from full timber to open meadows, which offer roadless recreation opportunities. **Goals:** Provide for the protection and enhancement of areas for roadless recreation use and provide for wildlife management where specific wildlife values are high.	4,436	10
10	**Big Game Winter Range** (Forest Plan pages III-38 through III-42) **Description:** Occurs on lands used by most species of big game (elk, moose, sheep, white-tailed and mule deer) for winter range. **Goals:** Maintain or enhance habitat effectiveness for winter use by big game species and maintain the viewing resource in areas of high visual significance.	1,050	2
11	**Big Game Winter Range** (Forest Plan pages III-43 through III-47) **Description:** Occurs on lands used by most species of big game for winter range. It is found at lower elevations in most drainages and the topography ranges from steep to moderate and rolling topography. **Goals:** Maintain or enhance habitat effectiveness for winter use by big game species while producing a programmed yield to timber, and maintain the viewing resource in areas of high visual significance.	8,830	20
12	**Big Game Summer Range** (Forest Plan pages III-38 through III-42) **Description:** Occurs mostly above 4,000 feet on moderate terrain; used by most species of big game from late spring through late fall. **Goals:** Maintain or enhance habitat effectiveness for non-winter big game habitat and produce a programmed yield of timber.	9,094	20
14	**Grizzly Bear Habitat Management** (Forest Plan pages III-58 through III-63) **Description:** Identified Interagency Grizzly Bear Situation 1 and 2 areas that are in conjunction with suitable timberland. **Goals:** Maintain or enhance grizzly bear habitat, reduce grizzly human conflicts, assist in the recovery of the grizzly bear, realize a programmed level of timber production, and provide for the maintenance or enhancement of other wildlife, especially big game.	13,092	29
15	**Timber Production** (Forest Plan pages III-64 through III-69) **Description:** Generally located at medium elevations on moderate topography and characterized by its ability to produce timber volumes suitable for harvest using conventional methods. **Goals:** Focus on timber production using standard silvicultural practices while providing for other resource values.	1,439	3
21	**Special Interest Areas** (Forest Plan pages III-90 through III-112) **Description:** Areas of special interest including unique, unusual, or important flora, fauna, geological, recreational, cultural, or historical attributes that are of public interest and require protection or special management. **Goals:** 2) Preserve and maintain genetic diversity; 3) Protect against serious environmental disruption.	295	<1

Forest Vegetation

Introduction

This section addresses the purpose and need for vegetation treatment, reviews the vegetation characteristics in the analysis area, and identifies past disturbances (natural and human) that have contributed to the landscape characteristics that currently exist in the context of the purpose and need and effects of the proposed actions (Schantz 2007).

Analysis Area

The analysis area considered is the project area (44,404 acres), which includes 1,246 acres of private lands and 43,158 National Forest acres. The project area consists of the Grizzly Subunit and the portion of the Buckhorn Subunit (Whitetail Creek) in the Yaak River 6th-field watershed. The area within the project boundary has historically received similar management (timber management, road construction) and is large enough to allow analysis of cumulative effects.

Analysis Methodology

The Grizzly Ecosystem Assessment at the Watershed Scale (EAWS) was completed in 2004 to evaluate the existing condition of vegetation, watershed conditions, and grizzly bear habitat. Past management effects, current disturbance agents, and landscape trends for vegetation were identified. Key management issues, questions, and opportunities that would move vegetation towards a desired future condition based on reference conditions were discussed. The assessment identified a variety of resource conditions that do not meet desired conditions as identified in the Forest Plan. The Forest Plan Revision Analysis of the Management Situation (AMS; USDA Forest Service 2003) also incorporates findings from monitoring and evaluation of past management, historic and current trends of resources, and science and assessments relevant to the resources being managed. Historic range of variability (HRV), presented in a social and environmental context, was used to help establish baseline reference conditions, disturbance regimes, and departures from historic conditions. The AMS was also referenced for the need for change in management of vegetation, and implications for continuing under current management direction.

Site-specific information incorporated in the district vegetation database (TSMRS), geographic information system (GIS), stand exam data, and site-specific surveys by professional vegetation specialists were used to further refine the identification of existing conditions and proposed management treatments.

Stratification of the analysis area is further refined by use of vegetation response units (VRU), allowing more precise display of effects related to past management and the expected effects of the proposed treatments. VRUs are used to stratify lands for planning (Gautreaux 1999; AMS 2003), which is especially useful for comparing to historic conditions. A VRU is an aggregation of related vegetative communities (habitat types) with similar soils, topography, and climate. Natural processes such as nutrient and biomass cycling, plant succession, fire regimes, and site productivity are also similar. Responses to disturbance from human and natural causes can therefore be expected to follow similar pathways. Historically, lands within a given VRU were subject to similar disturbances.

Effects of historic wildfire and timber harvest are still evident in this area today. Analysis of the effects of past management and changes from historic conditions considered all available fire records and timber management records dating back to the early 1900s.

Biophysical settings are aggregations of VRUs grouped by temperature and moisture gradients, such as warm/dry, warm/moist, and subalpine. Biophysical settings were used as a basis for classification for historic range of variability. Three biophysical settings have been established, which group the VRUs into warm/dry (VRU 1-3), cool/moist (VRU 4-6), and subalpine (VRU 7-11).

The vegetative composition of the project area in VRUs is shown in Table 11. The majority of the project area (76 percent) falls into the moderately warm/moist VRUs 5S and 5N; these are the VRUs where timber harvest would occur under the action alternatives. The ecosystem burns would be located in VRUs 2, 3, and 5, while the wildlife burns are located primarily in VRU 5. Precommercial thinning would all occur in VRU 5, except for 24 acres in VRU 2S. For effects analysis, VRU 5 and overall project area effects would be displayed.

Table 11. Vegetation response units (VRUs) of project area

VRU	NFS	Private	Total Acres	% Total
VRU2S	1,034	0	1,034	2.3%
VRU3	261	0	261	0.6%
VRU4S	56	0	56	0.1%
VRU5N	15,557	124	15,682	35.3%
VRU5S	18,043	148	18,191	41.0%
VRU6	1,002	0	1,002	2.3%
VRU7N	2,907	0	2,907	6.5%
VRU7S	2,155	349	2,504	5.6%
VRU9	1,630	0	1,630	3.7%
VRU10	309	0	309	0.7%
Undefined	202	625	827	1.9%
Total	43,158	1,246	44,404	100%

VRU 5

This VRU occurs at an average elevation of 3,800 feet, where precipitation ranges from 30 to 50 inches per year. This VRU has among the highest biological productivity on the Kootenai NF due to the common occurrence of loess deposits. The western hemlock and western redcedar series represent the median conditions of this VRU; while the drier ecotones are represented by the grand fir series and the cooler ecotones by the subalpine fir series.

VRU 5 has historically received the most timber harvest and vegetation management on the Kootenai NF, mainly due to mountain pine beetle-caused mortality and wildfires in lodgepole pine. Stand composition, outside of plantations, is currently dominated by either dense lodgepole pine (about 200 stems per acre 9 inches and larger) or a dense mixture of larch, western hemlock, Douglas-fir, and western redcedar, with varying amount of healthy larch.

VRUs 2 and 3

Current stand compositions in VRUs 2 and 3 are large ponderosa pine and Douglas-fir with an understory of Douglas-fir and grand fir seedlings, saplings, and poles. The understory trees have

developed during the period of fire exclusion, and historically the ponderosa pine was a "fire climax."

Regulatory Framework

The National Forest Management Act (16 USC 1604) and the implementing regulations require specific findings to be made when implementing the Forest Plan (see "Regulatory Consistency on page 56).

Affected Environment

Influences on Existing Condition

Fires of 1889 and 1910

The most profound influence directly affecting vegetation has been the occurrence of stand-replacing fires in 1889 and 1910. The fire of 1889 affected 33 percent of the Grizzly Subunit, and the fire of 1910 affected 39 percent of the Grizzly Subunit, for a combined total of 72 percent of this subunit's area or 29,200 acres. The stand-replacing fire burned in over 80 percent of VRU 5, and over 40 percent of VRU 7, affecting distributions of age classes, size classes, and structure. Distributions of age classes, size classes, structure and species diversity were further influenced by fire suppression, logging, and later by smaller stand-replacement fires.

It appears that in the lower Lucky Gulch and along the lower benches of Shine Creek a fire in about 1919 or 1920 either reburned some of the 1910 fire area or simply was stand-replacing on its own. This is not recorded in the district fire records (conclusions from on-site stand visitations and consistent results of tree boring in lodgepole dominated stands, as well as other species, showed the same ages by ring count).

The fires of 1889 and 1910 were rare (in terms of the historic fire regimes in this area and the historic range of variability; Chatters and Leavell 1994); and appear to be the result of a unique combination of weather factors (especially hurricane-force winds) that caused these million-acre fires. While stand-replacing fires are considered a part of the historic fire regime, mixed-severity fires were also a part of the pattern (Smith and Fischer 1997). Especially in VRU 5, many stands would have been "groomed" by surface fires and kept at a lower propensity towards stand-replacement fire. Given that the 1889 and 1910 fires appear to be at a high variance from the mean conditions, management for this fire regime would be counterproductive (i.e., management actions could be taken to restore resilience to more modal conditions).

Fire Suppression/Timber Harvest

These two extensive fire events, along with the subsequent implementation of a fire suppression policy, has resulted in the absence of an age class greater than 150-years old, an increase in shade-tolerant species distribution, a continued trend toward homogeneity of structure, increased stand densities, and a large acreage of mature lodgepole pine in the process of deteriorating due to the effects of mountain pine beetles and blowdown. The situation is further influenced by early harvest that targeted the fire-survivor trees and left younger trees that originated with the fire disturbance, effectively removing the older age class and seral seed sources from these two-storied stands. These fires initially provided an extensive opportunity for species diversity, creating conditions to allow for the development of most major seral species.

Fire suppression without intervention or cultural treatments led to more densely stocked stands with all trees using greater energy to compete and survive, resulting in less energy reserves to use

in defense of insect attack or disease infection (Hessburg et al. 1994; Christiansen et al. 1987). Although overall tree species diversity is good, individual species such as western white pine, whitebark pine, western larch, and ponderosa pine are decreasing in the overall composition of the subunit.

Many sites within the assessment area have been part of an active timber management program. Much of this began around the 1950s as harvest focused upon salvage of beetle-killed spruce. Subsequent entries in the 1970s through the 1980s focused on reducing economic losses in lodgepole pine stands killed or at high risk to mountain pine beetle infestation. These areas were composed primarily of mature, very dense lodgepole pine stands with a small component of western larch and subalpine fir, and have been regenerated to healthy, single- and two-storied sapling and pole-sized stands of western larch, spruce, white pine, lodgepole pine, and Douglas-fir. The 1990s regeneration harvests in the Cool Creek and Otis Creek drainages were concentrated on dense stands of lodgepole or lodgepole-mixed conifer stands having densely stocked, shade-tolerant species. All regeneration efforts from past harvest have been successful, although long trending drought conditions have created some reforestation challenges. Table 5 displays the regeneration and intermediate harvest by decade for the project area. Table 6 displays the past harvest trends and general effects. Table 7 displays the most recent harvest activities by timber sale name and type of harvest. Appendix F lists all past harvest and ground-disturbing activities within the project area. Since the 1950s, new stands in VRU 5 consisting of seedlings, saplings, or poles have established successfully in 91 percent of the cases where natural regeneration was used, and in 96 percent of the cases where planting was done.

The removal of overstory white pine, western larch, Douglas-fir, and to a minor extent ponderosa pine, has resulted in fewer management options on many of the affected acres. These treatments have shifted the species composition towards western redcedar and western hemlock, often leaving very dense stands where western larch has been declining due to lack of sunlight and dwarf mistletoe. These types of stands, which are in the non-lodgepole forest types, are representative of the stands being proposed for regeneration harvest in the proposed action.

Quaking aspen has also been affected by fire suppression and timber management. The mature aspen in the project area appears to have originated with the large fire events of 1889 and 1910, and is nearing the end of its typical lifespan. Aspen is very intolerant of shade, and requires a stimulation to initiate the suckering response (Shepperd 2001). As a general rule, physiological age limit varies from 60 to 120 years. Fire has been the most important disturbance factor influencing changes in structural stages and composition and in minimizing competition by conifer species. Non-lethal fires at lower elevations, and mixed severity fire at mid-and higher-elevations historically regenerated this species and kept structural stages in balance (Northern Region Overview, USDA Forest Service 1998). Successful development of vegetative reproduction is limited throughout most of the project area by lack of available sunlight due to competing conifers, and a lack of a stand disturbance that would trigger vegetative reproduction. Where timber harvest in the project area has previously occurred within areas occupied by an aspen component, aspen regeneration has generally become successfully established.

In summary, the project area vegetation is reflective of the inherent fire history, structural change from fire exclusion, timber harvest, and forest development affected by other disturbances.

Ecosystem Function and Resiliency

The major change affecting function and resiliency of the forests in the project area is the increase in late-seral, shade-tolerant, and fire-intolerant species such as western redcedar, western

hemlock, grand fir, and to a lesser extent, Douglas-fir (AMS USDA Forest Service 2003). There has been a corresponding decrease in ponderosa pine, white pine, and western larch.

Loss of the fire-resistant, large-tree component has reduced the fire resiliency of stands, while also affecting ecosystem function by virtue of the roles that the large trees historically played in providing nesting sites, large snags and down logs. An increase in homogeneity in fuel loadings and stand structure as a result of fire suppression has lead to a higher hazard of stand-replacing fire. Historically, mixed severity fires, along with other disturbance agents, maintained approximately 60 percent of the landscape in a mixed age, multi-aged, mid-seral condition (Losensky 1994). Currently, essentially all sawtimber stands (9 inches dbh and larger) are predicted to experience active tree torching and/or crown fire with winds of 16 to 39 miles per hour, based on FVS-FFE analysis (Fuels section, project record). This propensity towards tree torching equates to a higher risk of losing the large-tree component in these stands, with the associated effects on future old growth.

Some diseases are now thought to be playing a different role than historically. The almost total lack of mixed-severity fires in the last 80 years has changed the role of dwarf mistletoes, and perhaps root diseases. Dwarf mistletoes have been found to contribute to fuel loadings in heavily infected sapling/pole stands (Koonce and Roth 1985) because infected branches tend to be larger, more resinous, and persist longer than uninfected branches. Fires would often remove these infected trees because of their increased flammability. Root diseases tend to be more aggressive on Douglas-fir, true firs, and hemlock than larch or white pine, and their increased prevalence is directly correlated with the increase in susceptible species due to fire exclusion.

The ability of trees to overcome stressors such as drought and insects and pathogens is thought to be due to a prioritization of their resources. Trees under heavy competition have few or no extra photosynthate to devote to protection against insects and disease (Perry 1985). Currently, about 30 percent of the stands in VRU 5 have densities that exceed 200 square feet of basal area per acre, which is thought to be the upper limit of the historic reference condition (Steele 1994). These stands are at a higher risk of damage from these agents.

Forest Structure and Composition

Forest Type

Forest type is a classification based on the dominant species currently occupying the site. Table 12 portrays the current forest type distribution in comparison with the desired condition based on historic vegetation patterns for the analysis area, and within VRU 5. The following trends are suggested by this data: the percentages of grand fir/cedar/hemlock types and the Douglas-fir type are higher than the historic ranges, and the percentages of larch, white pine, and ponderosa pine are lower than the historic ranges. These conclusions are consistent with the analysis of forest types done Forestwide.

VRUs 2 and 3. Analysis Forestwide has indicated that in general there has been a decrease in early-seral ponderosa pine and larch and an increase in Douglas-fir in these VRUs. There is a corresponding higher proportion of mid-seral stages and a lower proportion of late-successional stages compared to historic conditions.

VRU 5. Trends for forest type for VRU 5 are similar to Forestwide and project-area-wide trends, namely a decrease in the larch and white pine forest types compared to historic levels. The loss of most of the white pine type (3 percent versus 12 percent historically) seems particularly noteworthy.

Data on historic percentages of the quaking aspen type are not available. Only 122 acres are currently classed as the aspen type, and most of this is in mature clones. Mature aspen is commonly found within conifer stands in VRU 5, but little or no development of regeneration has been noted, except where recent regeneration harvest of conifers has occurred.

Table 12. Comparison of current forest type percentage with historic range

	Analysis Area			VRU 5		
Forest Type	**Total Acres**	**% Total**	**HRV**	**Total Acres**	**% Total**	**HRV**
No Data	558	1%	-			
Aspen	122	<1%	No Data	122	<1%	-
Birch/Alder	18	<1%	No Data	18	<1%	-
Douglas-fir	4,474	10%	4-8%	3,525	10%	7-15%
Grand Fir/Cedar/Hemlock	8,899	20%	5-11%	7,933	23%	15-29%
Larch	9,525	21%	26-52%	8,874	26%	37-73%
Lodgepole	8,974	20%	12-23%	8,084	24%	-
Non-Forest	529	1%	-	78	<1%	-
Ponderosa Pine	451	1%	5-9%	73	<1%	-
Subalpine Fir	9,819	22%	11-21%	4,131	12%	-
White Pine	1,035	2%	4-9%	1,035	3%	8-16%
Total	44,404	100%		33,873	100%	

Western larch. The western larch cover type is found mainly within VRU 5 (93 percent of acres). This species was historically one of the dominant early-seral species found here due to its very high degree of fire-resistance (Smith and Fischer 1997; Scott et al. 2002). The AMS identified the decrease in dominance by western larch as a major change that has occurred, and the current dominance of approximately 20 percent is below the desired condition of between 26 to 52 percent. Major factors influencing this condition are the increase in competition from shade-tolerant species due to fire suppression and timber harvest, and the heavy incidence of dwarf mistletoe.

Lodgepole pine. The lodgepole pine cover type is found mainly within VRU 5 (89 percent of cover type acres). Historically lodgepole dominated areas after stand replacement fire due to its closed-cone habit and the heavy fuel loading generated after a mountain pine beetle caused stand regeneration.

Western white pine. The western white pine cover type currently occupies only about 2 percent of the project area, all within VRU 5. This type has been greatly reduced in extent due to white pine blister rust fungus and fire suppression.

Western redcedar, Western hemlock, Grand fir. These cover types are discussed together, because they are usually found in combination, occupy similar sites, and are the primary shade-tolerant species found in the project area. Together, these types comprise about 20 percent of the project area, with about 90 percent of the acres found within VRU 5. Increase in the number of

acres dominated by these species has occurred due to a reduction in mixed severity fires, loss of western white pine, and past timber harvest, which targeted the larch, Douglas-fir, and white pine.

Subalpine fir. The subalpine fir type is found mainly in the subalpine biophysical setting (VRUs 7-11). The fact that it occupies about 4,000 acres in VRU 5 is more evidence that there has been a shift towards shade-tolerant, fire-intolerant species in this VRU.

Quaking aspen. Quaking aspen is a very minor type by itself, but is found as a minor component of most stands in the cool moist biophysical setting. Suppression of fires has also reduced the occurrence of aspen by allowing for the increase in shade-tolerant, fire intolerant species and increases in conifer competition. Aspen is not shade tolerant, so competition for light is a factor in its distribution within the project area.

Age Classes

Comparisons of current age class with historic levels for the analysis area and VRU 5 are found in Table 13. Approximately 75 percent of the area is occupied by stands less than 150 years old, reflecting the stand replacing fires of 1889 and 1910, fire exclusion policies since 1910, harvest of remnant trees that survived the fires, and salvage of beetle-killed spruce and lodgepole pine starting in the 1950s. The late-seral age class (over 150 years) is low compared to historic levels, while the early (0 to 40 years) and mid-seral age (40 to 150 years) classes are within historic ranges. It should be noted that the early-seral stage is generally on the upper end of the age range (i.e., a tall sapling/shrub and pole stages).

Table 13. Age class distribution comparison between current and historic

	Analysis Area			VRU 5		
Age Class	**Total Acres**	**Total**	**HRV**	**Total Acres**	**% Total**	**HRV**
0-40 yrs (early seral)	6154	14%	15-25%	5,248	16%	10-20
41-100 yrs (mid seral)	15725	35%	10-15%	13,139	38%	15-35
101-150 yrs (mature)	10057	23%	10-15%	7,318	22%	10-30
over 150 yrs (late seral)	4041	9%	2-64%	3,352	10%	25-55
Multi-aged	7226	16%		4,738	14%	
Non-forest	529	1%	5-15%	78	<1%	
No data	672	2%				
Totals	44,404	100%		33,873	100.0%	

Density

In VRU 5, approximately 70 percent of stands have densities (square feet of basal area per acre) that are on the high end of or exceed historic reference conditions as described by Steele (1994). All sites have a fixed amount of resources and carrying capacity—one way of expressing this capacity is through a density management regime that considers the points where the site becomes fully occupied and where the site resources become limiting (Long 1985). Based on research and studies to develop local growth projections and local experience, these points would occur at approximately 100 and 200 square feet of basal area per acre in mixed-conifer stands. Where stands exceed the point in density where site resources become limiting, tree mortality generally begins to occur either from the effects of inter-tree competition, or from the effects of

insects and diseases. In this case, 200 square feet of basal area per acre represents this threshold density.

Stands proposed for intermediate harvest (commercial thinning) range in density from 150 to 340 square feet of basal area per acre. Mixed-conifer stands proposed for regeneration harvest generally have densities that exceed 200 square feet of basal area per acre and are currently showing effects of insects and diseases (root diseases, stem decays, dwarf mistletoe).

Snags

Existing snag densities were estimated from stand exams from 1996 through 2002 (215 exams), which is the best available information on occurrence of dead trees. The vast majority of these exams were taken within VRU 5, which has the highest biological potential to produce snag habitat. Therefore, this is considered a reasonable representation of the existing densities of snags within the majority of the project area (VRU 5 is found over 75 percent of the project area). To allow for expected fall-down rates during the time since the exams were taken, the numbers of smaller diameter snags (10 to 19 inches dbh) were reduced by 40 percent from the exam totals, while large diameter snags were reduced by 12 percent (Reinhardt and Crookston 2003). The relatively high rates of fall-down for the small diameter snags is due to a species composition of lodgepole pine, hemlock, and cedar, while large diameter snags are composed of larch, Douglas-fir, and white pine which have lower inherent decay rates as well as larger girth to provide longevity.

Current density of snags 10 to 19 inches dbh is estimated to be 15 per acre. This density is reflective of the recent mountain pine beetle mortality in lodgepole pine, white pine blister rust, and mortality of larch due to dwarf mistletoe, which has been noted in field reconnaissance as well as stand data. Current density of snags 20 inches dbh and larger is estimated to be 0.4 per acre, which is reflective of the generally smaller size classes found within the project area due to factors discussed below.

Insects and Disease

Native insects and pathogens (not including white pine blister rust) of forest trees perform important functions in natural ecosystems, killing decadent trees, creating dead and down woody habitat for other species, recycling nutrients, and creating gaps for regeneration. Most of the time, these organisms remain at levels where they do not cause rapid, large-scale changes in the structure or composition of plant communities. Yet certain conditions, such as drought can trigger major insect outbreaks or trigger disease effects that result in substantial tree mortality, such as recently occurred in the project area with mountain pine beetle. These outbreaks have increased fuel loadings, contributing to increased fire hazards in these forests.

Forest Insects and Diseases Common to the Project Area

White pine blister rust (*Cronartium ribicola*). This was introduced into western North America from Europe in 1910 on infected eastern white pine seedlings grown in France and planted near Vancouver, B.C. It then spread quickly throughout most of the range of five-needle pines, where is has substantially reduced the populations of these pines throughout their ranges in the West, except for those in southern California. It is a major factor in mortality of natural regeneration, and makes reestablishment of wild populations of these species on high hazard sites difficult or impossible. In many areas, the only natural hosts remaining in high hazard areas are large trees that have had their tops and many branches killed by the fungus, and trees in this condition are often predisposed to attack by mountain pine beetle. Blister rust is an exotic pathogen that has

not coevolved with its hosts, and because of the importance of white pine to forest diversity, there is great interest in managing to reestablish rust-resistant strains of this once widespread tree. This fungus has substantially reduced the amount and distribution of white pine within the project area.

Evidence of blister rust can be found in all stands where white pine still is or has recently been a component. Recent activity of this fungus has essentially eliminated white pine from many stands, while other stands still have a relatively healthy component most likely because factors controlling infection have not been favorable. There may be some genetic resistance in the remaining healthy trees, or the appropriate weather conditions for pine inoculation in late summer and early fall have not happened yet.

Mountain pine beetle (*Dendroctonus ponderosae*). This is a native bark beetle that attacks primarily lodgepole pine, white pine, and whitebark pine in the project area. Trees attacked by this beetle are generally killed. As mentioned above, it is often the agent responsible for mortality to white pine infected with blister rust. However, its main role in the project area is as the key agent in regenerating stands of older lodgepole pine.

This bark beetle has continued to be active over the last 10 years in the project area. Also, based on stand exam data on species composition, size class, and density, approximately 4,300 acres are at high hazard of infestation, and another 1,450 acres are at moderate hazard.

Dwarf mistletoes (*Arceuthobium* spp.). These small, parasitic plants infect host trees via seeds disseminated by wind and birds. These species are generally host-specific, but the larch dwarf mistletoe can also infect lodgepole pine. Their effect is to slowly but inexorably weaken trees by robbing them of both nutrients and water. The primary role of dwarf mistletoes in this area is their contribution to the break-up of lodgepole pine stands, and to the continued mortality of larch. They also play a role in susceptibility to fire, because of the accumulations of fuels resulting form dead witches' brooms, dead fallen trees, and live brooms in the lower crowns of trees. Historically, fire played a role in controlling the distribution of dwarf mistletoes. Based on stand exam data, approximately 50 percent of the stands in the larch type are infected with mistletoe.

Root diseases (*Armillaria ostoyae, Phellinus weirii, Heterobasidium annosum*). These are generally found throughout the project area, and are associated mostly with stands dominated by true firs, western, hemlock, and Douglas-fir. Root diseases historically contributed to the dominance of white pine and western larch, by reducing other species early in stand development (Smith and Fischer 1997). With the loss of white pine and larch due to the fires of 1889 and 1910, selective timber harvest, and white pine blister rust, approximately 25 percent of VRU 5 is now dominated by the grand fir/cedar/hemlock type with its inherent high susceptibility to root diseases. Intermediate harvests that favor the resistant larch and white pine, and that are thoughtfully designed to minimize root compaction can reduce the overall impact of root diseases within the stand.

Old Growth

Stands within the project area below 5,500 feet elevation were classified as effective old growth or replacement old growth. The acres of old growth were analyzed at the level of the project area, compartment, and VRU 5. The following explains the rationale for old growth designations for the Grizzly project area:

Effective old growth is defined as an ecosystem distinguished by old trees and structural attributes that encompass the later stages of stand development in a variety of characteristics, which may include tree size, accumulations of large woody material, number of canopy layers, species composition, and ecosystem function. More specific attributes of effective old growth are suggested in "Old Growth Forest Types of the Northern Region" (Green et al. 1992, corrected 02/2005) by habitat type.

Replacement stands are usually younger than the suggested minimal age for effective old growth, yet the stand may possess many other old growth characteristics. Consequently, these stands are not considered as effective old growth, but are expected to become so in time.

Designated old growth stands meet the effective or replacement criteria, and are designated within an old growth management area (MA 13 or other nontimber base management area with old growth designation such as MA 21/OG or MA 2/OG). Old growth criteria for both western Montana and northern Idaho have been used to describe the existing condition for the project area. Stands with the most old growth character and least fragmentation (or the best stands) have been designated. In some cases, where the amount of effective old growth is well below standard, replacement old growth is designated as an old growth management area.

Undesignated old growth stands meet the effective or replacement criteria, but are not designated within an old growth management area (MA 13 or other non-base management area with old growth designation such as MA 21/OG or MA 2/OG). Some stands have not been designated into old growth management areas because they are below the 50-acre minimum that is preferred for some of the wildlife species that use old growth. Other reasons include (1) locations above 5,500 feet elevation, (2) juxtaposition between openings from old harvest units that affect habitat edge and quality, and (3) adjacency to primary road systems and/or private development. Undesignated effective stands generally have all the structural attributes unique to old growth habitat, including snags, and large logs. These stands may not be ideal habitat for some of the wildlife species that utilize old growth; however, they generally contain many important components unique to old growth ecosystems, such as suitable substrates for the lichen, bryophyte, and fungi species that inhabit old growth habitats.

Current old growth within the project area is displayed in Table 14. Old growth of all types is currently at 4,418 acres, or 11 percent of the project area. Designated old growth is 10.8 percent of the project area, exceeding the Forest Plan standard of 10 percent. Most of these acres (3,630 acres) are considered interior old growth in blocks of forest 50 acres and larger and unaffected by edges of plantations 30 years old and younger.

Table 14. Old growth within project area

Type	Acres
Designated effective	3,212
Designated replacement	1,140
Undesignated effective	43
Undesignated replacement	23
Total	4,418
NF acres below 5,500 ft. elevation	40,225
Percent project area in old growth	11%

Environmental Consequences

This section summarizes the changes in species composition, stand structure, and forest successional conditions that are likely to occur as the result of implementing the Grizzly Project alternatives. The successional conditions predicted represent the most logical pathways given the existing conditions of stands in the project area. Where the effects of the proposed treatments are very similar, the disclosures are combined. Also addressed will be the effects to management from any proposed road decommissioning, storage, as well as road development. This section will also display how each alternative addresses the purpose and need of the project and the major issues identified.

The basis for this project is the stand-specific silvicultural diagnosis and the field review of the areas proposed for treatment. Existing stand conditions and proposed treatment options were site-specifically identified and reviewed. Additional information can be found in the stand summaries and stand diagnosis records in the project files.

The removal of vegetation during harvest and fuels treatment processes, and stand regeneration, are considered under the action alternatives. These effects and the resulting change in the vegetation would vary with the timing, size, number, and spatial arrangement of harvest units and associated road systems. These effects would be different from those expected to occur under the No Action Alternative.

Alternative 1

Direct and Indirect Effects. The effects of no action provide a baseline from which to compare the action alternatives. The following trends have been discussed above under the Existing Condition section, and are summarized again below:

- Species composition (as defined by forest type) is outside of the historic ranger of variability (HRV). No action would continue a trend whereby shade-tolerant species that are more prone to insects and disease and are less fire-adapted are replacing shade-intolerant species that have adapted to the influences of fire and are generally less susceptible to insects and diseases. Size class distribution is also outside of HRV, and no action would preclude thinning to increase average tree size and individual tree growth.
- In VRU 5 (where proposed vegetation treatment activities would take place) 70 percent of stands have densities (measured by square feet of basal area per acre) that are on the high end of or are exceeding historic reference conditions.
- Western larch and western white pine are declining in many stands, and there is an elevated risk of losing many of these trees due to dwarf mistletoe, blister rust, and fire. No action would preclude management to encourage more resilient and sustainable forest conditions.
- The late-seral stage is below historic levels, and many of the moist mixed-conifer stands are on a trajectory that would not lead to an historic late-seral structure dominated by large larch and white pine. This is due to the stands currently being dominated by lodgepole, cedar, hemlock, grand fir, and Douglas-fir, and due to infestation of the larch with dwarf mistletoe and continued loss of white pine from blister rust. Passive management would be a missed opportunity to ‘cultivate’ future old growth replacement in areas that are suitable for stand improvement thinning designed to improve growth in dominant trees and diversify the stand structural attributes to trend towards old forest conditions. Stands currently classed as old growth are also at risk of being lost due to stand replacement fire, given the increased dead fuel loads and increased horizontal continuity of both live and dead fuels.

- Production of understory vegetation important to wildlife has decreased due to increases in tree canopy cover and senescence of vegetation.
- The lodgepole pine forest type (8,730 acres) is currently composed mainly of high hazard stands (4,300 acres) and moderate hazard stands (1,450 acres) for infestation by mountain pine beetle and mortality of lodgepole is occurring within other forest types as well. No fuels would be reduced (without salvage of dead and dying lodgepole) on any of these acres.
- The majority of the quaking aspen are in a mature stage and there is a lack of developing regeneration due to closed canopies and a consequent lack of sunlight. Only 122 acres are classed as aspen forest type in the project area. Aspen would continue to decline within mixed-conifer/aspen stands in the absence of treatment, and this project area is considered to contain some of the best opportunities for aspen restoration on the Three Rivers Ranger District.
- Fuel loadings have increased due to decades of fire suppression. Of the stands with a dominant, healthy larch component (e.g., stands proposed for thinning in the action alternatives), 40 percent are rated as having a high to very high crown fire hazard. Potential fire behavior in lodgepole stands would continue to increase due to mountain pine beetle activity and subsequent fall-down of beetle-killed trees.
- Approximately 7,200 acres of plantations have been established in the last 50 years, and 515 acres of these are in need of thinning to promote larch, Douglas-fir, and white pine, so as to more rapidly increase the representation of these species in the larger size classes in the project area.
- The opportunity to capture the economic value of some of the dead and dying lodgepole stands in the project area (up to 1,009 acres under Alternative 2) would be lost.

In summary, the No Action Alternative would not move vegetation towards the purpose and need and desired condition. Only the healthiest larch stands and previously thinned plantations would continue on a trajectory towards a desired stand structure in VRU 5, and even these would remain at an elevated risk of loss to crown fire because of the surrounding increase in horizontal continuity of heavy dead and live fuels.

Consistency with 1987 LRMP. The No Action Alternative is not consistent with Forestwide Goals 1, 7, 16, and 17 (II-1, II-2); nor is it consistent with Timber Goal 4 (II-4) or with MA goals for MA 11, MA 12, MA 14, and MA 15.

The No Action Alternative would not contribute to the sustainability of the forests within the project area, nor would it meet the purpose and need of this project. High stand densities of non-fire-adapted species and increasing ladder fuels have increased risk of large-scale wildfire. Without fuel abatement through harvest, excessive natural fuels accumulate and would likely lead to higher long-term fire suppression costs. Without prescribed fire, the Forest Plan goal of simulating natural ecological processes, creating habitat diversity for wildlife, and maintaining ecosystems would not be realized. Additionally, the maintenance of diverse age classes would be limited to that which presently exists. The No Action Alternative would not meet direction from 36 CFR 219.26 which requires forest planning to provide for diversity of plant and animal communities and tree species consistent with the overall multiple use objectives of the planning area.

A loss in economic value would occur as the dead, dying, or mature lodgepole pine is left to fall down. Without stand improvement activities or removal of high-risk host tree species, additional mortality from bark beetles is likely to occur. The No Action Alternative would not move the existing forest conditions within insect-killed areas towards the conditions identified in the

purpose and need. Stand productivity would be below optimum following a natural successional pattern. In-growth of shade-tolerant species would continue to occur and reduce the ability to manage for early-seral, fire-adapted species. Restoration of white pine, western larch, and quaking aspen on moist sites would not occur. Without the creation of openings associated with regeneration harvests and increased sunlight from thinning and prescribed burns, forage areas for wildlife would not be enhanced.

Alternative 2

All proposed timber harvest and all precommercial thinning (except for 24 acres in VRU 2S) would occur in VRU 5. Ecosystem burns would occur in VRU 2, 3, and 5; wildlife habitat burns would occur primarily in VRU 5, with approximately 20 acres in VRU 9.

Restoration of fire regime characteristics involves promoting the fire-resistant western larch through regeneration and intermediate harvest. Regeneration harvest would occur in stands that are currently occupied by deteriorating or high-risk lodgepole pine, and in stands where larch is a minor component. Healthy larch and white pine reserve trees would be left in all regeneration harvest units where available, and reforestation would focus on establishment of these species. Thinning would favor larch and white pine (where available) and would reduce crown density and ladder fuels. Agee and Skinner (2005) outlined four basic principles that are most important to address in designing fuels reduction treatments:

1. Reduce surface fuels—this reduces the potential flame lengths, reduces tree torching, and allows for easier suppression.
2. Increase height to live crown (gap between surface fuels and canopy fuels)—this necessitates a longer flame length for tree torching.
3. Decrease crown density—this makes tree-to-tree crown fire less probable.
4. Retain big trees of fire-resistant species (i.e., pines)—this results in less mortality for the same fire intensity.

Increasing the proportion of fire-resistant species in a stand is an additional basic principle (Graham et al. 2004). Thinning from below can be the most effective way to alter fire behavior, if followed up with treatment of surface fuels to offset the increased flame lengths and drier fuels in thinned stands (Graham et al. 1999). It is important to manage all fuels strata over time and space, and the most appropriate strategy is often thinning followed by prescribed fire, pile burning, or other mechanical treatment of surface fuels. Mechanical treatments can create a more specific desired stand structure than fire alone, and when followed up with slash treatment, can eliminate the need for multiple prescribed fire treatments over a period of years (Graham et al. 2004). All thinning in the action alternatives would follow these principles (i.e., thinning would be from below leaving the largest, most fire-resistant species, and slash and surface fuels would be treated through combinations of piling, underburning, and lop and scatter).

All regeneration harvest treatments emphasize the retention and development of reserve trees to function as big game hiding cover, seed reservoirs, relic overstory, and future snag recruitment. The specific number and distribution of reserve trees would vary with the existing stand composition, logging systems prescribed, safety considerations, and site-specific resource objectives. In addition, to providing long-term vertical diversity, these efforts would particularly benefit snag-dependent wildlife species and associated interior habitat dwellers that require security in the form of cover.

Forest Structure and Composition

Direct and Indirect Effects. Where forest conditions are outside the range of historic variability, concerns for species viability, ecosystem integrity and sustainability are addressed by improving species and structural diversity in a variety of forest settings. Even-aged stands with a significant component of uniform, maturing lodgepole pine and increasing fuel loadings would be replaced as would stands with moderate to high levels of insects or disease. Following harvest, restoration planting would provide an opportunity to increase the amount and distribution of fire-adapted species and species at risk (i.e., larch, white pine, Douglas-fir). These treatments would contribute to the overall goal of maintaining historic vegetative patterns through retention of most large, overstory trees, especially western larch, ponderosa pine, Douglas-fir, healthy western white pine, and western redcedar. These concerns are also addressed through proposed treatment of lodgepole pine stands that are either currently impacted by bark beetles or are at high risk due to stand characteristics. Proposed activities are not intended or expected to reduce beetle populations. Most of the beetle-infested trees planned for removal are dead and bark beetles will have emerged from these trees prior to logging activities. Instead, the intent is to provide a mosaic of age classes and species diversity across the landscape to break up the continuous forest cover of lodgepole pine.

Additionally, vegetation treatments are expected to improve forest conditions that have resulted from the interruption of a natural fire cycle. Other areas would be managed to reduce stand density, improve tree growth, and promote a more open stand structure that is conducive to the potential, future use of prescribed fire. Hessburg et al. (1994) looked at the historic and current roles of insects and pathogens in forests of eastern Oregon and Washington. One of their conclusions was that stocking levels should be reduced where long-term carrying capacity is exceeded, and that as long as inter-tree competition depresses tree vigor, effects of bark beetles, root diseases, and dwarf mistletoes will be greater when compared to historic levels.

The proposed action would convert approximately 224 acres of high risk and dead lodgepole pine to western larch and white pine dominated stands. In these stands, there is very little or no representation of larch, white pine, and Douglas-fir (where healthy trees of these species are found they would be left as reserve trees). This action would reduce the number of acres at high risk of infestation and contributing to the current mountain pine beetle population. Regeneration harvest of 319 acres in stands where larch is a minor component would lead to two-storied stands with larch reserves over a developing larch/white pine understory.

Commercial thinning on 509 acres would maintain and promote the early seral larch and white pine, and also favor Douglas-fir and ponderosa pine where available, while removing shade-tolerant competitors. The effect would be to increase both the fire- and insect/disease-resiliency of these stands by removing ladder and crown fuels, reducing density and competition, and increasing the proportion of species resistant to root diseases.

Precommercial thinning on 515 acres would also promote growth and vigor of less than 40 year old larch, white pine, Douglas-fir, and ponderosa pine (on south- and west-facing slopes) leading to more rapid development of larger size classes.

Quaking aspen would be released from competition on 84 acres, with an expected increase in this cover type of 84 acres (units 57 and 57a). Additionally, on 154 acres of salvage and 509 acres of commercial thinning, aspen would be promoted where found by removing competing conifers.

Table 15 shows the expected changes in forest type in VRU 5 as a result of the proposed action. Within the analysis area, the changes are similar (as VRU 5 is the majority of the analysis area).

There would be a conversion of forest type on the 543 acres of regeneration harvest from lodgepole and grand fir/cedar/hemlock to larch, and 84 acres of larch would be converted to aspen. Overall, the result is a positive trend towards the HRV in the larch type. White pine as a cover type is not affected, because the establishment of regeneration on 543 acres would be a mixture of larch, white pine, and Douglas-fir. It is not desirable to establish new plantations dominated by white pine due to the risk of blister rust, even when using rust-resistant planting stock.

Table 15. Forest type distribution in relation to HRV for VRU 5

Forest Type	Existing	HRV	Alt. 2	Alt. 3
Aspen	0.4%	-	0.6%	0.4%
Douglas-fir	10.5%	7-15%	10.5%	10.5%
Grand Fir/Cedar/Hemlock	23.6%	15-29%	22.7%	23.2%
Larch	26.4%	37-73%	27.8%	27.3%
Lodgepole	23.7%	-	23.0%	23.2%
Non-Forest	<0.1%	-	<0.1%	<0.1%
Ponderosa Pine	0.2%	-	0.2%	0.2%
Birch/Alder	<0.1%	-	<0.1%	<0.1%
Subalpine Fir	12.1%	-	12.1%	12.1%
White Pine	3.1%	8-16%	3.1%	3.1%
Total	100.00%		100.0%	

Table 16 displays the changes to age class as a result of the action alternatives. The changes are similar at the analysis area scale, and therefore are not displayed.

Table 16. Age-class distribution in relation to HRV in VRU 5

Age Class	Existing	HRV	Alt. 2	Alt. 3
0-40 yrs (early seral)	15.5%	10-20	17.1%	16.7%
41-100 yrs (mid seral)	38.8%	15-35	37.8%	38.1%
101-150 yrs (mature)	21.6%	10-30	21.8%	21.8%
over 150 yrs (late seral)	9.9%	25-55	10.1%	9.9%
Multi-aged	14%		13.0%	13.3%
Non-forest	<1%		<1%	<1%

Prescribed burning to enhance wildlife forage would occur on 468 acres. Fuels treatments using underburning and jackpot burning would occur on another 71 acres. Additionally, approximately 2,000 acres of silvicultural treatment (thinning, regeneration harvests) would result in an increase of light to the understory, stimulating vegetative growth.

Prescribed burns and fuels treatments employing burning would result in a short-term reduction in species such as blue huckleberry, buffalo berry, serviceberry, snowberry, Rocky Mountain maple, and pinegrass. However, under the light to moderate burning conditions that would be in

effect, all of these species would to return to at least pre-fire levels within 3 to 5 years. All of these important wildlife foods are adapted to fire (Smith and Fischer 1997), and in fact many are fire-obligates.

In regenerated areas, those plants associated with the early successional stages would be reestablished. Populations of plants favoring sunlight are currently poorly represented. These plant communities would become reestablished in response to increased sunlight, decreased competition, and seedbed preparation. The planted coniferous trees are expected to become established within 5 years of harvest completion, with crown closure anticipated by year 20, by which time understory production will have decreased.

Where commercial thinning is proposed, plant species associated with early successional stages are not expected to become as widely established as with regeneration harvest. With these types of harvests, crown removal is considerably less and growing space for new establishment of vegetation is less suitable. It is expected that following treatment the existing understory vegetation would continue to dominate these sites and would likely benefit from any associated underburning that might be planned in the future. Mechanical fuels treatment (i.e., excavator piling) could have some short-term effects on plant reestablishment but no adverse effects in the long run.

Units planned for pre-commercial thinning would increase sunlight to the forest floor and stimulate growth of existing vegetation. Since no mechanized ground-based equipment would be used, there would be no soil scarification and establishment of new vegetation is not anticipated.

Release of quaking aspen, as discussed above, would result in an increase in available browse from this species on 84 acres of release treatment, as well as additional acres of aspen found within salvage and commercial thinning treatments.

Old Growth

Direct and Indirect Effects. Stands classified as effective or replacement old growth, both designated and undesignated, would not be affected by any proposed activities. All harvest units would be designed to be at least 300 feet from any old growth stand, in order to eliminate the potential for edge effects created by removing tree canopy. Roads opened for timber harvest activities would restrict public access, minimizing the potential for snag loss from firewood harvesting. No proposed temporary roads are within or adjacent to old growth.

Road Closures and Decommissioning

Direct and Indirect Effects. Roads being proposed for decommissioning with this project were categorized as being of low or moderate value to timber management in the roads analysis process. Any roads proposed for decommissioning or storage following all post-treatment activities would eventually provide forest cover, although they would likely go through a prolonged period of grass, forbs, and/or shrub dominance. Placing roads in storage would restrict access to some areas, making fire suppression and stand-tending operations such as pre-commercial thinning more difficult and costly. While road decommissioning results in motorized access being unavailable for the foreseeable future, putting a road in storage status allows for motorized access sometime in the future, if needed.

Effects Related to the Key Issues

Fragmentation

Direct and Indirect Effects. Units 40, 41, and 60 were identified as having the most potential to increase fragmentation during public scoping. Unit 41 was subsequently dropped for reasons having to do with soils, logging systems, and unit size. Units 40 and 60 together total 57 acres. Unit 40 is a mixed stand of lodgepole and Douglas-fir with mortality in the lodgepole and plantations on two sides, while unit 60 is a high risk lodgepole stand on the north end of a several hundred acre patch of high risk lodgepole. Harvest of these units would increase or at least accelerate the development of more edge into relatively large patches of forest, thereby increasing fragmentation. However, given the condition of the stands in terms of their lodgepole species composition and susceptibility to mountain pine beetle attack, this effect would likely occur in the next 10 to 20 years under no action, especially in the case of Unit 60.

Regeneration Harvest Units Greater Than 40 Acres

Direct and Indirect Effects. Units 49 and 50 would form an opening totaling 126 acres under the proposed action. The stands forming these units are lodgepole pine that is breaking up due to an ongoing mountain pine beetle infestation, which has killed about 25 percent of the stand. These dead trees are now in the process of falling to the ground. The surviving trees are susceptible to attack, and it is expected that the stand will be at least 80 percent dead within the next several years.

A larger opening was designed to produce the following benefits:

- Reduce the potential for increased blowdown from harvest of the timber—the unit is exposed to the prevailing winds and cutting strips into the stand would only increase the ongoing blow-down of trees.
- Increase the economic viability of logging systems—expensive helicopter and skyline systems would be used on 86 of the 126 acres; also, allowing harvest in one entry would allow Unit 49 to be entirely logged with a less expensive ground-based system, instead of a combination of ground-based and skyline as in Alternative 3.
- Increase the realization of economic value from salvage of dead and dying lodgepole—harvest in one entry would maximize the capture of the value of dead trees, and trees expected to die before the next entry, which would be possible in 20 years (time needed for the development of hiding cover) in regeneration harvest units.
- Management activities would be accomplished in one entry rather than two.
- There would be a larger and more complete treatment of dead and dying fuels along Road 472, and near private residences along the Yaak River.
- A larger regeneration patch size would be more characteristic of the historic range of variability.

Alternative 3

Proposed treatments are similar to the proposed action with the addition of a defensible space treatment that would remove trees generally less than 12 inches in diameter along the Long Meadows Road, and the dropping of the release treatment for quaking aspen (Units 57 and 57a). The acres of clearcut with reserves and seedtree with reserves in this alternative are less than the proposed action (419 acres versus 543 acres in the proposed action). The acres of ecosystem burns, wildlife burns, thinning, and precommercial thinning are the same as the proposed action.

Alternative 3 contains the same activities as the proposed action with the following changes:

- Units 40, 57, 57a, and 60 are dropped; MA 14 is not affected by timber harvest.
- The opening size of 40 acres is not exceeded by breaking up Units 49 and 50 into three 20-acre units with 600-foot-wide corridors between them (meets MA 11 recommendations for whitetail deer and moose habitat).
- Underburning was prescribed instead of grapple piling on approximately 230 acres.

All proposed timber harvest would occur in VRU 5, and essentially all precommercial thinning. Ecosystem burns would occur in VRUs 2, 3, and 5. Wildlife habitat burns would occur primarily in VRU 5; with some in VRU 9.

Effects Related to the Purpose and Need

Forest Structure and Composition

Direct and Indirect Effects. Alternative 3 would convert 124 acres less of high risk and dead lodgepole pine to western larch and white pine dominated stands, by addressing the fragmentation and opening size issues. Effects of regeneration harvest in stands where larch is a minor component (319 acres) would be the same as under the proposed action as would the effects of precommercial thinning (515 acres) and commercial thinning (509 acres).

Alternative 3 would not release quaking aspen in Units 57 and 57a south of Burnt Creek. These units are part of a large block (several hundred acres) of aspen and mixed conifer, the majority of which is within an inventoried roadless area. These units represent an opportunity to perpetuate some aspen in this area that, without release, will continue to succeed to conifers.

The increased use of underburning as fuels treatments under Alternative 3 would potentially cause a greater increase in browse and forage on the additional 230 acres of harvest units employing underburning instead of grapple piling. This would be in addition to the 468 acres of wildlife burns.

Old Growth

Direct and Indirect Effects. Stands classified as effective or replacement old growth, both designated and undesignated, would not be affected by any proposed activities. All harvest units would be laid out to be at least 300 feet from any old growth stand, in order to eliminate the potential for edge effects created by removing tree canopy.

Effects Related to the Key Issues

Fragmentation

Direct and Indirect Effects. Units 40 and 60 were dropped in Alternative 3 to address the fragmentation issue. These units would continue to deteriorate, as the lodgepole pine continues to succumb to mortality and windthrow. Regeneration of western larch and western white pine would not occur, as the seed sources are not present.

Regeneration Harvest Units Greater Than 40 Acres

Direct and Indirect Effects. Units 49 and 50 were redesigned under Alternative 3 to address the opening size issue and standards for MA 11. Instead of one opening of 126 acres, the units were redesigned to maintain opening sizes consistent with Management Area 11 guidelines of 20 acres. Units were also designed to have a minimum of 600 feet between boundaries to provide travel corridors. This redesign would:

- Increase the potential for increased blowdown from harvest of the timber—the units would be exposed to the prevailing winds and the increased edge (from several small openings) would increase the ongoing blow-down of trees.
- Smaller patch sizes would not be characteristic of the historic range of variability for disturbance patch sizes.

Underburning versus Grapple Piling

Direct and Indirect Effects. Underburning replaces grapple piling on 230 acres of post-harvest fuels treatment in Alternative 3 (compared to the proposed action). Intermediate harvest units were identified where it was felt that fire behavior would be conducive to a successful underburn, resulting in little tree mortality and soil disturbance. Underburning in these stands would have the additional effect of stimulating regrowth of favorable understory browse species such as huckleberries, buffalo berry, service berry, and Rocky Mountain maple.

Cumulative Effects of Each Alternative

Alternative 1

The cumulative effects of past actions are included in the existing condition. No action would essentially continue the trends set in motion by previous management actions, including fire suppression. These trends would continue, and have been discussed in the previous section.

Past, present, proposed, and reasonably foreseeable activities were reviewed to determine cumulative effects to forest vegetation. With no action, the condition of unmanaged forest areas would change over time, with continuing tree mortality, declining growth, and wood decay as a result of insect mortality in high-risk stands. For shade-tolerant, late-seral species, such as western redcedar, grand fir, and western hemlock this condition would create available growing space and increased growth. In many areas, this change would continue a trend whereby shade-tolerant species more prone to insects and disease and less fire-adapted replace shade-intolerant species that have adapted to the influences of fire and are generally less susceptible to insects and diseases. No action foregoes the opportunity to restore and/or provide maintenance treatments in western larch, ponderosa pine, quaking aspen, and western white pine in stands where sustainability of these species is at risk. The intensity and severity of the loss of these important species would vary, impacting wildlife (birds, small mammals, etc.) that depend on the habitat unique to these conifer species. Accumulation of fuels from existing and expected deadfall would likely increase the intensity of a fire in the future. Deferring the opportunity to thin previously harvested stands may, in the long term, compromise habitat diversity, tree health, and vigor.

Alternatives 2 and 3

Alternatives 2 and 3 would attempt to restore many of the ecosystem components that have been altered through the cumulative effects of past actions. These actions would probably have an overwhelmingly positive effect on the current condition, which is not meeting many desired conditions for vegetation.

Alternatives 2 (proposed action) and 3 would treat approximately 6 and 5 percent of the entire project area, respectively. A fairly even balance of intermediate harvest with regeneration harvest methods, along with prescribed burning, would create less edge and patchwork units with greater connectivity between forested areas. While there is no specific Forest Plan standard for maintaining forest connectivity, the National Forest Management Act (NFMA) does direct the Forest Service to maintain or improve biological diversity. Forest connectivity was considered in

design of the alternatives to provide habitat and dispersal opportunities for plant and animal species across the landscape. However, some increase in fragmentation by implementing regeneration harvest is inevitable for the next 20 to 30 years until reforested stands reach a height where edge effects are minimal.

Past Actions and their Effect on Current Conditions. As discussed previously, forests in the project area have developed in close relationship with wildfire. Many of the plants and animals found rely on fire, and the associated ecosystem processes, to sustain the structure, composition, and patterns of vegetation. Fire is also important for maintaining early-seral conifer species, creating openings in the forest, reducing tree competition, maintaining or enhancing old growth conditions, regeneration of lodgepole pine, and recycling nutrients to the soil. The exclusion of fire in the landscape since the early 1900s has had a strong influence on these fire-dependent ecosystems. Based upon findings in the landscape assessment (EAWS) the natural fire regimes in the project area have been altered by virtually eliminating low to moderate intensity fires and creating an environment more conducive to high-intensity stand replacement fire. In fact, District records indicate that since 1931, only 15 percent of the project area has burned, as compared with 65 percent from 1850 to 1931, and much of that 15 percent burned with high intensity fire. This trend is expected to continue in the short term with continued fire suppression.

Although portions of the project area have had little active management history due to the extent of inventoried roadless area, old growth habitat protection, and inaccessibility, substantial harvest has occurred throughout much of the project area. These activities include a variety of management practices, ranging from intermediate harvests (i.e., salvage, commercial thinning) such as the recent Dutch Oven salvage sale, to regeneration harvests (i.e., clearcuts, seedtree, etc.) such as the recent Cool-Otis timber sale, resulting in a mosaic of openings, distinct successional stages, and variable tree densities.

Regeneration harvests have occurred on about 16 percent (7,250 acres) of National Forest lands in the project area and about 15 percent of VRU 5 (6,152 acres), beginning in the 1950s. Many sites within the assessment area have been part of an active timber management program. Much of this began around the 1950s as harvest focused upon salvage of beetle-killed spruce. Subsequent entries in the 1970s through the 1980s focused on reducing economic losses in lodgepole pine stands killed or at high risk to mountain pine beetle infestation. These areas were composed primarily of mature, very dense lodgepole pine stands with western larch and subalpine fir, and have been regenerated to healthy, single- and two-storied sapling and pole sized stands of western larch, spruce, white pine, lodgepole pine, and Douglas-fir. The 1990s regeneration harvests in the Cool Creek and Otis Creek drainages (Cool-Otis timber sale) were concentrated on dense stands of lodgepole or lodgepole-mixed conifer stands having densely stocked, shade-tolerant species. All regeneration efforts from past harvest have been successful, though at varying levels because of the long-trending drought.

Today, these stands consist of sapling and pole-sized trees and provide very high conifer species diversity. Within the next 15 to 20 years, these stands would move into the mid-seral age class, trending towards a closer approximation of reference conditions. This trend is expected to occur in the mid-seral and mature age classes, as well. The relatively high level of young stands reflects the emphasis in late 1970s and 1980s on regeneration harvest in lodgepole pine stands impacted by bark beetles. This type of harvest created a fairly uniform patchwork of openings that are not considered characteristic of reference conditions, due to the increased edge effect and fragmentation. This type of forest management practice also resulted in a loss of snags, down wood, and overstory structure.

In the last decade, the harvest and conversion of mature mixed-conifer stands and the salvage of dead western white pine has been the focus of treatment entries. In areas where shade-tolerant species were the predominant type harvested, both artificial (planting) and natural reforestation have been used to increase the abundance of seral species since they are better adapted to fire. In some cases, mechanical scarification was used to reduce grass competition and create sites for newly planted seedlings.

Intermediate harvests have occurred on approximately 13 percent (5,684 acres) of the project area. These harvests were primarily aimed at salvage of dead or dying trees, removal of blowdown, and overstory removal. Removal of the overstory western larch and western white pine was not consistent with management for historic conditions.

Contrasting Effects of Proposed Actions with Past Actions. The Grizzly Project objectives address concerns for species viability, ecosystem integrity, and sustainability by improving species and structural diversity in a variety of forest settings. As compared with most harvest activities that occurred prior to this past decade, the Grizzly Project places an equal emphasis on intermediate and regeneration harvests to promote historic stand structure and species composition and maintenance of conditions that promote the health and sustainability of forested areas. Treatments are designed to retain greater structure and species diversity, leave more live trees, snags, and coarse woody debris. Where specific concerns occur, some units would be harvested in the winter to protect soils and thin barked leave trees.

In many instances, past intermediate harvest may have removed the largest, most valuable overstory trees to 'release' the developing understory. This practice of removing the most adapted, fire-resistant species with the greatest genetic diversity contrasts with the Grizzly Project where maintenance and promotion of fire-adapted species is a primary objective. With this project, vegetation treatments are expected to improve forest conditions that have resulted from the interruption of a natural fire cycle. Areas would be managed to reduce stand density, improve tree growth, and promote a more open stand structure that is conducive to the potential future use of prescribed fire.

Even-aged stands, with a significant component of uniform, maturing lodgepole pine and increasing fuel loadings, would be replaced as would stands with moderate to high levels of insects or disease. Following harvest, restoration planting would provide an opportunity to increase the amount and distribution of fire-adapted species (i.e., western larch, western white pine, Douglas-fir, and ponderosa pine). In many areas, the sustainability of these species is at risk due to absence of fire-created growing conditions, disease issues, and/or lack of seed source. These treatments would contribute to the overall goal of maintaining historic vegetative patterns through retention of most large, overstory trees, especially western larch, ponderosa pine, Douglas-fir, healthy western white pine, and western redcedar. These concerns are also addressed through proposed treatment of lodgepole pine and Douglas-fir stands that are either currently impacted by bark beetles or are candidates for treatment to reduce their susceptibility.

Unlike past actions, which responded primarily to individual stand treatment needs, proposed activities are a reflection of landscape-level strategies. This effort is directed at trending stand conditions towards a more sustainable and resilient level.

Effects of Ongoing and Reasonably Foreseeable Actions. The ongoing Obermayer Fuels Reduction Project is consistent with the objectives of the proposed action and would help restore fire, and the associated ecosystem processes, to this fire-adapted ecosystem. As discussed previously, fire suppression is likely to continue to contribute to uncharacteristic vegetative

conditions. There would be no cumulative effect to the forest vegetation resource from ongoing and reasonably foreseeable activities, such as road maintenance, weed control, public use of National Forest lands, and outfitter and guide permits.

The mountain pine beetle has been active in many portions of the project area for a number of years. As previously described, mortality in lodgepole pine likely peaked around 1984, but more recent site-specific outbreaks have resulted in mortality levels in lodgepole pine stands that vary from 20 to 90 percent. Whether or not management actions are taken, insects and pathogens will continue to play their role in modifying forest vegetation. Mortality in lodgepole pine as a result of ongoing bark beetle infestation will continue, particularly in the maturing trees that are less vigorous. However, the overall number of acres affected by bark beetles would likely remain the same for the next 5 to 7 years. The Douglas-fir beetle is expected to periodically kill mature overstory trees in areas of uncharacteristic densities and susceptible stand structure.

Large areas of standing dead or down trees can provide a fuel matrix for the rapid spread of wildfires, as was the case with numerous fires that burned in 1994 and 2000 throughout the District. In particularly dry years, insect infestations and mortality could increase dramatically. Bark beetles have the ability and the tendency to affect management options. Where these effects are considered negative, it may be necessary to respond in an appropriate and timely manner.

Combined Effects from Past, Proposed, Ongoing and Foreseeable Actions. Where intermediate harvest (commercial thinning, aspen release, salvage) is implemented, post-treatment conditions are expected to move the project area (VRU 5 specifically) more towards historic conditions than what currently exist, partly as a result of cumulative past actions. The proposed action would increase the level of intermediate harvest in the project area from the existing 13 percent of the project area to approximately 15 percent of the project area. By design, the proposed treatments are expected to make an incremental contribution towards maintaining the desired seral species composition, creating conditions more typical of a mixed-severity fire regime, and trending towards a more open stand structure with improved growth potential. Unlike regeneration harvest, proposed intermediate harvests would not change the successional stage distribution, although the average tree diameter would increase in treated stands. The silvicultural prescriptions prepared prior to implementation provide details of the target stand conditions and unit-specific treatment methodology.

Regeneration harvest (clearcut with reserves, seedtree with reserves) proposed with this project would add 543 acres to the existing 7,250 acres of plantations in the project area, an increase of about 1 percent of the project area. This additional treatment is expected to minimally overlap with these previous actions due to their limited extent, the placement of these treatments on the landscape, and the vegetative and functional recovery of past harvest units. Regeneration harvest would change the early seral (1 to 40 year) age class from 14 to 15 percent. However, because of stand dynamics and natural aging processes, this change would be negligible as many stands in this age class would be moving up into the mid seral (41 to 100 year) age class as well. Following implementation of the proposed regeneration harvest, stand-level improvement in overall seral species sustainability is expected. By treating existing fuels and tending these specific stands towards greater species, age class, and structural diversity, there should be incremental improvement in resiliency to disturbance agents.

Regulatory Consistency

NFMA Consistency (16 USC 1604)

The National Forest Management Act and the implementing regulations require specific findings to be made when implementing the Forest Plan. Those findings include the following:

a. Suitability for timber production. Harvest units proposed on suitable lands have been reviewed by a certified silviculturist and determined that they are located on suitable lands and are capable of being regenerated within 5 years of timber harvest.

b. Clearcutting and even-aged management. The Kootenai NF Forest Plan direction favors use of even-aged silvicultural systems on suitable lands within the management areas proposed for harvest in this assessment. The ID team and the silviculturist have determined that prescribing even-aged systems on specified units is appropriate. The decision path for this rationale is displayed in the Silvicultural Diagnosis in the project record. Many of the target stands would be two-storied, yet would be considered even-aged. In order to meet the purpose and need for the project, some proposed units are prescribed as a clearcut with reserves regeneration harvest. The rationale for choosing this method as the optimum regeneration method is also provided in the Silvicultural Diagnosis in the project record.

c. Vegetative manipulation. The National Forest Management Act provides that timber harvest and other silvicultural practices shall be used to prevent damaging population increases of forest pest organisms and treatments shall not make stands susceptible to pest-caused damage levels inconsistent with management objectives. Harvest of trees provides social and economic benefit, reduces potential losses attributed to insects and diseases, and manipulates forest vegetation to enhance wildlife habitat and/or meet associate objectives. The silvicultural prescription which directs the vegetative management process is designed to meet Forest Plan goals, objectives, and guidelines for forest productivity and wildlife habitat improvement while achieving ecosystem-based management.

Improvement harvest and commercial thinning are proposed for some stands in order to improve tree vigor of the desired leave trees and to maintain or enhance the plant diversity. NFMA provides for these treatments where they increase the growth rate of residual trees, favor commercially valuable species, favor species valuable to wildlife, or achieve some other multiple use objectives.

d. Regeneration potential. The National Forest Management Act specifies that: "timber would be harvested from national forest system lands only where there is assurance that such lands can be adequately stocked within five years after final harvest" (16 USC 1604). Determination of adequate stocking is based on reforestation surveys conducted within a 5-year period following harvest or site preparation. Results of these stocking surveys are compared with the desired and minimum levels identified in a site-specific silvicultural prescription written for each treatment area. Restocking is considered satisfactory when the harvest area contains the minimum number, distribution, and species composition of vegetation specified in the prescription.

Proposed treatment areas may include the use of regeneration harvests in order to rehabilitate affected areas and move them towards the desired future conditions. These harvest openings would be planted or seeded naturally to create a diverse community of plants and trees. The survey records on the District have been analyzed for VRU 5 where treatment is planned. Table

17 demonstrates assurance that these sites can be adequately restocked within the required timeframe.

Table 17. Regeneration success by VRU

VRU	District Plantations Stocked within 5 Years (%)		Acres Of Proposed Regeneration Harvest		
	Natural	Planted	Alt. 1	Alt. 2	Alt. 3
5	91	96	0	543	419

Consistency with 1987 Forest Plan

All proposed treatments in all action alternatives are consistent with Forest Plan standards for timber management, and meet or exceed the standards and guidelines for vegetative management. Forest Plan direction provides that timber management activities will be the primary process used to minimize the hazards of insects and diseases and will be accomplished by maintaining stand vigor and diversity of plant communities and tree species. No treatments are proposed within designated or replacement old growth, and specific design features are included to ensure that no adverse affects to old growth would occur. Designated old growth currently meets standards within the project area and Forestwide.

The following items are specifically mentioned in the Forest Plan for MAs affected by proposed activities:

- Prescribed fire is allowed in MA 2 and MA 11 for purposes of maintaining or enhancing habitat.
- Programmed timber harvest is allowed in MA 11, MA 12, MA 14, and MA 15.
- Precommercial thinning is consistent with MA 11, MA 12, and MA 15

Fire and Fuels

Introduction

Fire will occur within and around the project area as it has for centuries. Manipulation of live and dead fuels is part of the fire triangle (climate, ignition sources, and fuels) that can be manipulated to modify fire behavior. Existing fuel loadings (amount of biomass) and structure (fuel continuity - horizontal and vertical) support the potential for fire behavior that has the potential to support fire behaviors that could result in large scale wildfires as has been experienced in the recent past (Young 2007).

Analysis Area

Project activities in conjunction with past, ongoing, and reasonably foreseeable activities has effects on fuels and fuel continuity; therefore, the project area is sufficient to display effects on the landscape.

Analysis Methodology

Sources of Information

Vegetation and Past Disturbances. The same sources used in the vegetation analysis (previous section) were also used for this analysis.

Weather and Fire Occurrence. Libby RAWS station data was retrieved from Weather Information Management System (WIMS) and historic fire occurrence data was retrieved from the National Interagency Fire Management Integrated Database (NIFMID). Weather data used in fire behavior analysis is for a critical fire day according to historic weather record from the RAWS station. A critical fire day includes temperature of 91 degrees and strong winds at 21 to 40 miles per hour (30 miles per hour was used). Fuel moistures used for analysis 1 hour fuels = 3 percent, 10 hours fuels = 4 percent, 100 hour fuels = 5 percent.

Fire Regimes

Fire regimes were taken from Fischer and Bradley (1987); fire regimes described therein were mapped at the Forest level using habitat types as the mapping unit. VRUs have also been classified as to their dominant fire regimes.

FVS-FFE Model

The Kootenai/Kaniksu/Tally Lake variant of the Forest Vegetation Simulator (FVS) was used for modeling of forest stands. The Fire and Fuels Extension (FFE) was used to model changes in fire behavior and fire effects from proposed treatments, using fire hazard ratings and fuel models as indicators.

Limitations. Data on current fuel loadings were not always available. Fuel loadings predicted by the model generally underestimated current conditions.

Data on current lodgepole pine mortality from the mountain pine beetle was not available. Field visits to lodgepole pine stands indicated that mortality levels are generally higher now than when stand exam data was collected.

Assumptions. Fire/fuels parameters for a severe fire, based on a critical fire day on the KNF, to calculate crowning and torching indexes were as follows:

- Fuel moisture content: 1 hour = 3 percent; 10 hour = 4 percent; 100 hour = 5 percent; 1,000 hour = 10 percent; woody = 70 percent; live = 78 percent; duff = 60 percent
- Weather conditions: temperature = 91 degrees F; winds = 30 miles per hour

Fire hazard rating was based on an algorithm that considers crowning and torching indices (wind speeds required to initiate crown fire and active tree torching). Indices of 40 miles per hour and greater are classed as low; indices of 15 miles per hour and less are considered high. A matrix that considers both indices is used to rate the stand as low, moderate, high, very high, and extreme hazard.

Regulatory Framework

National Fire Plan

The National Fire Plan (USDI and USDA 2000) provides national direction for hazardous fuels reduction, restoration, rehabilitation, monitoring, applied research, technology transfer; and established the framework for a 10-Year Comprehensive Strategy (USDI and USDA 2002). The

four principle goals and implementation outcomes of the 10-Year Comprehensive Strategy pertaining to the National Fire Plan include:

- *Improve Fire Prevention and Suppression*—Losses of life are eliminated, and firefighter injuries and damage to communities and the environment from severe, unplanned, and unwanted wildland fire are reduced.
- *Reduce Hazardous Fuels*—Hazardous fuels are treated, using appropriate tools, to reduce the risk of unplanned and unwanted wildland fire to communities and to the environment.
- *Restore Fire-Adapted Ecosystems*—Fire-adapted ecosystems are restored, rehabilitated and maintained, using appropriate tools, in a manner that will provide sustainable environmental, social, and economical benefits.
- *Promote Community Assistance*—Communities at risk have increased capacity to prevent losses from wildfire and the potential to seek economic opportunities resulting from treatments and services.

Federal Policy

Applicable guiding principles of the National Wildland Fire Policy (USDI; USDA; DOE; DOF; DOC; EPA; FEMA; NAOSF 1995) include:

- Firefighter and public safety as the first priority.
- Recognize and incorporate the role of wildland fire as an essential ecological process and natural change agent into the planning process.
- Fire management plans and activities are based on the best available science.
- Fire management plans and activities incorporate public health and environmental quality considerations.

The Healthy Forest Restoration Act (2003) directs agency personnel to improve forest conditions though fuels reduction activities. The Healthy Forest Initiative (2002) provides administrative reform to aid in accomplishing this task.

Forest Plan

The KNF Forest Plan (USDA Forest Service 1987) provides the overall direction of management activities on the Forest. Forest-wide management goals, as well as management area direction, represent the desired future condition that management actions are designed to achieve. The following are the forest goal and management area direction for the project relative to fire and fuels management.

1987 Forestwide Management Direction Goal

Use prescribed fire to simulate natural ecological processes, prevent excessive natural and activity fuel buildups, create habitat diversity for wildlife, reduce suppression costs, and maintain ecosystems.

Management Areas Direction

Actions proposed in the project area are within Management Areas (MAs) 2, 10, 11, 12, 14, 15, and 21. Each MA has goals, management standards, schedule of management practices, and monitoring requirements. Forest Plan direction in regards to fire suppression strategy for the MAs within the project boundary is to control all fires during the critical fire season. Critical fire season is defined as when the Energy Release Component (ERC) exceeds 39 for the past 4 days and the Burning Index (BI) is 30 or greater, or the 1,000-hour time lag fuel moisture is below 16 percent. Refer to the text box at right for definitions of ERC and BI. During a non-critical fire season, a contain and/or confine strategy may be used in the above MAs if an analysis shows no effect to the area or adjacent MAs, and it is more cost effective to do so. Although the current Forest Plan allows for unplanned natural ignitions to be managed to perpetuate the natural ecological processes in some of the above MAs, there are currently no areas on the KNF that allow for wildland fire use because there are no "approved wildland fire use for resource benefit" plans.

Affected Environment

Fire History and Occurrence

District. The Three Rivers Ranger District had 1,183 fires (involving 47,574 acres) over the last 35 years. Forty were large fires; most fires occurred between April and October. Approximately 62 percent of the fires where started by lightning; 38 percent were human caused.

Project area. The Grizzly Landscape Assessment references large stand-replacing fires in 1889 and 1910 in the project area. The fires of 1889 and 1910 affected 33 and 39 percent of the area, respectively. The total amount of the subunit burned in these 2 years was over 29,200 acres. It should be noted that it appears in the lower Lucky Gulch and along the lower benches of Shine Creek, a fire in the era of 1919 or 1920 either reburned some of the 1910 fire or simply was stand-replacing on its own and is not recorded in the district fire records (this was deduced from onsite stand visits and consistent results of tree boring in lodgepole-dominated stands with other species as well showing the same ages by ring count). Historically, a full range of fire intensities occurred, from non-lethal underburning to stand-replacing crown fires. Fire size tended to be larger since weather and fuels were the only limiting factors.

Energy Release Component - A number related to the available energy (BTU) per unit area (square foot) within the flaming front at the head of a fire. ERC evaluates the contribution of various fuel loadings represented mathematically in the NFDRS fuel model. The day-to-day variations of the ERC are caused by changes in the moisture contents of the various fuel classes, including the 1,000-hr time lag class.

Burning Index - An estimate of the potential difficulty of fire containment as it relates to the flame length at the head of the fire. A relative number related to the contribution that fire behavior makes to the amount of effort needed to contain a fire in a specified fuel type. Doubling the burn index indicates that twice the effort will be required to contain a fire in that fuel type as was previously required, providing all other parameters are held constant.

Existing Fire Hazard and Fire Behavior

Across the project area, the absence of mixed- and high-severity fires has caused a substantial increase in surface fuel loading, understory vegetation and stand density. There are areas with high fuel loadings caused by insects and disease, self thinning and overstory tree mortality in the lodgepole, wind throw, and snow breakage. The loss of the fire-resistant large-tree component has reduced the fire resiliency of many stands. Past overstory removal and lack of fire has resulted in a shift to cedar and hemlock composition in many stands, significantly increasing ladder fuels and

decreasing canopy base height. If a fire occurs in these areas under good burning conditions, it is likely that torching and/or crowning would cause overstory mortality.

Surface fuel loadings vary throughout the project area. In terms of fuels and fire potential, a majority of the closed stands proposed for commercial harvest treatment have fuel loads that are best represented as fuel model 10 (timber and litter), TL 4 (timber litter with small-diameter downed logs) and fuel model 8. Fuel model 5 occurs in more open stands. Areas proposed for ecosystem and wildlife burns are well represented by fuel models 8 and 5, with minor inclusions of fuel models 2 and 10. Fuel models contained within the proposed activity areas are described by Anderson (1982) and Scott and Bergen (2005).

Fire hazard ratings were calculated based upon the potential for individual stands to support a fire moving from the ground into the crowns of the trees, initiating and sustaining a crown fire. Individual trees "torch", providing the ladder for fire to move from the ground to the tree crowns, where stand conditions could sustain a crown fire, where fire moves through the crowns of the trees, independent of fire and fuels conditions on the ground. Torching and crowning also cause fire brands that can spread fire well beyond their source, increasing fire spread to adjacent stands. Crowning significantly limits fire suppression options; suppression personnel must rely on aerial resources or implement other indirect attack techniques. These two aspects of fire behavior are calculated and then combined to determine overall stand fire hazard.

Currently 45 percent of the stands contain horizontal and vertical fuel continuity that have a very high (9 percent) or high (36 percent) chance of causing overstory mortality should a fire occur under severe burning conditions. The remaining stands (55 percent) are rated as moderate risk.

Fuel Models within the Project Area

Fuel Model 2 (Timber, Grass and Understory)
Fire spread is primarily through the fine fuels, such as grass and pine needles. The stand is open where larger pine and Douglas-fir cover one- to two-thirds of the area. Surface fuel loading, less than 3 inches in diameter, averages 4 tons per acre. Surface fuel bed depth is 1 foot.

Fuel Model 5 (Low Brush)
Fire is generally carried in the surface fuels that are made up of litter cast by the shrubs and the grasses or forbs in the understory. The fires are generally less intense because surface fuel loads are light. Surface fuel loading, less than 3 inches in diameter, averages 3.5 tons per acre. Surface fuel bed depth is 0.2 feet.

Fuel Model 8 (Timber, Closed Timber Litter)
A typical stand includes a closed canopy of short-needled conifers, such as Douglas-fir. The compact litter layer consists of needles, leaves and occasional twigs. Surface fuel loading, less than 3 inches in diameter, averages 5 tons per acre. Surface fuel bed depth is 0.2 feet.

Fuel Model TL4 (Timber, Closed Timber Litter)
TL4 is similar to fuel model 8, but with slightly higher spread rate and flame length. The primary carrier of fire is a moderate load of fine litter and coarse fuels; includes small diameter logs.

Fuel Model 10 (Timber, Litter and Understory)
Fuels in this model include greater quantities of dead and down material 3 inches and greater. Any forest type may be considered if heavy down material is present, such as those caused by insects, disease, wind throw, or over maturity. Surface fuel loading, less than 3 inches in diameter, averages 12 tons per acre. Surface fuel bed depth is 1.0 feet.

Environmental Consequences

Alternative 1

Under Alternative 1, lodgepole stands would continue to decline. Current and future mortality in these stands would lead to increased heavy fuel loading over time. Commercial harvest would not be used to reduce crown and ladder fuels; thus, fire hazard rating would not be improved and more acres would likely move into a higher hazard rating class. Fuel loadings in all forest types would continue to increase (as they have for decades) due to fire suppression; fire intensity and

flame length would likely increase, which could limit suppression opportunities. There would be no defensible space created on Long Meadow Road to provide safe access and egress routes in case of a fire. No progress would be made towards the desired condition of restoring historic fire regimes.

Alternatives 2 and 3

In harvest units, restoration of fire regimes involves promoting fire-resistant western larch through harvest activities. In stands that currently have high-risk lodgepole and in stands that only have a minor larch component, seedtree and clearcut with reserve prescriptions would be used. Healthy larch and white pine trees would be left where available and reforestation would focus on the establishment of these species. Thinning would also favor larch and white pine and would reduce crown densities and ladder fuels. Ecosystem and wildlife burning would reintroduce fire to the landscape and reduce fuel accumulations including ladder fuels.

Direct and Indirect Effects. Proposed commercial harvest and fuels treatments would significantly reduce the fire hazard rating by decreasing stem and crown densities and reducing surface fuel loadings. Ladder fuels are significantly reduced through timber harvest and slashing followed by underburning or grapple piling. Table 18 compares the hazard risk ratings before and after activities are completed.

Table 18. Hazard risk ratings

Hazard Risk Rating	Alternative 1	Alternative 2, 3
Very High	9%	0%
High	36%	6%
Moderate	55%	25%
Low	0%	69%

On mixed species stands proposed for seed tree harvest, effects of stand-replacing and mixed-severity fires would be somewhat mimicked by harvest techniques. This would be accomplished by reducing mid and understory cedar, hemlock and grand fir, retaining healthy larch, white pine and Douglas-fir. Surface fuels and the creation of seed beds for the remaining overstory would be accomplished through grapple piling and jackpot burning.

In lodgepole stands proposed for clearcut with reserve, the removal of existing and potential (due to mortality) standing dead lodgepole would reduce expected fuel loads. Current high surface fuel loadings would be decreased during post-treatment fuels treatments.

In stands proposed for commercial thinning, healthy larch, Douglas-fir, and white pine trees would be retained removing ladder fuels in subordinate crown positions and decreasing surface fuels by grapple piling.

In areas where lop and scatter methods are used, natural abatement would occur and a minor increase in surface fuel loadings would occur until naturally abated, depending on various rates of decay. The stands prescribed for this treatment currently do not have heavy surface fuel loadings.

Stands that are precommercially thinned would have an increased fire hazard until the resulting fuels abate naturally. The needles and smaller branches would fall from severed stems after the first 2 to 3 years. Snow pack would help compact smaller fuels, resulting in lower fire potential.

The larger diameter stems would persist for 10 or more years and add to the intensity of a wildland fire.

Ecosystem burning would reduce fuels, competition, and reintroduce fire on 250 acres. Wildlife burning would also reduce fuels, although the primary objective is to increase browse and forbs. These burns would be conducted in the spring or fall under conditions conducive for light to moderate burn intensities and severity. Although a short-term decrease in some species such as huckleberry would be seen in the first 3 to 15 years post-burn, depending on severity, it is expected that on a majority of the area this species would increase and have improved berry production due to decreases in canopy cover.

Alternative 3 includes treatment that would create a fuelbreak along Long Meadows Road by thinning currently high density stands with heavy understory stocking. This would decrease the fire intensity along the road providing safer egress and access if needed during a wildland fire. This treatment augments the fuels reduction work under the Obermayer Fuels Reduction Project.

Cumulative Effects

Activities considered for cumulative impacts are those that modify fire behavior and/or effect suppression capabilities in the analysis area. Refer to the Past Actions section in the EIS for summary tables used in this analysis. The following past, present, and reasonable foreseeable activities are recognized as having potential cumulative effects relating to fire and fuels within the cumulative effects analysis area.

Past Activities

There are primarily two past actions that affect the current fuel conditions: fire suppression and vegetation management.

Fire Suppression. Aggressive fire suppression has been the Forest Service policy since the destructive fire season in northern Idaho and western Montana in 1910. By restricting fire spread through suppression, fuels that would have been reduced by wildfire have been allowed to accumulate, increasing the probability of large, more intense fires.

Based on GIS analysis, about 21,268 acres (or 48 percent) of the analysis area have burned since 1825. Table 19 displays wildfire acres in the analysis area by decade.

Table 19. Wildfire acres in the analysis area

Decade	Acres
1825-1909	17,068
1910-1920	1,603
1921-1930	752
1931-1940	90
1980-1989	57
1990-1994	990
2000	708
Total	21,268

Fire suppression has also affected current conditions by substantially decreasing fire mosaics or patches on the landscape. Historically, fires burned large areas creating a landscape consisting of

a mixture of succession patterns or mosaics, with some of these patches serving as natural fire barriers. With successful fire suppression, the large-scale fire mosaics or patches on the landscape are being lost, creating a more uniform fuel structure with little or no natural barriers to help contain fire growth.

Vegetation Management Activities. Regeneration and intermediate harvests have occurred in the project area since the 1950s. A blowdown event in 1948 initiated a spruce bark beetle epidemic. Much of the regeneration harvest since the late 1960s was implemented to treat lodgepole pine stands affected by beetle outbreaks; other regeneration harvests occurred in mature mixed-conifer stands. Some intermediate harvests removed understory lodgepole and shade-tolerate species, while others removed larger, dominate trees to recover economic value and stimulate release of understory trees. Since 1950, 17 percent of the project area (7,647 acres) has had regeneration harvest and 13 percent (5,813 acres) has had past intermediate harvest.

Timber harvests were generally followed by mechanical piling and burning to reduce slash. Regeneration harvests were regenerated by both planting and natural seed source. Fuels such as needles and branches have slowly accumulated as the stands age. Heavier fuel loadings occur in stands that did not have post harvest fuels treatments.

These harvests have created their own vegetative mosaics on the landscape, especially the regeneration harvests. On a much smaller scale, past regeneration harvest has made incremental changes in disrupting lodgepole fuel continuity. Road building associated with past timber harvest has provided accessibility for fire suppression forces.

Ongoing and Reasonable Foreseeable Activities

The Obermayer Fuels Reduction Project will treat 1,056 acres within the project area. The project will be beneficial in modifying fire behavior and reducing fuel loadings, and will increase suppression capabilities and reduce fire intensity if a wildfire occurs in the area.

Routine maintenance of roads can result in minor amounts of fuel being generated in road clearing activities. This material is generally chipped and does not materially add to forest fuels. Road maintenance and good access can increase the efficiency of fire suppression activities.

The exclusion of wildfire from forest stands would continue to contribute to the increase in fuel loadings. Down and dead fuels would continue to accumulate. There would be continued growth of ladder fuels. Crown fires are dependant on this sequence of available fuels starting from the ground surface to the canopy. The existence of these fuels could accelerate initiation of crown fires in these stands. Fire suppression would have the cumulative effect of increasing fuel loadings.

Routine maintenance of trails generates minor amounts of ground fuels. Routine maintenance of developed and dispersed recreation sites can generate some fuels, but these are generally hand piled and burned. These activities would not have a cumulative effect on forest fuel loadings. Seasonally, recreation activities such as hiking, camping, hunting, and fishing have contributed to the incidence of person-caused forest fires, but most of these are suppressed quickly. These activities would not have a cumulative effect on forest fuel loadings.

Firewood gathering involves the cutting and removal of dead or dying trees and removes a minor amount of forest fuels. These activities have not had a significant effect in reducing fuel loadings.

There are no corporate timberlands in the project area, and much of the private property is in riparian areas along the Yaak River. Recent large fires have encouraged residents to treat their land through thinning, harvest, and prescribed fire. Over the extent of the project area, these activities have a very slight reduction in forest fuel loadings.

Combined Effects from Past, Proposed, Ongoing and Foreseeable Actions. The combined cumulative affects from past actions and the ongoing and foreseeable actions would be a reduction of fuels, trending the project area toward a more diverse age class structure, and breaking up of vertical and horizontal continuity of the fuels bed in treated areas. If the current policy of fire suppression continues, fuels would increase in the project area overall. However, in treated stands the changes in the fuel bed from management activities would contribute to reduced fire behavior conditions.

Regulatory Consistency

Alternatives 2 and 3 (action alternatives) comply with the Forest Plan and desired condition for fire and fuels as outlined in this report, and meet direction provided in the National Fire Plan and objectives of the Healthy Forest Restoration Act.

Air Quality

Introduction

This analysis discloses the potential air quality effects of the alternatives considered. Smoke produced from the prescribed burning of timber harvest residue and natural fuels may have an adverse effect on air quality. The amount of smoke produced is influenced by the same factors as smoke produced by wildland fires. Increasing the utilization of sub-merchantable material can reduce the amount of fuel remaining after timber harvest, thereby reducing the amount of smoke produced. The type and timing of burning, and weather conditions influence the amount of smoke produced (Young 2007a)

Analysis Area

The analysis area for air resource impacts is Idaho Airshed 11 and Montana Airsheds 1 and 2. These airsheds include the project area airshed and airsheds within 62 miles (100 kilometers) of the project area, which may be impacted by project activities.

Analysis Methodology

The analysis was completed to calculate potential impacts on visibility and health concerns to non-attainment areas and Class I Airsheds. The town of Eureka, Montana, is also included due to its proximity to the project area and location in alignment to general wind patterns from the project. The Smoke Impact Spreadsheet (SIS) model was used to calculate particulate matter emissions (PM 2.5) and concentrations downwind of a prescribed fire proposed in both alternatives. SIS conservatively predicts (estimates higher) than actual downwind PM concentrations for use in comparing to state or Federal standards and known health and visibility levels. The prescribed burn in Unit 17 was used in this analysis since it is largest prescribed unit in the project and would therefore produce the most particulate matter. This unit was modeled using an intermediate slash fuel loading during the spring.

Regulatory Framework

Federal, State, and Local Regulations and Standards Pertinent to Fuels Reduction Projects

Federal Clean Air Act. The framework for controlling air pollutants in the United States is mandated by the 1970 Clean Air Act (CAA), as amended in 1977 and 1990 (42 U.S.C. §7401 et seq.). The CAA was designed to "protect and enhance" the quality of the Nation's air resources, and encourages reasonable Federal, state, and local government actions for pollution prevention. State implementation plans (SIPs) are developed by each state to implement the provisions of the CAA. The SIPs describe the state's actions to achieve and maintain the National Ambient Air Quality Standards (NAAQS).

Section 160 of the CAA requires measures "to preserve, protect, and enhance the air quality in national parks, national wilderness areas, national monuments, national seashores, and other areas of special national or regional natural, recreational, scenic, or historic value." Stringent requirements are therefore established for areas designated as "Class I" attainment areas. Class I areas include Forest Service and Fish and Wildlife Service wilderness areas over 5,000 acres that were in existence before August 1977, and National Parks in excess of 6,000 acres as of August 1977. Designation as a Class I area allows only very small increments of new pollution above existing air pollution levels.

National and State Ambient Air Quality Standards. EPA developed the NAAQS for a specific set of "criteria" pollutants designed to protect public health. States can adopt standards even more stringent than the Federal standards. NAAQS are defined as the amount of a criteria pollutant above which detrimental effects to public health (or welfare) may result (Table 20). NAAQS are set at a conservative level with the intent of protecting even the most sensitive members of the public including children, asthmatics, and people with cardiovascular disease. If an area consistently violates one of the NAAQS, that area becomes federally designated as a "non-attainment" area. States must demonstrate to the public and the EPA how a non-attainment area will meet the NAAQS, based upon the control of emission sources. Such demonstrations employ control plans that are part of each SIP, including emissions from prescribed fire. Smoke particles from combustion of wood biomass are small with about 80 percent of smoke particulates being less then 2.5 microns. Smoke particulates less than 10 microns are mostly PM 2.5.

Table 20. Montana and Federal Ambient Air Quality Standards pertinent to the project

Pollutant	Average Time	Montana Standards	Federal Standards
Ozone	1-Hour	0.10 ppm	0.12 ppm
	8-Hour	—	0.08 ppm
Respirable Particulate Matter (PM-10)	24-Hour	150 µg/m^3	150 µg/m^3
	Annual Arithmetic Mean	50 µg/m^3	50 µg/m^3
Fine Particulate Matter (PM-2.5)	24-Hour	—	65 µg/m^3
Carbon Monoxide (CO)	8-Hour	9.0 ppm	9 ppm
	1-Hour	23 ppm	35 ppm
Nitrogen Oxide (NOx)	Annual Arithmetic Mean	.30ppm	0.053 ppm
	1-Hour	0.05 ppm	---
Sulfur Dioxide (SO2)	Annual Arithmetic Mean	0.02ppm	0.030 ppm
	24-Hour	0.10 ppm	0.14 ppm
	1 Hour	0.50 ppm	---

Source: EPA and Montana Department of Environmental Quality.

Regional Haze Rule (1990 Clean Air Act Amendments), 40 CFR Part 51. In 1999, EPA promulgated the Regional Haze Rule (40 CFR 51.308-309), which calls for states to establish goals for improving visibility in mandatory class I areas and to develop long-term strategies for reducing the emissions of air pollutants that cause visibility impairment. Class I areas include wilderness or national parks greater than 5,000 acres which existed on August 7, 1977. The Regional Haze Rule requires states to demonstrate "reasonable progress" toward improving visibility in each Class I area over a 60-year period (to 2064), during which visibility should be returned to natural conditions.

The Regional Haze Rule also requires states to address visibility impairment in mandatory class I areas due to emissions from fire activities. The Preamble to the Rule emphasizes the "implementation of smoke management programs to minimize effects of all fire activities on visibility." The Rule requires states to address visibility effects from all fire sources contributing to visibility impairment in mandatory class I areas (Dzomba and Story 2005). Montana is developing their Regional Haze State Implementation Plan; the Forest Service will help with the fire emissions portion.

The Interim Air Quality Policy on Wildland and Prescribed Fires (U.S. EPA 1998). The Interim Policy suggests that air quality and visibility impact evaluations of fire activities on Federal lands should consider several different items during planning (U.S. EPA 1998). In a project-level NEPA document, it is appropriate to consider and address to the extent practical, a description of applicable regulations, plans, or policies, identification of sensitive areas (receptors), and the potential for smoke intrusions in those sensitive areas. Other important disclosure items include applicable smoke management techniques, participation in a basic smoke management program, and potential for emission reductions. Typically ambient air quality, visibility monitoring, and cumulative impacts of fires on regional and sub regional air quality are not explained to the same level of detail. Ambient air quality and visibility monitoring (for class I areas) are typically done collaboratively with the states. Impacts to regional and sub regional air are addressed operationally through a coordinated smoke management program. The EPA urges states to develop, implement, and certify smoke management programs that meet the recommended requirements of the Interim Policy. If a "certified" program is in place and smoke exceeds the particulate standard, it may not be considered a violation by EPA (Dzomba and Story 2005).

State Regulations. All open burning in the State is regulated by the State of Montana Air Quality Bureau. Major prescribed burners, including the Forest Service, have formed the Montana/Idaho Airshed Group (formally known as the Montana Airshed Group). Through a Memorandum of Understanding with the Montana Air Quality Bureau, this group has established a smoke monitoring system that provides daily air quality predictions and restrictions to its members. To accomplish this, the Airshed Group has a monitoring unit consisting of meteorologists and technicians that use weather forecasts, balloon soundings, burn plans, and air quality conditions to determine, on a daily basis, the need for restrictions on prescribed burning. The Forest Service is issued an annual permit to burn by the Montana Air Quality Bureau. Issuance of this permit is based on participation and compliance with burning restrictions issued by the Montana/Idaho Airshed Group. Prescribed burning is reported to the Airshed Coordinator daily; if ventilation problems are forecasted by the monitoring unit, prescribed burning is either restricted by elevation or curtailed until good ventilation conditions return.

Local Regulations. The Forest Plan provides the direction for management activities on the Kootenai National Forest. Forestwide management goals and specific management area direction

embody the desired future condition that management actions are designed to achieve. The following goals and standards are applicable to the Forest as a whole, followed by management area direction specific to the project area relevant to air quality.

Forest Plan goals:

- Maintain the excellent air quality on the Forest.
- Protect local and regional air quality by cooperating with the Montana Air Quality Bureau in the Prevention of Significant Deterioration (PSD) program and State Implementation Plan (SIP). Requirements of PSD and SIP and the Montana Smoke Management Plan will be met.
- Prevent long-term deterioration of the air quality, classified as Class I for the Cabinet Mountains Wilderness, and Class II for the rest of the Forest (Forest Plan, p. II-6)

Forest Plan Standards:

- Activities on the Forest will meet State Air Quality Standards, and the Forest will cooperate with the State in meeting the requirements of the SIP and Smoke Management Plan (Forest Plan, p. II-26).

The project proposes burning in the following management areas: MA 2, Roadless Area Recreation; MA 10, Big Game Winter Range; MA 11, Big Game Winter Range/Timber; MA 12, Big Game Summer Range/Timber; and MA 14, Grizzly Habitat/Timber. The air resource standard for all MAs is to comply with the Smoke Management Plan published by the Air Quality Bureau of the Montanan Department of Health and Environmental Sciences and administered by the Montana State Airshed Group.

Affected Environment

Montana is divided into 10 airsheds by the Montana State Air Quality Bureau. The project area lies entirely within Airshed 1. Smoke produced within the analysis area would most likely be carried in an easterly direction by the predominantly westerly, synoptic-scale, wind flow pattern that influences western Montana.

Air Quality/Pollution

Airshed 1 air quality is influenced predominantly by smoke and dust originating from areas located to the west, the general wind flow direction for the area. This includes grass burning on the Rathdrum and Palouse Prairies, located between Sandpoint and Lewiston, Idaho, as well as other agricultural areas in Washington and northern Oregon. Industrial emissions and those from internal combustion engines add to the level of regional haze and air pollution load. Prescribed burning of logging residue by private and other government entities adds wood smoke to the air mass. Wildland fires burning as far west as the coastal range of Oregon and Washington also contribute to air quality degradation. Dust, originating from tilled farmland during dry windy weather, can add to local haze and reduce air quality.

Under the current State and federal rules, wildland fires are considered natural events so the smoke they produce is not considered as a cause of violations of air quality standards or visibility protection goals. Conversely, prescribed fires are considered active management so the smoke produced is considered as an impact on air quality and visibility standards. Non-attainment areas addressed in this report are Libby, Kalispell, Whitefish, Columbia Falls, and Thompson Falls, Montana. Eureka, Montana is also included in this analysis as a sensitive area due to it location.

The project area is not in a non-attainment area; therefore, a conformity determination is not required for this analysis.

Smoke Dispersion

Smoke dispersal is usually best during the spring and early summer because daytime heating and general wind flows help smoke rise above ridgetops and into the free air winds where it is diluted and dispersed. Stable high-pressure systems that often occur during late summer and fall, hamper the vertical motion of air and reduce the smoke dispersion potential. Infrequent low pressure systems also move through the area during the summer and early fall and improve smoke dispersal until high pressure re-establishes. As the heat of summer changes to milder daytime temperatures and nighttime temperatures begin to drop, air quality begins to deteriorate as nighttime inversions become more prevalent. Smoke is trapped in valley bottoms until adequate heating breaks the inversion later in the day. Weather patterns begin to change during the fall with periodic cold front passages being interspersed with periods of stable high pressure. These cold fronts are often dry, but can bring substantial moisture. Wind associated with these cold fronts provides good ventilation, but also increase the risk that a prescribed burn may escape control. The late fall often marks the return of wet, foggy, and cloudy weather to the analysis area. During this time, periods of good ventilation occur during fontal passages, but valley inversions often hamper the dispersion of smoke. Winter weather is very similar, with smoke dispersion being poor.

The mountainous topography of the analysis area also influences the dispersion of smoke. Smoke produced at higher elevations is nearer to the free air winds that occur at and above ridgetops, so dispersion is usually better than at lower elevation. Conversely, smoke produced at lower elevations is more likely to be effected by valley inversions and must rise farther to enter the free air wind. Burns on south exposures are more likely to be effected by local thermal winds than those on north slopes. Burns on slopes exposed to the prevailing wind would have better smoke dispersion than those located on the lee slope.

Smoke dispersal is best when the daytime heating is greatest. This usually coincides with the period of greatest atmospheric instability for the day. Free air winds penetrate into lower elevation at this time resulting in good vertical motion and smoke dilution. These conditions generally occur from 13:00 to 18:00. Smoke dispersal is usually poor for nighttime burning due to the increase in atmospheric stability as cool air pools in valleys. This process also results in the development of valley inversions.

Visibility at Class I Areas

Certain wilderness areas and national parks established before August of 1977 were designated as Class I areas. A Class I designation allows only very small increments of new pollution above already existing air pollution levels. The CAA amendments of 1977 included a program for prevention of significant deterioration of air quality, generally referred to as the PSD program. This program is to prevent areas currently having clean air from becoming more polluted. The Bob Marshall Wilderness, Glacier National Park, and the Cabinet Mountains Wilderness are all Class I areas.

Naturally occurring visual range in the East (United States) may be between 105 to 190 kilometers (65 to 118 miles), while natural visual range in the West is between 190 to 270 kilometers (118 to 167 miles) (Interim Air Quality Policy on Wildland and Prescribed Fires, U.S. EPA 1998). The existing condition of the representative standard visual range for the Class I areas of concern for this project is shown in Table 21.

Table 21. Standard visual range of Class I areas of concern in the project area

10th percentile	50th percentile	90th percentile
Cabinet Mountains Wilderness		
88 kilometers (55 miles)	160 kilometers (99 miles)	228 kilometers (141 miles)
Bob Marshal Wilderness		
97 kilometers (60 miles)	178 kilometers (110 miles)	249 kilometers (154 miles)

Source: (http://www.fs.fed.us/r6/aq/natarm/r1/cabinet_mtns_ct.htm) and (http://www.fs.fed.us/r6/aq/natarm/r1/bob_marshall.htm)

The interpretation of these percentile figures is as follows: For the Cabinet Mountains Wilderness, on 10 percent of the days monitored, visibility was 55 miles or less, which also means that on 90 percent of days monitored visibility was greater than 55 miles. On 50 percent of the days monitored visibility was 99 miles or less, which also means that on 50 percent of days monitored visibility was greater than 99 miles. On 90 percent of days visibility was 141 miles or less, which also means that on 10 percent of the days monitored visibility was greater than 141 miles.

The degree of visual impairment and the amount of airborne pollutants resulting from the burning of wildland fuels is undoubtedly less than it was prior to the advent of effective fire suppression. Conversely, pollutants from other human related sources have increased during the same timeframe. There is no historic data for comparing the existing situation to the historic situation.

Monitoring

The Forest Service is a member of the Montana/Idaho Airshed Group, which monitors air quality on a daily basis during burning season. The Monitoring Unit is activated when prescribed fire activity begins in the spring and continues until the end of November when the open burn season closes. The amount of burning allowed for any given day is based on this monitoring and forecasted weather conditions. Air quality is monitored daily at several locations within the area covered by this group. The amount of burning allowed within each airshed is tied directly to the daily monitoring of ambient air quality. The process of monitoring and forecasting has been effective at achieving the Airshed Group's objectives, which are listed in the Montana/Idaho Smoke Management Agreement.

One objective is to minimize or prevent accumulation of smoke during the fall prescribed burning season when burning is necessary for conducting accepted forest management practices such as hazard reduction, site preparation, and wildlife habitat improvement. This is done by prohibiting or restricting burning at times and places where stagnant weather conditions result in poor smoke dispersion, and by conducting prescribed burns when ventilation and air quality conditions are good. The development of alternative methods is encouraged when such methods are practical.

A second objective is to develop a smoke management plan for reporting and coordinating burning operations on all forests and rangelands within Montana and Idaho. Guidelines in the plan will be based upon technical information currently available on smoke dispersion and on state and Federal air quality regulations.

The third objective is to improve the smoke management program through regular review and evaluation. One or two general meetings of members are held annually to exchange ideas, review operations, and offer suggestions for improving the program.

Fugitive Dust

Air quality is affected locally by fugitive dust produced by vehicular traffic, especially on native surface roads. The silt content of the road surface layer, the distance traveled, the weight and speed of the vehicle, and weather conditions, influence the amount of dust produced. Paved roads produce a relatively smaller amount of dust than do native surface roads, especially during dry weather.

Environmental Consequences

Particulate matter air pollution refers to microscopic airborne particles made up of dust, dirt, soot, smoke, sulfates, nitrates, and liquid droplets. PM can vary in size, but according to the EPA, particles less than 2.5 micrometers in diameter (PM2.5) are believed to pose the greatest risks to human health. Due to the small size of PM2.5, it can travel longer distances and has a longer life than coarse particulate matter.

Smoke particles from the combustion of woody biomass are small, with about 80 percent of smoke particulates being less than 2.5 microns. Health problems can be cause by PM 2.5 especially for people suffering from cardiopulmonary illnesses. Federal Ambient Air Quality Standards are set at levels intended to protect public health. EPA issued official designations for the PM 2.5 standard on December 17, 2004, and made modifications in April 2005; prior to that time only PM 10 was monitored. Currently, the State of Montana has not adopted a more stringent standard than Federal regulations recommend.

Particulate concentrations that exceed health standards may occur for several miles downwind of prescribed burns. Smoke from prescribed burns may impact Class I wilderness areas and national parks, diminishing scenic vistas. The Montana DEQ created the smoke categorization for human health and visibility with a PM 2.5 pollutant standard index (see Table 22).

Table 22. Visibility and PM particulates

Categories	24 hour PM2.5 (µg/m3)	8 hour PM2.5 (µg/m3))	1 hour PM2.5 (µg/m3)
Good	0–15	0–22	0–40
Moderate	15–40	22–58	40–80
Unhealthy for sensitive people	40–65	58–93	80–175
Unhealthy for all people	65–150	93–215	175–300
Very unhealthy	150–250	215–358	300–500
Hazardous	>250	>358	>500

The direct effects of prescribed burning smoke are reduced visibility, and levels of small diameter particulates, specifically PM 2.5 that exceed standards, which is a concern for human health reasons. The indirect effects are the effect of public use in smoke impact areas.

Alternative 1 - No Action

Direct Effects. Impacts from dust, vehicle emissions, and other sources would not change from current conditions. Wildfire would continue to present a risk to the public that may result in damage to both the environment (e.g., loss of wildlife habitat and large trees) and private property.

This alternative would have no immediate direct adverse effects on air quality. If a wildfire were to occur, the potential indirect effects include degraded air quality and reduced visibility. Existing and continued mortality and fuel accumulations would contribute to increased fire intensities and severities. Consumption of the increased fuel loads and understory biomass would increase the amount of smoke emissions. In fact, emissions from wildfire are typically twice those of a prescribed fire on the same acreage due to greater emission factor (Ottmar 2001), fuel consumption, and fire intensity. These emissions would also occur over a period of a few days to several weeks as opposed to intermittent days over several years for a prescribed fire project.

In 2000, wildfire smoke concentrations in Montana were many times higher than monitored previously—including nearly a decade of prescribed fire smoke and wildfire smoke. Based upon 2000, PM 2.5 concentrations can be expected to range between 100 and 600 $\mu g/m^3$ (24-hour average) up to 100 miles from the fire. Also, smoke concentration can increase during the night due to inversions, but may decrease during the afternoons due to dispersion. Wildfire smoke may last for several weeks depending on fire behavior and meteorology. Data is available at http://www.fs.fed.us/r1/gallatin/resources/air/index.shtml.

Alternatives 2 and 3

The amount of smoke emissions resulting from prescribed burning of both natural fuels and logging slash can be reduced by four general methods; fuel loading reduction, fuel consumption reduction, flaming combustion optimization, and impact avoidance. All of these methods are incorporated as part of this project.

Fuel Loading Reduction

To decrease the amount of woody fuel that must be burned, the Kootenai NF has encouraged, through sale contract provisions, the increased removal of material that is smaller than the established utilization standard for a given timber sale. First, purchasers are required to pay for, and therefore encouraged to utilize, top wood smaller than the utilization standard (Special Contract Provision C(T) 6.414). Second, the standard contract allows the purchaser to remove submerchantable material from regeneration harvests without prior consent of the Forest Service (Standard Contract Provision B(T) 3.41). And third, sub-merchantable material may also be removed from commercial thinning units with prior Forest Service agreement.

Reduction in the Amount of Fuel Consumed

The reduction of the amount of fuel consumed by prescribed burning would be accomplished by spring burning when feasible. During this timeframe, larger diameter fuels and the duff layer usually have relatively high moisture contents that reduce the amount of these fuels consumed by prescribed burning.

Flaming Combustion Optimization

Concentrations of logging slash by excavator piling increase the amount of material consumed during flaming combustion and also allows material to be burned in the late fall during cloudy weather when smoke is less obvious and the risk of escape is low. Purchasers are required to construct piles so they are compact and free of excess soil.

Impact Avoidance

Smoke impact avoidance would be accomplished through daily monitoring of airshed conditions. In Montana, the open burning season is from March 1 through November 30. All open burning in the State is regulated by the State of Montana Air Quality Bureau. Major prescribed burners,

including the Forest Service, have formed the Montana Airshed Group. Through a Memorandum of Understanding with the Montana Air Quality Bureau, this group has established a smoke monitoring system that provides daily air quality predictions and restrictions to its members. To accomplish this, the Airshed Group has a monitoring unit consisting of meteorologists and technicians that use weather forecasts, balloon soundings, burn plans, and air quality conditions to determine, on a daily basis, the need for restrictions on prescribed burning. The Forest Service is issued an annual permit to burn by the Montana Air Quality Bureau. Issuance of this permit is based on participation and compliance with burning restrictions issued by the Montana Airshed Group. Prescribed burning is reported to the Airshed Coordinator on a daily basis. If ventilation problems are forecasted by the monitoring unit, prescribed burning is either restricted by elevation or curtailed until good ventilation conditions return. The Forest Service would cooperate with the State in meeting the Requirements of the SIP and the Smoke Management Plan (Forest Plan, p. II-26).

Fugitive Dust

Mitigation measures would be used to reduce fugitive road dust emissions within the area include the use of watering or dust suppressants. Reducing the speed of vehicles can also reduce the localized impacts.

Trained and Qualified Prescribed Fire Practitioners

Individual burn bosses are trained in smoke management techniques prior to qualification. Part of a burn boss's responsibility is to evaluate smoke dispersion and halt burning operations in the event the smoke dispersion is not as forecasted.

Public Notification

At the beginning of each burn season the Three Rivers Ranger District places an advertisement in the local newspaper alerting the public to prescribed burning that may affect local air quality. On days when burning is expected to occur, residents near the burn may be contacted by telephone to make them aware of potential air quality impacts.

All of the PM 2.5 concentrations are well below the Federal Ambient 24 hour standard (Table 23). Many of the areas of concern are located some distance away from the project area. There are scattered homes near the project area. It would be expected that these residences may experience higher concentrations of PM 2.5 during the course of the prescribed burning operations and, depending on diurnal airflow, may be impacted by inversions in the evenings.

The analysis indicates that transport winds, from a direction that would carry smoke towards Cabinet Mountain Wilderness, would occur about 4 percent of the time throughout the year, towards Glacier National Park about 5 percent of the time, and towards the Bob Marshall Wilderness less the 3 percent. If burning occurs on one of these days, smoke has the potential to impact visual quality and would also deliver airborne pollutants to these Class I Airsheds. The effects of visual impairment would be less noticeable during spring weather because visitor use would be limited due to deep snow. The overall probability of impacting the air quality of these airsheds and recreational use is considered low because of the distance from the project area, general wind patterns, and the amount of time the smoke has to disperse.

Table 23. Concentrations of PM2.5 in Areas of Concern

Areas Of Concern	Transport Wind Direction from Project to Location of Potential Impact	Distance from Project to Area of Concern (miles)	24 hour PM2.5 (µg/m^3) Concentration of PM 2.5 at the Area of Interest 0-15 considered good	1 hour PM2.5 (µg/m^3) Concentration at the Area of Interest 0-40 considered good	Percent Probability of Wind Direction Occurrence Based on Average Annual Wild Direction[1]
Libby, MT; non-attainment PM 10, 2.5	S	23 Miles	5	25	4%
Whitefish, MT; non-attainment PM10	SE	64 Miles	<2.3	<12	<3%
Columbia Falls, MT; non-attainment	SE	73 Miles	<2.3	<12	< 3%
Kalispell, MT; non-attainment PM10	SE	75 Miles	<2.3	<12	<3%
Sandpoint, ID; non-attainment PM10	SW	49 Miles	2.4	12	10%
Eureka, MT; sensitive area	NE	38 Miles	3	16	13%
Cabinet Mt. Wilderness Class I Airshed	S	28 Miles	4	7	4%
Glacier National Park Class I Airshed	E	65 Miles	<2.3	12	5%
Bob Marshall Wilderness Class I Airshed	SE	120 miles	<2.3	12	< 3%

1 Based on radiosonde data collected at Spokane, Washington

Cumulative Effects for All Alternatives

Past, present, and reasonably foreseeable activities and their impacts on air quality are difficult to address in terms of cumulative effects. Large fires have occurred near the project area over the past century; however, those effects on air quality are gone and cannot be viewed cumulatively.

Cumulative foreseeable activities that produce pollutants include, but are not limited to, the burning on private lands and public lands, use of fireplaces, dust from unsurfaced roads, wildfires, and so on. The Forest Service would be responsible for establishing burn priorities and the Airshed Group would be responsible to manage all the burning on a given day. Because air quality is strictly regulated, overlapping effects to air quality are minimized.

Alternative 1

If a large wildfire were to occur, the Forest Service and the Airshed Group would probably restrict all regulated burning. However, effects of smoke from a large wildfire could become cumulative with unregulated pollutants in the area, such as smoke from fireplaces and dust from roads. These types of cumulative effects are difficult to measure and predict.

Alternatives 2 and 3

Smoke from prescribed burning is transitory in nature. The effects of the proposed action from smoke are not likely to have cumulative effects with other activities in the airshed given the oversight by the Airshed Group. The groups burn-day determinations only allow burning when criteria allow for good smoke dispersion. Daily regulation of amount of burning is managed to reduce impacts and negative effects of smoke. The number of days to accomplish prescribed

burning in this project would compete with other burning in the airshed on any given day. The Forest Service would be responsible for establishing burn priorities and the Airshed Group would be responsible to manage all the burning on a given day. If air quality is exceeding thresholds when proposed activities are scheduled to occur, implementing either one of these alternatives may result in some delays in burning as a result of this increased demand for "air space."

Regulatory Consistency

Both action alternatives are consistent with Forest Plan direction, which incorporates State and Federal guidelines.

Soil Resource

Introduction

This section discusses the effects to soil productivity. The effects to soil erosion and watershed are discussed in the hydrology section following (Archer 2007)

Analysis Area

Each proposed timber harvest unit is identified as the activity area within the analysis area, as this is the area where potential direct and indirect effects would occur, in accordance with regional direction. The cumulative effects analysis area is the same, as effects are site-specific to the areas affected.

Analysis Methodology

The project area was surveyed by a qualified soils specialist to assess current soil conditions and identify specific design features and restoration activities to ensure compliance with Regional policy and direction related to soil quality (see project record). Findings were integrated into the project proposal to minimize long-term soil impacts (see Alternative 2 in Chapter 2). Where past harvest was identified, existing detrimental impacts were quantified using a combination of professional judgment and line transect results following Howes (2000) protocol. Current soil condition and potential impacts from the project alternatives were evaluated against thresholds provided by the R1 Soil Guidelines (USDA Forest Service 1999). These guidelines were referenced to individual harvest and burn unit boundaries and do not apply to the watershed as a whole. Effects analysis includes the effects of the proposed treatments, including all temporary road and restoration activities.

Regulatory Framework

- Kootenai National Forest Management Plan (p. II-7) has forestwide direction that indicates project planning with heavy equipment operation shall consider effects on soil productivity and where high risk is involved, establish a standard to limit the extent of soil disturbance. Furthermore, site preparation activities should consider alternative methods to minimize impacts to soil productivity.
- The Soil and Water Conservation Practices (SWCP) Handbook (USDA Forest Service 1988) is incorporated by reference in the Forest Plan, describing Best Management Practices (BMPs) to be used in the planning and implementation of timber sale and associated activities. Specific BMPs for this project are described in Appendix D.
- Regional guidance is available from the Region 1 Forest Service Manual for Soil Management (FSM 2500-99-1, USDA Forest Service 1999). Region 1 policy states "Design

new activities that do not create detrimental soil conditions on more than 15 percent of an activity area. In areas where less than 15 percent detrimental soil conditions exist from prior activities, the cumulative detrimental effect of the current activity following project implementation and restoration must not exceed 15 percent."

- The National Forest Management Act (16 U.S.C. 1604) states "timber harvested from National Forest System lands...only where soil, slope, or other watershed conditions will not be irreversibly damaged."

Affected Environment

The project area is within the Cabinet-Yaak ecosystem, which has one of the highest moisture regimes in northwestern Montana and is highly productive given the moderate climate. Forest growth is supported by high rainfall and mild temperatures. Climate is moderated by maritime influences and low elevation. Rainfall averages 36 inches and may increase to over 60 inches annually (USDA Forest Service 2006, Western Regional Climate Center 2006). Soil moisture is also moderated by pervasive mist.

Soil development in the project area is defined by the steep topography and recent retraction of mountain glaciers. The Yaak area has rounded hilltops from the southern extension of continental ice during the last glaciation. On hillslopes, erosion from over-steepened hillslopes has limited soil development resulting in common rock outcrop. Bottomlands have greater soil development and deeper soils where parent material is weathered and fractured. Soils generally are rocky with fragments from underlying bedrock or glacial till. Rock fragments common to the very old Precambrian Belt rock metasediments include siltites, quartizites and argillites (Kuennan and Gerhardt 1995). Field surveys found most of the project area to have argillite-based belt rock (see project record).

Soil productivity is increased from loess deposition. Ash from Mount Mazama was deposited roughly 7000 years ago adding to remnant glacial loess that creates these "ash cap" soils. The silt loam textured ashcap supplements soil productivity by forming a good growing medium, adding water-holding capacity while facilitating adequate drainage. Topsoils typically have ashcap topsoil that ranges from 7 to 14 inches.

Soil depth is shallow to moderate with depths ranging from 20 to 40 inches. Soils within the project area primarily developed in belt rock residuum and colluvium adjacent to Burnt Creek, while soils in the north project area have higher amounts of glacial till. In particular, units along Cool Creek and adjacent to Spread Creek developed primarily in compact glacial till. Rock content averages 10 percent in ash topsoil and 80 percent in subsoil.

Soil drainage is adequate throughout the project area except where glacial till is compact and slope is low. Wet soil areas may occur along toe slopes or benches and along valley bottoms where glacial till was compacted to a greater extent, impeding soil drainage. Units 3, 13 and 13a have these compacted till subsoils.

Current soil conditions throughout the project area are affected from stand replacing fires in 1889 and 1910, historical timber harvest and road building that were initiated in the 1950s. The greatest impact of timber harvest was associated with regeneration harvest and dozer piling that occurred prior to 1990. Soil monitoring on the Kootenai NF in the late 1980s and early 1990s found a distinct drop in harvest related impacts associated with the movement away from dozer piling (Kuennan 2005).

Current soil condition was determined by field reconnaissance to all proposed units. The level of detrimental soil disturbance from past management was detailed using regional thresholds for soil impairment (USDA Forest Service 1999) and professional judgment. Field surveys of planned harvest where past activities have occurred found variable impacts depending on the terrain and level of past harvest (see project record).

Surveys indicate that Units 1, 2, 3, 11, 12, 12a, 18 and 20, have existing past harvest impacts that would require additional implementation and restoration actions to ensure compliance with regional soil standards. Table 24 displays by affected unit the proposed treatment acres the existing level of soil disturbance, and the estimated disturbance from project activities (including restoration actions).

Environmental Consequences

Alternative 1

No adverse impacts to soils would occur. Potential impacts may occur if fire suppression actions are unsuccessful, allowing high-intensity fire to consume increased levels of fuels. These fuel loads could provide potential adverse impacts to soils depending on fire intensity and duration. Recovery of existing impacted soils would continue through natural means (freeze/thaw cycles, root penetration into compacted soils, etc). Litter and duff accumulations would continue to increase, unless removed by wildfire. Overall, trends towards increased soil productivity on those units with existing levels of detrimental soil disturbance would occur, but gradually.

Alternatives 2 and 3

Both alternatives propose treatments that have the potential to affect soil productivity. Each alternative has similar impacts on soils, though Alternative 3 has less risk for adverse affects. Alternative 3 has less risk from timber harvest impacts since roughly 100 acres of timber harvest would be dropped, 20 acres would use cable yarding instead of tractor yarding, and less area overall would have tractor harvest on steep slopes. The alternatives also differ in fuel treatments though the effects on soils may be similar. Alternative 3 uses underburning where possible while Alternative 2 favors grapple piling. Alternative 3 also has roughly 80 more acres for very low impact treatments using lop/scatter methods. These acres are summarized in the Alternative tables in Chapter 2. To limit soil disturbance, a number of project design features were incorporated as shown in Table 24. The effects analysis assumes that the design features and mitigations in Table 24 are implemented.

The primary impacts to soils from the proposed treatments are related to timber harvest and follow-up fuel treatment. Fuels treatment disturbance is related to grapple piling/pile burning and underburning. Underburning is favored for drier forest types, while mechanized treatment using an excavator is typical for the moist sites where slopes are generally below 35 percent. Another result of the activities is the loss of forest canopy associated with timber harvest treatments. Roughly half of the timber harvest specifies regeneration harvest, while the other half is salvage or commercial thinning where a forest canopy is retained. Impacts to soils may occur due to changes in solar radiation and accompanying shifts in understory vegetation. Timber harvest and burning may also incur soil erosion though the abundant groundcover limits erosive overland flows. Field observations found erosion rare and primarily associated with roads and not within timber harvest areas.

The effects of precommercial thinning would be beneficial, increasing fine and coarse woody litter, increasing soil nutrients and ground cover. No adverse affects to soils productivity are expected; therefore, these units will not be discussed further.

General Effects Related to Timber Harvest

The impact from timber harvest activities typically result in compaction and displacement of topsoil from skidding operations and landing construction. The Kootenai NF has monitored soil disturbance over the past 20 years, primarily on activities in previously undisturbed areas using standard best management practices. Data summaries of this monitoring indicate tractor logging has average soil disturbance of 7 percent. Cable yarding operations averaged 2 percent, winter tractor harvesting averaged 3 percent, and slash piling by excavators averaged 2 percent. Fireline construction for burning averaged 1 percent. Helicopter harvesting did not increase detrimental soil disturbance. Overall, monitoring summaries indicate that tractor operations were within regional guidelines of 15 percent detrimental disturbance for treatment units (Kuennan 1998, 2005). Ranges in tractor related soil disturbance typically vary according to soil moisture and machine operator (Grigal 2000, Williamson and Nielson 2000). Most of the compaction occurs within one machine pass, although bulk densities generally do not exceed root limiting bulk densities until three passes (Williamson and Nielson 2000).

Field reconnaissance found effects of tractor-based logging was higher on compact glacial till soils along benches and foot slopes (Units 1, 2, 3, 4, 13, 13a) compared to belt rock controlled hill slopes. Soil disturbance was typically associated with past temporary road building and bench cut skid trails rather than dispersed compaction. Specific restoration activities and design features identified in Table 24 address these existing conditions, and are designed to avoid additional impacts from proposed activities.

The direct effects of harvesting are tied to the amount of mechanical traffic from harvest, yarding and slash piling following treatment. The ash cap soils of the Grizzly project area may compact easily where surface rock is absent in the upper profiles (Page-Dumroese 1993). These ash cap soils may also be susceptible to erosion where soils are displaced and ground cover lost. Based on field observations of the project treatment units, these potential effects appear unlikely due to the strong vegetative regrowth potential. Also, the high rainfall and fog supplement growth with relatively low rainfall intensity (WRCC 2006).

Direct Effects of Tractor Harvesting

Direct effects from tractor yarding are most likely to occur on slopes greater than 40 percent during non-winter periods of operation. Overall, the project design mitigates this hazard by limiting tractor operations to generally less than 40 percent slope (BMPs, Appendix D). Units 40, 43, 45, 49, 50, and 60 have some areas where slopes range from 40 to 50 percent. Specific design features identified in Chapter 2 to delineate these areas as special treatment areas to restrict equipment will avoid detrimental disturbance on these slopes. Overall disturbance in these units would not exceed 15 percent detrimental disturbance, based on past monitoring results (Kuennen, 1998, 2005) and existing levels of disturbance (less than 5 percent existing).

Units 15, 18 and 20 have areas of steep slopes, but are planned for winter harvest where frozen conditions and snow depths would minimize additional impacts. For unit 15, overall disturbance would not exceed 15 percent detrimental disturbance, based on past monitoring results (Kuennen 1998, 2005) and existing levels of disturbance (less than 5 percent existing). For units 18 and 20, existing levels of detrimental disturbance exist due to existing skid trails, and excavated trails. Specific design features for these units include the least impactive treatments (harvest on frozen

or snow covered ground, underburning) to minimize increased detrimental disturbance, and restoration of existing skid trails. Winter harvest was identified due to the amount of subsurface water that would exacerbate rutting and compaction if summer logged. Monitoring on the adjacent Idaho Panhandle NF shows reductions of 3 to 5 percent in detrimental disturbance using winter tractor harvest as opposed to summer tractor harvesting (Niehoff 2002). Restoration activities would occur during the driest part of the year, August 1-September 15, unless otherwise approved by the district hydrologist.

The very moist conditions in the Yaak can increase compaction risk since silt loam soils are more susceptible to rutting and compaction when wet (Page-Dumroese 1993, Seigel-Issem et al. 2005). Most of the soils in the Grizzly project area have high rock content to reduce compactive forces from mechanical equipment. However, Units 3, 13 and 13a have areas where terrain rock is minimal within the ash topsoil and soils are moist given the footslope proximity. To minimize compaction risk, Units 13 and 13a have restricted tractor yarding to frozen soils or sufficient snow depth to protect soils and Unit 3 has seasonal restrictions requiring tractor yarding during the period when soils are dry, August 1 through September 15. Unit 3 has a southern aspect and thus winter logging was not feasible from lack of consistent snow or frozen ground. In addition, Unit 3 has a design feature to identify leave islands where equipment is restricted (special treatment area) around wet areas that provide habitat for sensitive species.

To avoid increasing the amount of compacted areas in Units 1, 2, 3, 11, 12, and 12a, design features identified in Chapter 2 would require the use of existing skid trails where possible to minimize any additional increase in compaction. These units would also require rehabilitation of major skid trails by ripping, seeding and placement of slash to reduce compaction and minimize erosion. Obliteration of existing benched roadcuts in Units 1, 2, 3, 4, 18 and 20 will also contribute to reduced overall detrimental disturbance. While an exact figure is not known for how much credit the reclamation would justify, the overall objective is to remove limits on soil productivity. The negative impacts of roads on soils and ecosystem processes in general are well-documented (Forman and Alexander 1998, Trombulak and Frissel 2000, Gucinski et al. 2001). Gucinski et al. (2001) outline these effects as removing and displacing topsoil, altering soil properties, changing soil microclimate, and accelerating erosion. While the Kootenai area has extraordinary growth potential with high rainfall, the existing skid trails in these units still have compacted conditions and stunted tree growth. Trees are dense and much lower in height with lateral rooting compared to similar aged regeneration off the roadways. While obliteration may have mixed results, the overall impact reduces erosion potential by restoring natural surface and subsurface hydrology (Foltz and Maillard 2004, Switalski et al. 2004). In addition, placing slash on the surface restores groundcover and promotes vegetation growth (Clearwater NF Monitoring, USDA Forest Service 2003) to restore soil processes.

Table 24 on the following pages displays the existing soils condition by unit, the predicted increase in detrimental effects from the proposed activities, and the specific design features identified to mitigate the detrimental effects. The prediction of proposed detrimental effects is based upon monitoring results from Kuennen (1998, 2005) for units with little past disturbance.

Table 24. Existing and predicted cumulative soil disturbance - Alternative 3 shown in parentheses

Unit	Acres	Harvest/Fuels Treatment	Existing Disturbance %	Predicted Disturbance%*	Cumulative Disturbance %*	Project Design Features to mitigate Potential Cumulative Disturbance
Unit 1	17	Tractor/Underburn	10	Estimated <5	Estimated maximum 15%	Changed unit to use old trails, Use old skidding/road template, Rehabilitate skid trails
Unit 2	16	Tractor/Underburn	10	Estimated <5	Estimated maximum 15%	Changed unit to use old trails, Use old skidding/road template, Rehabilitate skid trails
Unit 3	20	Tractor/Spot Grapple	13	Estimated <2	Estimated maximum 15%	Changed unit to use old trails, Use old skidding/road template, Limited grapple piling Rehabilitate skid trails, Seasonal restricted operations
Unit 4	20	Tractor/Grapple	1	9	10	Changed unit to eliminate steep slopes, Use old road template for access, Rehabilitate existing excavated skid trails
Unit 10	9	Tractor/Grapple	0	9	9	Standard BMPs
Unit 11	17	Tractor/Grapple	7	Estimated <8	Estimated maximum 15%	Use old skid trails, rehabilitate skid trails
Unit 12	7	Tractor/Grapple	6	Estimated <9	Estimated maximum 15%	Use old skid trails, Rehabilitate skid trails
Unit 12a	19	Tractor/Grapple	6	Estimated <9	Estimated maximum 15%	Use old skid trails, Rehabilitate skid trails
Unit 13	39	Winter Tractor/Underburn	0	6	6	Winter harvest, underburn
Unit 13a	24	Winter Tractor/Underburn	0	6	6	Winter harvest, underburn
Unit 15	33	Tractor/Grapple (Lop/Scatter)	5 5	6 (4)	11 (9)	Winter harvest
Unit 17	163 (107) (56)	Tractor/Grapple (Tractor/Underburn) (Tractor/Grapple)	3 3 3	9 (8) (9)	12 (11) (12)	Alt. 3 split unit into underburn and grapple units
Unit 18	28	Winter Tractor/Underburn	13	Estimated <2	Estimated maximum 15%	Winter harvest, underburn Rehabilitate existing skid trails
Unit 20	34	Winter Tractor/Underburn	12	Estimated <3	Estimated maximum 15%	Winter harvest, underburn Rehabilitate existing skid trails
Unit 31	5	Skyline/Grapple (Skyline/Lop/Scatter)	3	6 (4)	9 (7)	Alt3 Lop/Scatter
Unit 32	40	Tractor/Grapple	5	9	14	Standard BMPs
Unit 33	20	Skyline/Grapple	0	6	6	Standard BMPs
Unit 34	98	Helicopter/Lop/Scatter/Handpile	0	0	0	Standard BMPs

Unit	Acres	Harvest/Fuels Treatment	Existing Disturbance %	Predicted Disturbance%*	Cumulative Disturbance %*	Project Design Features to mitigate Potential Cumulative Disturbance
Unit 36	8	Tractor/Grapple (Tractor/Underburn)	3	9 (7)	12 (10)	Alt3 Underburn
Unit 36a	13	Skyline/Grapple (Skyline/Underburn)	3 (3)	9 (8)	12 (11)	Alt3 Underburn
Unit 37	64	Tractor/Grapple	0	9	9	Standard BMPs
Unit 40	17 (0)	Tractor/Grapple (No Treatment)	0 (0)	9 (0)	9 (0)	Restrict equipment to slopes<40%, restricted operating season
Unit 42	36	Tractor/Grapple (Tractor/Lop/Scatter)	5 (5)	9 (7)	14 (12)	Alt3 Lop/Scatter
Unit 43	63	Tractor/Grapple (Tractor/Lop/Scatter)	3 (3)	9 (7)	12 (10)	Restrict equipment to slopes <40% Alt3 Lop/Scatter
Unit 44	18	Skyline/Lop/Scatter/Jackpot Burn	0	5	5	Standard BMPs
Unit 45	10	Tractor/Grapple	0	9	9	Restrict equipment to slopes <40%
Unit 45a	20	Skyline/Lop/Scatter/Jackpot Burn	0	5	5	Standard BMPs
Unit 46	15	Skyline/Grapple	0	6	6	Standard BMPs
Unit 47	13	Skyline/Lop/Scatter	0	5	5	Standard BMPs
Unit 49	41 (20)	Tractor/Grapple (Skyline/Lop/Scatter)	3 (3)	9 (5)	12 (8)	Restrict equipment to slopes <40% Alt3 uses Skyline/ Lop/Scatter
Unit 50	86 (20)	Skyline/Helicopter/Grapple (Skyline/Helicopter/Lop/Scatter)	3 (3)	6 (4)	9 (7)	Restrict equipment to slopes<40%
Unit 50a	(19)	(Helicopter/Lop/Scatter)	3	3	6	Standard BMPs
Unit 55	7	Skyline/Lop/Scatter	0	5	5	Standard BMPs
Unit 55a	11	Skyline/Lop/Scatter	0	5	5	Standard BMPs
Unit 55b	13	Skyline/Lop/Scatter	0	5	5	Standard BMPs
Unit 55c	17	Skyline/Lop/Scatter	0	5	5	Standard BMPs
Unit 55d	20	Skyline/Lop/Scatter	0	5	5	Standard BMPs
Unit 55e	31	Skyline/Lop/Scatter	0	5	5	Standard BMPs
Unit 55f	33	Skyline/Lop/Scatter	0	5	5	Standard BMPs
Unit 55g	39	Skyline/Lop/Scatter	0	5	5	Standard BMPs
Unit 57	84	Helicopter/Lop/Scatter	0	3	3	Standard BMPs
Unit 60	40 (0)	Tractor/Grapple (No Treatment)	3 (3)	9 (0)	12 (3)	Restrict equipment to slopes<40%

*These values are estimates based on the assumptions previously stated. Post project monitoring will determine if additional mitigation is necessary to meet soil quality standards.

Harvest practices would implement standard BMPs identified to limit disturbance (Appendix D), plus the specific design features identified in Chapter 2.

For units identified with higher levels of past detrimental impacts, (Units 1, 2, 3, 11, 12, 12a, 18, and 20) estimations for project activity vary according to the levels of mitigation needed to ensure long term soil productivity. For example, Unit 1 has upwards of 5% predicted disturbance compared to unit 3 with 2%. Unit 3 has much higher level restrictions and reclamation activities including more skid trail/road recontouring to restore natural slope processes. These reclamation activities are intended for better overall site recovery. As mentioned above, these figures are not exact, but rather are based firmly on the goal of improving the site condition over current conditions in line with regional policy. In general, the project activity estimates and design feature detrimental and cumulative disturbance are based upon the following assumptions:

- Information specific to quantifiable reductions in detrimental soil disturbance from restoration activities is unavailable (Shovic 2007, pers. comm.), and estimates are based upon existing research (Foltz and Maillard 2004, Switalski et al 2004, Clearwater NF Monitoring, USDA Forest Service 2003) which indicate these activities will improve existing soil conditions.
- In addition to standard best management practices included in Appendix D, additional specific design features identified in Chapter 2 would be implemented to mitigate existing disturbance and potential impacts from activities.
- Use of existing skid trails where possible would reduce the predicted increase (Kuennen, 2005) in compaction by some amount (no monitoring available to predict exact amount).
- Rehabilitation of skid trails and firelines, and obliteration of excavated skid trails would reduce existing levels of detrimental disturbance, and although these activities are not quantifiable, they are supported by research to have beneficial effects and are estimated to reduce the cumulative disturbance sufficiently to meet Regional policy.
- Restoring groundcover (placing slash) over rehabilitated skid trails will improve soil quality by reducing erosion, providing nutrients, and protecting vegetation growth.
- All restoration activities identified will improve existing detrimental soils conditions, meeting regional policy of a net improvement in soil quality.
- Project specific monitoring (Monitoring Plan, Appendix E) would be conducted after harvest, and after rehabilitation operations are completed to determine the amount of detrimental impacts, and to identify additional restoration needs to meet Regional policy.

General Effects of Burning

The proposed burning would not impair long-term soil productivity. The ecosystem burn units A though E and the two wildlife burns G, H and I on Grizzly Peak would lead to increases in mineral nutrients in the short term for 1 to 2 years (Choromanska and Deluca 2002). MacKenzie et al. (2006) suggest that these fire effects may maintain higher nutrient availability in the long term.

Burning in the harvest units may have adverse effects from the combination of harvest and burn impacts (Prietikäinen and Fitze 1995), and the use of burning in primarily dry habitats such as Douglas-fir dominated stands. Burning where thick cedar ingrowth exists may have higher adverse effects. Field data from monitoring recently burned units with thick cedar and grand-fir ingrowth on the Clearwater NF showed a high level consumption of the coarse wood after burning and subsequent high levels of bare soil. Coarse wood was reduced from 60 to 80 tons/acre to 10 to 15 tons/acre in clearcut units with a high predominance of hemlock and cedar in

growth. Recently cut and burned areas within the Grizzly project area showed similar coarse wood levels as the Clearwater with large reductions in duff and litter, but without the persistent bare soil. These effects are not anticipated to occur, as design features for this project would require yarding of tops to reduce activity fuels prior to burning, and burning would be restricted to periods of high soil moisture (greater than 25 percent).

Burn treatments of harvest slash would have less adverse effects by lowering the amount of consumption and not broadcast burning across the unit. Burning during higher fuel and soil moistures would lower consumption. These higher moistures present tradeoffs where soil microbial communities can be adversely affected from deeper heat penetration when burning in wet soils (Dunn et al. 1985, Hart et al. 2005), but may exclude the deep heating and organic matter losses associated with burning heavy fuels during dry times.

Coarse wood is beneficial for continued soil productivity by ameliorating the site after forest clearing. The wood provides microsites for microbial activity, retains carbon on site, and may moderate soil moisture (Graham et al. 1994, Brown et al. 2003). On wet sites such as the western redcedar forest types, Brown et al. (2003) recommend from 10 to 30 tons/acre of coarse wood be maintained after logging to balance soil productivity amelioration while addressing fuel hazard concerns. On the upper end, Graham et al. (1994) recommend from 15 to 30 tons/acre for similar western hemlock habitats. For dry sites, fuels and soils optimums range from 5 to 20 tons/acre (Brown et al. 2003), which is in agreement with ranges outlined by Graham et al. (1994) for Douglas-fir habitats.

Direct Effects of Fuels Treatments

Fuel treatments contrast between the two action alternatives, and are displayed in Table 25. Detrimental impacts to soils are most likely to occur where fuels treatments are implemented with equipment. Although impacts from grapple piling can vary widely based upon implementation variables (soil moisture at time of operation, operator experience), other fuels treatments like yarding tops/lop and scatter, hand piling, and jackpot burning have either very low impact or beneficial effects to soil productivity with organic matter inputs. Monitoring on the Idaho Panhandle NF showed a drop from 30 percent detrimental disturbance from “hot” burns with heavy slash to 1 percent using cool conditions and moistures above 25 percent (Niehoff 2002). The effects of grapple piling, and fireline construction related to underburning in harvest units has been incorporated into the effects displayed in Table 24.

Table 25. Fuel treatment acres by method for the action alternatives

Fuels Treatment	Alternative 2	Alternative 3
Grapple Piling/Burn Piles	692	203
Spot Grapple Piling/Burn Piles	20	45
Hand Piling/Burn Piles	5	5
Underburning	191	393
Jackpot burning	38	38
Yard tops, Lop and scatter	365	445

Underburning impacts where low-severity fire with intermittent unburned areas result, higher fuel complexity and greater preservation of forest duff/litter would ameliorate soils for increased moisture and retained nutrient base. Weed invasiveness would be less by limiting disturbance to the forest floor. Some higher severity fire impacts to soils may occur where high concentrations

of slash are present. This would be primarily related to burning of piles resulting from grapple and hand piling. These piles are typically burned in late fall and winter, when soil moistures are high (greater than 25 percent), reducing potential impacts.

For the dry forest types, fire may complement mineral nutrient processes with short-term increases in mineral nitrogen (N) availability (Certini 2005, Hart et al. 2005). In addition, charcoal may lower the allelopathic effect of phenolic compounds associated with some conifer litter (Deluca et al. 2006). Working in unmanaged forests in western Montana, recent findings by MacKenzie et al. (2006) suggest that charcoal may continue to stimulate the mineralization of Nitrogen up to 50 years after a fire. Thus, the role of fire may be important for long-term soil productivity.

Road-related Impacts

Road-related disturbance includes soil excavation for a total of 2.1 and 1.9 miles of temporary road building of five temporary road segments (Alternatives 2 and 3, respectively). All temporary roads would be returned to contour where soil hydrologic function would remain lower than natural forest for the short term and improve over time as vegetation returns (Luce 1997, Foltz and Maillard 2004). These roads would be considered to be trending towards improvement, meeting regional soils policy requirements. In addition, both alternatives include 30 miles of active road decommissioning (dependent upon funding), 54 miles of committed drainage upgrades (BMPs) that would limit potential soil erosion by dispersing road drainage, and 18 miles of roads placed in intermittent stored service (Appendix B). Approximately 8 miles of intermittent stored service and watershed restoration work would be completed prior to harvest activities (Gus and Pheasant Creeks, roads 902B and 903), with the remaining 22 miles being completed as funding is available. Best management practices would be implemented prior to harvest activities on roads 902, 6084C, 8021 and 8021B to address existing sediment sources. Net positive impacts to soils would occur where road decommissioning is planned and roads are placed in intermediate stored service. These roads would continue to revegetate, lowering overland flow potential. Soil hydrologic function would be set in a positive direct with natural slope processes restored.

The committed rehabilitation and best management practices work would have immediate effects towards improving soils conditions related to sediment production related to roads. As additional rehabilitation work is completed (as funding becomes available), additional improvement would be realized.

Cumulative Effects

Past Actions and their Effects on Current conditions: As described in the Affected Environment section, many of the proposed units have experienced past harvest activities, which resulted in varying levels of detrimental soil disturbance. These conditions were identified and specific design criteria or unit modifications were incorporated to ensure that the cumulative effects of the proposed projects trend towards meeting regional policy. The specific modifications and design features are listed in Table 24, and in Chapter 2 on page 16.

Field sampling (see soil surveys in project record) found approximately 158 acres of proposed harvest units (Units 1, 2, 3, 11, 12, 12a, 18, and 20) with existing high levels of existing soil disturbance where cumulative impacts from the action alternatives could impair long-term soil productivity and result in an adverse cumulative effect. Existing detrimental disturbance on these units is from 6 to 13 percent. Roughly 548 acres have minor soil disturbance from mostly 1950s era select cutting (Units 4, 15, 17, 31, 32, 36, 36a, 42, 43, 49, 50, 50a). Existing detrimental

disturbance on these units ranges from 1 to 5 percent. Past disturbance seemed limited to scattered harvest of bigger trees after the large fires in the early 1900s and white pine blister rust epidemic in the 1950s. The level of existing soil disturbance on these 548 acres is low enough that when combined with the anticipated impacts of the proposed activities, would remain below 15 percent detrimental soil disturbance. Adverse cumulative effects exist where residual harvest effects may complicate recovery from planned treatments, and detrimental disturbance may exceed 15 percent. Units 1, 2, 3, 18, and 20 have the highest residual harvest impacts. Past impacts include bench cut skidding roads and localized compaction.

Contrasting Effects of Proposed Actions with Past Actions: Past harvest activities did not incorporate practices designed to minimize detrimental disturbance. Tractor harvesting occurred on steeper slopes, excavated skid trails were commonly used, dozer piling was a common method for slash disposal and site preparation, and soil moisture limitations were not practiced.

The proposed units were designed to minimize detrimental disturbance from proposed activities, with specific design features and unit modifications identified during the development of the proposed action. Comprehensive field surveys were conducted to determine existing levels of disturbance, and to identify design features to minimize additional disturbance. Units 1 through 4 were redesigned to better utilize existing skid trails.

In the past, coarse woody debris was commonly piled with dozers, removing the vast majority of woody debris. Removal of the majority of this material reduced the availability of nutrients to recycle, decreased erosion protection, and limited incorporation of woody material into the soil matrix. The proposed actions include specific requirements to retain coarse woody material, and limit soils disturbance and displacement to protect these resources.

Specific measures included in the Soil and Water Conservation Handbook and Best Management Practices are standard requirements to protect soil and water quality in all proposed treatments (Appendix D). These practices were not commonly used prior to the 1980s. As a result of these practices, forest monitoring indicates that disturbance levels on tractor harvest units have decreased from close to 30 percent prior to 1990, to less than 10 percent today (Kuennen 2005).

Combined Effects from Past, Present and Proposed Actions: The effects of the proposed actions are associated specifically with the proposed units, and therefore the only cumulative effects would be from those activities that have occurred on those specific sites. These effects are considered and are displayed in Table 24. The only reasonably foreseeable action would be the potential fire suppression activities, which are speculative at best and cannot be quantified for this analysis.

Poor soil conditions in units 1, 2, 3, 11, 12, 12a, 18, and 20 require additional measures (design features) to minimize potential long-term soil productivity impairment. These design features would minimize the short-term impacts, and would result in these units trending towards meeting regional policy. Adverse cumulative impacts from the prescribed burning and precommercial thinning are not expected due to the lack of soil-disturbing activities.

To minimize potential adverse cumulative effects, winter harvest would occur on units 15, 18 and 20 where snow loads are expected to adequately buffer against soil disturbance from mechanized equipment. For units 1 though 4, winter harvesting was not recommended since winter conditions were questionable. The lower elevation and south-facing aspect may not freeze adequately to buffer equipment and thereby lead to higher disturbance than summer activities from harvesting in wet conditions.

For units 1 through 4, unit boundaries were reconfigured to take advantage of existing old road and skidding templates towards lowering additional disturbance from skidding. To further address the poor soil conditions in unit 3, mechanized skidding would be limited to designated skid trails only, and a more restrictive operating season (August 1-September 15) required to lower rutting and compaction risk in this recovering area.

Regulatory Consistency

The impacts to soils would be expected to meet regional guidelines for maintaining soil productivity with the incorporated design features. This assessment is based on field review of all the units by a qualified soil scientist with transect data collected where potential cumulative impacts had the potential to exceed regional thresholds of 15 percent (see soil surveys in project record). Based on field review, numerous modifications to the original proposed units were identified including: dropping units, reworking unit boundaries to lessen road building and skidding, and changing logging systems and fuels management. These modifications are discussed in Chapter 2, and are addressed in the cumulative effects section since much of the project has some impact from past activities. The modifications are project design features towards minimizing potential impacts to soils. No landslide risk was identified for the action alternatives.

Soil conservation practices as identified in the Soil and Water Conservation Handbook, State of Montana Best Management Practices code, and the timber sale contract would be applied (Appendix D). BMP monitoring by Kootenai NF personnel from 1990 to 2001 found high compliance with BMPs. Over this 12-year period, 97 percent of activities rated scored acceptable or better for implementation, and 94 percent of activities rated scored acceptable or better for effectiveness (USDA Forest Service 2002).

Forest Service Guidelines

Under all action alternatives the amount of cumulative detrimental disturbance is expected to meet regional guidelines (USDA Forest Service 1999). Design features and unit modifications identified in Chapter 2 and Table 24 are specifically designed to minimize potential project disturbance to avoid long-term detrimental soil productivity. Monitoring by the Kootenai NF has shown that recent harvest units are consistently below the 15 percent cumulative detrimental disturbance (USDA Forest Service 2005). The silvicultural prescription, the timber sale contract, and the slash disposal contracts would include provisions to retain coarse woody material in the harvest units, which meet the guidelines recommended by Graham et al. (1994).

Forest Plan Consistency

Forest Plan guidelines are met with all alternatives by conducting this environmental analysis, designing logging systems to minimize disturbance, and implementing soil and water conservation practices through design and implementation.

Hydrology

Analysis Area

Figure 2 on the following page shows hydrology analysis watersheds. Watershed boundaries are selected on a basis of stream resources that are of concern for potential impairment and adequate size to have condition surveys.

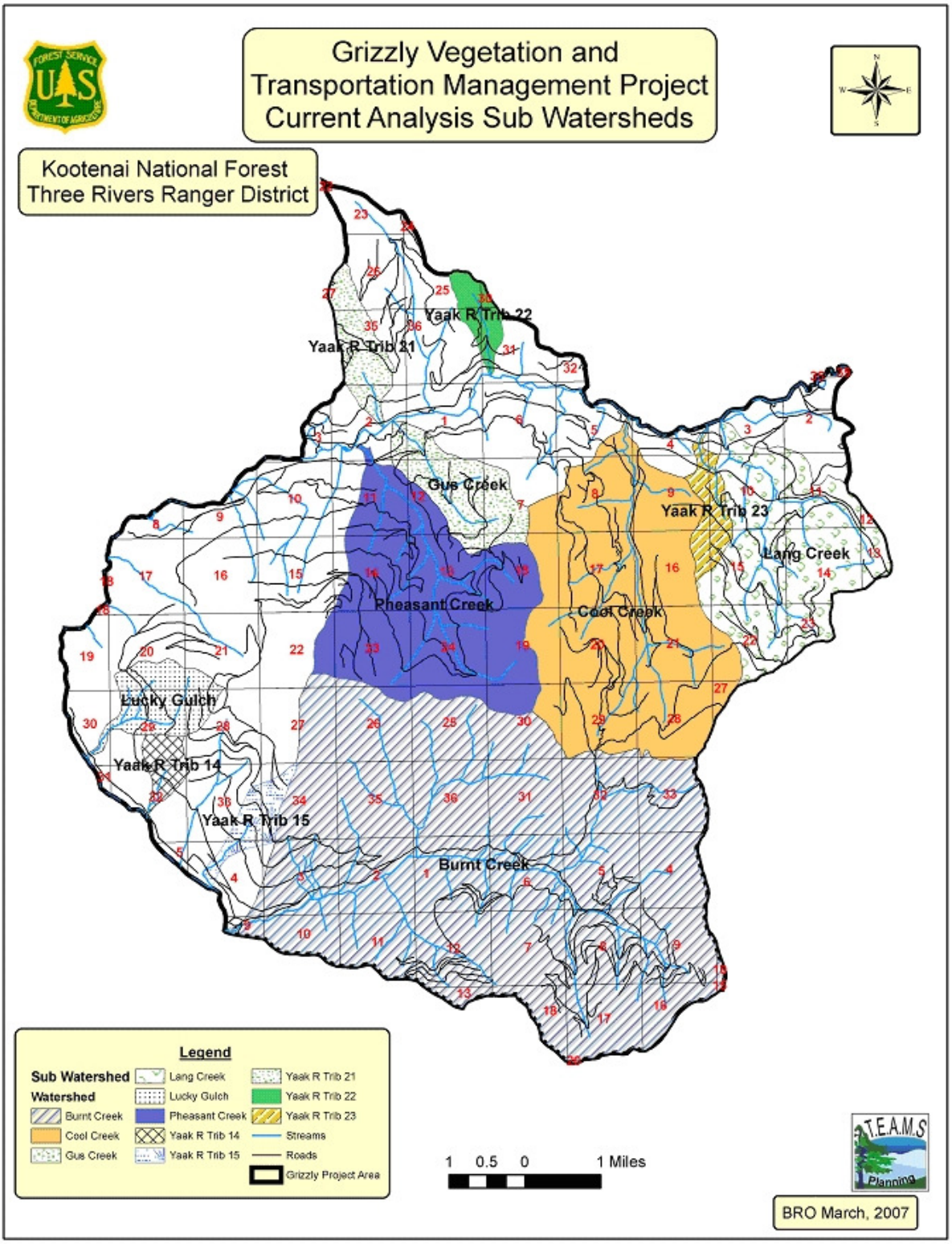

Figure 2. Analysis subwatersheds

These watersheds constitute the analysis area for effects from the proposed treatments, and cumulative effects (Moser 2007). Several units (1, 11, 12, 32, 34, 36, 37, 40, 42, 43, 45a, 45, 49, 50 and 55) are outside of these analysis watersheds, and are directly contributable to the Yaak River, and are almost entirely within first order draws.

No data exists on channel condition or flow regime for these areas. All these units lie on hill slopes immediately adjacent to the main stem Yaak River valley. While all units will have riparian habitat conservation area (RHCA) buffers established, the units range from 300 to 1,500 feet up slope of the valley bottom, spread over a distance of greater than 15 river miles. The Yaak River at a point close to the Whitetail Creek campground, where a now discontinuous USGS stream gage was sited, has a measured drainage area of about 315,500 acres (U.S. Geological Survey 2006). At this scale there would be no measurable effect to the Yaak River, either in terms of flow yield, flow peaks, or water quality, by the proposed action on those units' area that is outside of analysis watersheds. For these reasons, these units will not be considered further in ECA analysis for cumulative effects of the project and these subwatersheds were dropped from further analysis.

Analysis Methodology

Current condition of the watershed was assessed from field notes and data forms of channel stability surveys undertaken previously by the Forest (USDA Forest Service 1976, 1977, 1980 and 1992), and from field notes of sediment source surveys (see project record), primarily of forest road crossings and drainage, conducted by the Forest hydrology staff in preparation for the proposed project (USDA Forest Service 2005a, 2006b).

Direct effects of treatments and roads were assessed using the Water Erosion Prediction Program (WEPP) and its Disturbed Forest modules (USDA Forest Service 2002a and 2002b). This model is designed to calculate sediment delivery into channels at the bottom of forested slopes. WEPP uses parameters of soil type, slope gradient, vegetation cover slope length, and climate records to determine probabilistic erosion rates on a hillslope based on precipitation frequency and intensity data. WEPP is useful as a comparative tool to illustrate differences between action alternatives and baseline conditions. It is not suitable for determining specific erosion rates on a given unit, or within a particular watershed.

An Equivalent Clear Cut Area (ECA) model developed by the Forest in spreadsheet form was used for cumulative watershed effects (CWE) analysis. The model does not quantify effects, either as peak flows or inchannel erosion, but indexes these effects by the normalizing area of each specific activity (i.e., current system road, constructed road, or thinning harvest) to clearcut acreage, within each analysis watershed. ECA values for activity levels to cause concern have been determined for appropriate sized watersheds by Forest staff. Key elements in the model are assumed recovery curves for an activity area, which are based on habitat type (USDA Forest Service 2002a).

Regulatory Framework

Federal and State Guidelines

Section 303(d) of the Federal Clean Water Act requires that states produce a report every 2 years (even years) listing water bodies (streams, lakes, wetlands, etc.) that fail to attain or are not expected to attain water quality standards.

A review of the 2004 (most recent report) 303(d) listed water bodies GIS layers shows one water body (Yaak River, MT76B001_010) that has not been assessed for water quality (Montana Department of Environmental Quality 2004) within the project area. The Environmental Protection Agency (EPA) and the Kootenai NF are currently developing a total maximum daily load (TMDL) for the Yaak River basin (Yaak TMDL) (Montana Department of Environmental Quality 2004)

In a Memorandum of Understanding (MOU) between the Forest Service and the State of Montana, the Forest Service has been designated as the management agency for water quality protection on National Forest System lands. In this MOU, the Forest Service has agreed to follow State water quality standards, primarily through best management practices (BMPs). BMPs are designed to protect water quality and beneficial uses during the implementation of land management activities.

Forest Service Guidelines

The Forest Plan requires adherence to the following guidelines with respect to water resources and management activities: (1) Water yield increases will be limited to that which will protect beneficial uses; (2) soil and water conservation practices will be followed, and actions will meet State of Montana standards for protecting water quality; (3) actions in watersheds with mixed ownership will be modified or delayed if necessary to maintain the watershed condition; (4) sediment yields will not be increased beyond acceptable limits; (5) opportunities to mitigate adverse effects on water-related beneficial uses will be identified; and (6) all actions will comply with the Inland Native Fish Strategy (INFS).

The Soil and Water Conservation Practices Handbook (USDA Forest Service May 1988) is incorporated as a supplemental document to the forest plan. It describes the BMPs that national forests will use when implementing projects that could adversely affect soil and water resources, or water-related beneficial uses. Specific BMPs are identified for this project, and are listed in Appendix D.

INFS establishes guidelines for riparian habitat conservation areas (RHCAs) which are special management areas for perennial and intermittent streams, wetland areas, springs, seasonally saturated soils and landslide prone areas. See the Chapter 3 Fisheries section for a more detailed description of INFS guidelines.

Affected Environment

The affected environment includes the previously identified subwatersheds where activities are proposed that may have an impact on water resources. Table 26 displays the existing condition related to previous treatments and the amount of road influences.

Yaak River, Face Tributaries

Yaak River tributaries number 15 and 21 are face tributaries that flow directly into the Yaak River. These streams are second or first order draws with perennial flow in upper reaches becoming intermittent in the lower half. Channel stability surveys conducted in 2006 (USDA Forest Service 2006b) show ratings of good to excellent. Channels are very steep with a boulder predominate substrate, and step-pool profile. They are primarily transport type channels and show no evidence of carrying excessive fines. Inventory of road drainage and stream crossing trouble points have been noted (USDA Forest Service 2006b). These drainages have a high ratio

of past harvest and mostly high road densities. Yaak Tributaries 14 and 23 have had no channel stability or fish habitat surveys conducted. Flow regime is uncertain.

Table 26. Existing conditions by watershed

Watershed	Acres	Percent of Area in Past Harvest	Road Miles	Road Density (miles/square mile)	Channel Stability
Burnt Creek	13,836	16	49.0	2.3	Good
Cool Creek	5624	37	31.2	3.6	Poor
Gus Creek	1029	60	6.6	4.1	Poor
Lang Creek	3132	39	21.2	4.3	Fair
Lucky Gulch	749	34	4.4	3.8	Poor-fair
Pheasant Creek	4179	41	24.0	3.7	Poor-fair
Yaak #14	261	20	0.6	1.5	unknown
Yaak #15	381	33	3.2	5.4	Good-excellent
Yaak #21	566	63	2.8	3.2	Good-excellent
Yaak #22	300	84	1.5	3.2	unknown
Yaak #23	410	33	2.1	3.3	unknown

Burnt Creek

Burnt Creek main stem has a moderate to steep gradient (3 to 5 percent) channel with boulder or large cobble substrate. There are inclusions (short reaches) of flatter valley that have beaver ponds. Channel stability rating from a 1992 survey (USDA Forest Service 1992) gives a generally good rating throughout, with minor portions of fair rating, due to bank cutting and excessive deposition of fines in the bed. These same reaches also have incomplete canopy cover. Debris jams of large woody material are occasional throughout the stream, but more frequent in the upper half. Burnt Creek drainage has had the least past harvest level of the analysis watershed and the least road density.

Cool Creek

Cool Creek has a moderate to steep gradient channel (3 to 5 percent), with a boulder/cobble substrate, and step-pool profile. A stability and fish habitat survey was conducted in 1980 (USDA Forest Service 1980). Debris jams, of large down wood is common, creating fish barriers or major obstacles to fish movement. High bank cutting or undercutting is pervasive. There is a general lack of pools for fish due to excessive deposition of fines in the channel, and a lack of good spawning gravels. Cool Creek has a high proportion of its area harvested and a very high road density. Stability ratings for the entire 2.5 miles surveyed of the main stem channel were poor.

Gus Creek

Gus Creek is a steep gradient stream. Channel stability surveys conducted in 1976 (USDA Forest Service 1976), give mostly a poor rating for reaches. Upper bank cutting is continuous in main stem. Debris jams are numerous and constitute fish barriers. Excessive deposition of fines creates lack of quality pools and spawning habitat. A large alluvial fan exists at the mouth of the channel at its confluence with the Yaak River. Gus Creek has a very high proportion of its watershed harvested and a high road density.

Lang Creek

Channel stability ratings were fair to good for surveys conducted in 2006 (USDA Forest Service 2006b). The channel has a moderate to steep gradient (3 to 5 percent) and substrate predominately of gravel. Flatter gradient reaches exist at the bottom of the drainage near the confluence with the Yaak River leading to development of a braided or sinuous channel form. Fair ratings are influenced by upper bank cutting and filling of available pools with fine sediment.

Lucky Gulch

Lucky Gulch has a predominately steep gradient (5 to 10 percent). A channel stability rating was conducted in 1977 (USDA Forest Service 1977). Stability ratings for surveyed reaches were given a poor or fair rating. There were many down trees in the channel and associated debris. Upper bank cutting and excessive deposits of fine material were pervasive. Lucky Gulch has very high proportions of past harvest and road density. Road sediment source surveys conducted in 2005 (USDA Forest Service 2005b) describe a steep well-armored channel with stability inherent in large substrate (cobble/boulder) and tree roots, at road crossings. The survey however was not comprehensive of the entire channel in the project area and so could not be used to detect a trend in condition from 1977 survey.

Pheasant Creek

Channel stability and fish habitat surveys were conducted in 1980 (USDA Forest Service 1980). Pheasant Creek channel has a moderate to steep gradient (3 to 5 percent) with predominately boulder/cobble substrate. Debris jams were numerous, on average every 0.2 miles that were often fish barriers. Excessive fines were deposited in the bed, causing a general lack of quality pools or proper spawning gravels. Stability ratings were generally given a Poor with a minor proportion of fair rating due to pervasive bank cutting and deposition of fine sediment. Pheasant Creek has a high proportion of its area harvested and a high density of forest roads.

Environmental Consequences

Alternative 1 - No Action

Direct and Indirect Effects. No proposed timber harvest, landing construction, temporary road construction, or best management practices would occur. Current conditions of detrimental soil disturbance, canopy closure and ground cover would continue to recover from past disturbances, with the associated changes in hydrologic function of forested land that control response to peak flows and total yield from a watershed.

The No Action Alternative would not change the current rate or risk of sediment delivery to streams in the project area. Past harvest slopes would continue to revegetate. Infiltration capacity of the soil through decompaction, increased ground cover and precipitation interception by the overstory would steadily attenuate flow response and potential erosion by over land flow or mass wasting.

Roads would continue to be a chronic source of sediment to project area streams. The watershed rehabilitation work (decommissioning and intermittent stored service) would not be implemented under the No Action Alternative. Continued erosion at the existing road failure and sediment source sites on these roads are likely. Failure of fill slopes and banks at inadequate road crossings may affect channel stability resulting in a higher state of degradation in some reaches.

Alternatives 2 and 3

Direct and Indirect Effects. The effects of Alternative 3 are largely the same as Alternative 2, with only minor differences in acres of treatment, and approximately 5.1 miles less of BMP road work on road 472 in Alternative 3. Differences between the alternatives in treatment type and extent of treatment are captured in the ECA analysis and are displayed where there are differences.

Compaction and displacement of soil during harvesting reduces infiltration capacity, may cause overland flow during high intensity rainfall, and subsequently, erosion by sheet wash or rilling. The extent of these effects, as inferred from existing condition of soils in past harvest areas, has already been discussed and determined as having minimal potential in the project area due to very rapid regeneration and deep ash cap soils.

These effects are largely mitigated or avoided through implementation of BMPs (as required by the Clean Water Act for non-point sources of pollution), and Forest Plan standards and guides. Kootenai Forest Plan monitoring results from BMP implementation in 2001 indicated a high compliance rate. Results show that 96 percent of activities evaluated had appropriate BMPs implemented, and 94 percent of those were effective (USDA Forest Service 2002).

Standards and guidelines restrict harvest, operation of machinery, and other ground disturbance within a RHCA (USDA Forest Service 1995). RHCAs are vegetated buffers between streams and harvest area. The results of extensive research has overwhelming determined that streamside buffers are an effective measure against sediment delivery to channels (Belt et al. 1992; Castelle, et al. 1994). RHCA buffers for the project area adhere to Forest standards.

Erosion

Hillslope erosion was modeled using WEPP on various slope classes, and with typical parameters of soil texture and rock content and ground cover that occur in the project area. Mechanized harvest systems appropriate for slope classes (i.e., tractor yarding typically below 35 percent gradient) were assumed, therefore modeling was done for the most intrusive technique for each slope class. Model runs were conducted for the first year after harvest and for the fifth year after harvest, when vegetative regeneration is assumed to mitigate the primary effect of slope erosion from loss of ground cover. In all cases, a streamside buffer was assumed at the foot of the modeled hillslope. For prescribed burn units, lighting is assumed to occur upslope of RHCAs, allowing fire to back into RHCAs. Model calculations estimate that potential hillslope erosion from harvest would range between 0.06 to 0.24 tons/acre/year in the first year of harvest, decreasing to approximately 0.01 to 0.05 tons/acre/year after five years. These values for soil erosion rates are a range, for years containing average to extreme events on a 30-year frequency of occurrence. Region 1 standards for soil loss on hillslopes are 2 tons/acre/year, on average (USDA Forest Service 1999).

Peak flows

Another effect of harvesting is the reduction of vegetation canopy, which increases the fall of precipitation, causes a deeper accumulation of snow on the ground, and overall increases the amount of infiltrating water where soil is not already compacted. This effect may increase the extent of soil saturation zones, and the ground water pressure head that leads to rapid response to storms, particularly in small watersheds (Jones and Grant 1996). Hence, even with streamside buffering, the response of a watershed to storm events may be altered by harvesting.

Removal of vegetation also reduces evapotranspiration on the hillside in the growing season, possibly accentuating soil moisture conditions. This could cause localized and temporary increases in groundwater tables that is typically manifested in emergent or increased area of hillside seeps, or base flow in channels.

Roads may also alter the hydrologic response of a watershed by intercepting ground water flow on hillslopes in cuts that exceed the depth of the soil (Jones and Grant 1996; Beschta et al. 2000; Jones 2000). By converting groundwater flow, with a velocity on the order of feet per day to surface flow on road surfaces or in drainage ditches with velocity on the order of thousands of feet per day, peak flows are accentuated and advanced in timing over natural condition in a watershed with high density of roads.

The effects outlined above contribute to the overall hydrologic response of increased peak flows, yields, and alteration in timing in peak flows--a tendency for peaks to advance or occur more rapidly for a given intensity of storm.

Riparian Areas

In the past, timber harvest activities have occurred in riparian areas. Since the implementation of INFS guidelines for riparian protection by Forest Plan amendment in 1995, riparian areas and wetlands have been designated as RHCAs with harvest activities occurring to achieve RHCA objectives. Forest plan monitoring results indicate the protection of RHCAs has been effectively implemented (USDA Forest Service 2001). As a result of these guidelines there would be no discernible effect from timber harvest on riparian function, stream shading, or large woody debris recruitment.

Water Quality

Possible water quality impacts include nutrient increases, water temperature increases, and chemical contamination. Significant changes in nutrients and temperature are usually associated with widespread riparian disturbance from harvest or fire. There would be no effect on stream temperature because there would be no riparian harvest. There may be a slight effect on nutrients, but effects would be short term and levels would remain well within water quality standards.

There is potential for spills or leaks of petroleum products associated with the operation and refueling of logging trucks, logging equipment and helicopters. Incidents involving sizable spills of petroleum products are rare. Criteria to prevent and control spills are included in the timber sale contracts.

Activities Common to All Action Alternatives

Haul Road Activities

Maintenance and reconstruction, including BMP work, would occur on 54.5 and 49.4 miles of haul road, Alternatives 2 and 3, respectively. These activities would include blading roads, cleaning ditches, adding gravel surfacing, installing ditch relief culverts, replacing undersized stream channel culverts, constructing drain dips, and installing belt drains. Specific BMPs and road segments are identified in Appendix B - Access Management Plan, and Appendix D - Best Management practices. BMP work on roads 902, 6084C, 8021 and 8021B would be completed prior to hauling to address existing sediment sources. This work would improve conditions in Burnt Creek, Little Creek, Pheasant Creek, and Lucky Gulch. All remaining committed BMP work would be accomplished prior to completion of harvest-related activities.

Unfunded BMP work identified would be completed as funding is available. These projects are primarily stream crossing improvements identified on roads that would not be used for this project.

BMP work has recently been implemented on a number of roads in the affected watersheds (Table 8). The proposed BMP work would add to and improve on this previous work. Kootenai Forest Plan monitoring results for BMP implementation in 2001 indicated a high compliance rate. Ninety-six percent of activities evaluated had appropriate BMPs implemented and 94 percent of those BMPs were effective (USDA Forest Service 2002).

There would be some minor short-term sediment associated with road blading and culvert replacement, however, in the long-term BMP work would reduce road-related sediment.

Watershed Rehabilitation

The proposed watershed rehabilitation work is described in Chapter 2. Under all action alternatives active decommissioning work (including converting to trails) is proposed on 30 miles of road and stabilization work on roads being closed for core (intermittent stored service) is proposed on 22.6 miles of road (some are in watersheds that are not displayed here). Table 27 identifies the amount of rehabilitation work, stream crossings improved, and BMP work by watershed. In Gus and Pheasant Creeks, the Intermittent Stored Service work, including watershed restoration (Roads 902A, 902B, 903) is required to be completed prior to activities to compensate for habitat needs. All other decommissioning and watershed rehabilitation work would occur as funding is available. Refer to Appendix B for site-specific rehabilitation information.

Active decommissioning and storage often have similar short-term effects on sediment delivery. However, decommissioning generally provides a greater long-term watershed benefit than intermittent stored service, especially if there are stream crossings. Roads placed in intermittent stored service are likely to be used again which will require replacing stream crossing structures, resulting in future sediment delivery. The assumption is that decommissioned roads would never be used again.

There would be short-term sediment delivery during the rehabilitation work that may include several hours of elevated turbidity and the introduction of fine sediment into the stream. The long-term benefit would be improved channel stability, decreased chronic sediment production, and decreased risk of mass failures. The overall trend would be towards improved watershed conditions.

Prescribed Fire (Ecosystem and Wildlife)

The proposed work would not have a measurable effect on watershed condition. The proposed burns are expected to result in low levels of overstory tree mortality and would have little effect on ECA because up to 17 percent reduction in crown can occur before there are increases in water yield (USDA Forest Service 1974). Less than a 17 percent reduction in crown is expected as result of these low intensity burns. Some burning may occur in RHCAs, but is likely to be low severity and limited in extent due to the fire creeping downhill into these areas. No substantial change in riparian conditions is expected.

Table 27. Miles of Watershed rehabilitation/number stream crossings improved by watershed

Watershed	Active Decommission		Intermittent Stored Service		Best Management Practices	
	No. stream crossings improved		No. stream crossings improved		No. stream crossings improved	
	Committed	Unfunded	Committed	Unfunded	Committed	Unfunded
Burnt Ck.		20.3		3.63	18.8	
		33		1	4	
Cool Ck.		2.6		3.35	0	
		6		1	2	
Gus Ck.		1.03				
		2				1
Lang Ck.		1.58			8.8	
		2			1	
Little Ck.		1.63		1.04	1.2	
		2		0	1	4
Lucky Ck.					1.5	
					1	
Pheasant Ck.		1.35	3.5		1.0	
		1	3		0	2
Yaak R. #14		0		0	0.6	
					0	
Yaak R. #15		0		0	0.2	
					1	
Yaak R. #21		0		0		
						1
Yaak R. #22		.98				
		1				
Yaak R. #23		0		0		

Ignition of prescribed burns is prohibited in RHCAs. However, fire may enter RHCAs after ignition. The fire intensity is expected to be low because of the moisture conditions under which the burns would be permitted, and the even higher moisture conditions typically found in RHCAs. Prescribed fire may kill riparian vegetation, including trees. In the short term, this could decrease shading, and increase woody debris recruitment. The effects are expected to be similar to the natural effects of low intensity wildfires. Short-term effects are expected to be minor, and no long-term adverse effects are anticipated.

Cumulative Effects

Past Actions and their Effects on Current Conditions: The existing ECA reflects the results of past activities (timber harvest, road building) that have occurred within each watershed. Stream surveys conducted in those watersheds where existing ECAs are near the level of concern (Lang Creek, Yaak #15) both show condition ratings of fair to good, and good to excellent, indicating that the streams are handling existing stream flows without adverse changes (Newgard 2006 pers. comm.). Recent watershed rehabilitation projects (Table 8) has reduced sediment delivery to streams improving channel conditions.

Contrasting Effects of Proposed Actions with Past Actions: Activities proposed for this project include more intermediate harvesting than in the past, reducing the effects of canopy removal, as well as less impactive results on the ground. Design features included in the action alternatives address soils and watershed concerns, implementing BMPs, rehabilitating sediment sources and decommissioning roads to reduce watershed impacts. Fuels reduction activities are designed to reduce soils impacts, using excavators instead of bulldozers, using prescribed fire to minimize impacts, and requiring winter harvesting on units where watershed concerns are present.

Combining Effects from past, present and reasonably foreseeable actions. Analysis of the cumulative effects utilized the ECA model, which accounts for past activities, as well as proposed. Recovery rates for treated ground within the ECA model were subdivided into three habitat groups each with a different recovery rate. A clearcut equivalent acre will recover to pre harvest conditions in the fast recovery rate in approximately 77 years. Moderate rate is 105 years and a slow recovery rate is 139 years. An acre of road is considered a permanent clearcut equivalent acre.

A low ECA rating for a watershed indicates a low potential for effects to channel condition. A moderate rating indicates that stable stream channels are unlikely to be affected, but more unstable or sensitive channels may be affected, especially at the higher end of moderate. A high rating indicates that effects could be expected in all but the most stable channels (USDA Forest Service 2002).

Affected watersheds analyzed range in size from 261 to 13,836 acres. Of these, six are over 640 acres in size (Burnt, Cool, Gus, Lang, Lucky Gulch and Pheasant Creeks). In these watersheds, the risk for potential channel effects is rated as low if the ECA is less than 15 percent, rated as moderate if the ECA is between 15 and 30 percent, and rated as high if ECA exceeds 30 percent (USDA Forest Service 2002). Table 28 displays the existing and resulting ECA by alternative.

Table 28. ECA Results for Alternative 2 and 3

	Existing ECA	Maximum ECA	Alt 2. ECA	Alt.3 ECA
Burnt	9	30	11	10
Cool	12	30	15	14
Lang	24	30	29	29
Lucky	8	30	18	18
Gus	15	30	15	15
Pheasant	12	30	12	12
Yaak #14	7	40	11	11
Yaak #15	16	40	32	27
Yaak #21	3	40	13	13
Yaak #22	10	40	10	11
Yaak #23	15	40	16	17

Analysis of watersheds smaller than 640 acres is subject to forest plan guidelines for maximum allowable ECA. The allowable ECA varies by watershed size, aspect, and elevation (Johnson 1991). These are guidelines and do not ensure beneficial uses are protected. The allowable ECA depends on the professional evaluation of a number of factors, including channel stability (Solem 1995). Four subwatersheds, Yaak #14, 15, 21, and 23 are below 640 acres and the maximum percent ECA for these watersheds is 40 percent.

The allowable ECA for a given channel depends on the channel condition, especially its sensitivity to future peak flow increases. Watersheds with a recent history of ECAs in excess of 30 percent, a high road density, a history of mass failures or severe riparian disturbance are most likely to experience excessive channel scour and deposition.

Regeneration harvests are defined as treatments where the majority of the overstory is removed such as clearcut with reserves and seed tree harvests. Intermediate harvests are defined as treatments where a proportion of the overstory is removed and is associated with the thinning, salvage, and release treatments.

Burnt Creek

Due to low road density and previous harvest activity (mostly in the 1950s through 1970s); ECA values would stay within acceptable ranges. The bulk of proposed road abandonment and decommissioning identified for completion as funding becomes available for the entire project would occur in Burnt Creek, including most of the road system that exists in the headwater area. While an elevated risk of impacts would exist for 1 to 2 years for some sediment delivery to the channels due to the road work, it would soon ameliorate, and the general watershed condition trend would be positive. Moreover, since road work of this type is not accounted for in the Forest ECA model, it may be expected that flow response would trend towards a more natural condition faster than the model would indicate. Anticipated effects from the proposed Burnt Creek Bridge construction on road 472X are increased sedimentation in the short term during construction, but are not expected to contribute to decreased water quality in the long term. Long-term improvements are anticipated due to the removal of the existing ford crossing and placement of the bridge.

Cool Creek

Cool Creek would have increases in ECA values of 2 to 3 (Alternatives 2 and 3, respectively) these levels are well below ECA. Cool Creek has fairly high road density, and high levels of harvest that were done in the 1960's through 1980's, but little since then. Proposed harvest levels would be light, and about 5 miles of roads are proposed for decommissioning or intermediate storage. Two temporary road segments totaling 0.21 and 0.38 miles (Alternatives 2 and 3, respectively) are proposed for the project, but neither involves a stream crossing of a perennial or intermittent flowing channel. Small and short-term increases in sediment delivery to channels might occur during decommissioning work where 5 stream crossings are involved.

Gus Creek

There is no increase in ECA value, due to proposed activity, in the Gus Creek watershed because of the low level of that activity (less than 1 percent of watershed area). Existing ECA levels are moderate because of the high degree of past activity and fairly high road density. There would be no significant impact to channel stability, or water quality, from the proposed activity or other foreseeable activities.

Lang Creek

Current high ECA values reflect very high road density and moderate harvest levels from 1960s through 1980s. While increases to ECA values are moderate for the proposed project, it puts the watershed close to high levels of concern for watersheds of over 640 acres. Recent surveys conducted by the district hydrologist (Newgard 2006 pers. comm.) identified this stream channel to be in very good condition and quite stable. About 1.6 miles of road in the headwater area is proposed for decommissioning when funding is available, which would include two stream

crossings. This drainage would remain near levels of concern for watershed response until existing harvest and burned areas recover. Short-term increase in sediment delivery to channels would occur from road decommissioning. Design features that would lessen the impacts, but are not accounted for in the model include: Winter harvesting and underburning in units 15, 18 and 20 to reduce soil impacts, BMPs on road 6084C to be completed prior to hauling, and public access restrictions on the 6084 system to minimize traffic. Proposed BMP work associated with the Obermayer project (Table 8) would contribute towards improvement within this drainage. All of these actions reduce the potential for actual channel effects, and no adverse effects are expected to occur.

Lucky Gulch

Lucky Creek has fairly low ECA values despite high road density because of lower levels of past harvest, mostly in the 1980s. Moderately high ECA values, however, will result from the proposed harvest (about 11 percent of the watershed area). About 0.55 mile of decommissioned road is proposed when funding is available in the headwaters area, but involves no stream crossings of perennial or intermittent channels. Although ECA values increase, they are well below the maximum where adverse impacts may occur. The existing channel condition (well armored with large cobble/boulder and tree roots in the substrate) is well suited to handle the anticipated increases in water flow without detrimental effects.

Pheasant

There is no increase in ECA value due to proposed activity in Pheasant Creek watershed because of the low level of activity (less than 1 percent of watershed area). Existing levels are moderate because of relatively low past activity levels and moderate to high road density. There would be no significant impact to channel stability, or water quality, from the proposed activity or other foreseeable activities. Previous watershed improvement activities associated with the Cool-Otis timber sale have improved overall conditions.

Yaak #14

Fairly low ECA values would increase moderately with the proposed action in this tributary. Road densities are low and no changes are proposed. Past harvest levels (from 1980s) are moderate. Current channel conditions would remain consistent.

Yaak #15

In this tributary, ECA values will increase to close to a level of concern with proposed activities. Road densities currently are very high, but past harvest levels were moderate and date to the 1970s and 1980s. No changes in roads are proposed. Proposed harvest level is very heavy (19 and 15 percent of total area, Alternatives 2 and 3, respectively). The high gradient channel is well armored (large colluvial substrate) indicating a high sediment transport rate and resistance to change. Despite the amount of proposed hillslope harvest, with stream buffers and required BMP work on roads within this drainage, channel conditions are not expected to be adversely affected.

Yaak #21

Currently, this tributary has good to excellent channel conditions and low ECA values from past harvest (mostly in the 1950s) and, as described above in Yaak #15, similar robust channels. Road density is high. Proposed harvest is heavy (10 percent of total area). ECA values will be elevated to moderate levels. About 1.2 miles of temporary road is proposed, but no crossings of perennial

or intermittent streams are proposed. Channel conditions are expected to remain constant as a result of the design features specified for Units 1 through 4 improving soil conditions.

Yaak #22

In this tributary there is little to no increase in ECA value due to proposed activity because of the low level of that activity (less than 1 percent of watershed area). Existing levels are moderate because of very high past activity and moderately high road density. Existing channel condition is unknown, but no significant impact from the proposed or foreseeable future activities is expected.

Yaak #23

In this tributary, slight increases in ECA values will follow proposed actions. Road densities are moderate and no changes are proposed. There is no information on current channel conditions. Past harvest all dates from the 1960s. Current channel conditions are expected to be maintained as only a few acres of harvesting is proposed, and is a commercial thin, retaining much of the overstory canopy.

Regulatory Consistency

Protection of Water Quality

No measurable change in overall water quality is expected in any of the major streams from activities associated with the project. Risks to small intermittent tributary streams are discussed by watershed. Other federal ongoing and foreseeable activities would have no effect on water quality as discussed in the ongoing and foreseeable actions section above. Water quality is expected to remain near current levels the project area streams for the foreseeable future.

All alternatives meet the requirements of the Clean Water Act by maintaining beneficial uses at current levels. Water quality for downstream water rights would also be maintained. This project would comply with the MOU with the State of Montana to implement BMPs on land management projects.

Protection of Wetlands

All wetlands are identified as RHCAs. Wetlands less than one acre would have an RHCA width of 50 feet, and wetlands greater than one acre would have an RHCA width of 100 feet. No timber harvest, no temporary road construction, operation of heavy equipment or ignition of prescribed fire would be allowed in these areas. It is possible that prescribed fire may enter wetlands. Due to the naturally moist conditions of these areas, only low-intensity fire is anticipated. This would closely mimic natural fire conditions and no long-term adverse effects are expected.

Forest Plan Consistency

All alternatives are consistent with the Forest Plan with respect to protection of water resources. Water and sediment yields resulting from the proposed activities were analyzed and determined to maintain current levels of beneficial use protection. Federal actions in mixed ownership watersheds would not cumulatively contribute to degradation of the stream channel. Soil and water conservation practices would be followed through implementation of BMPs. Sale implementation would protect riparian conservation habitat areas. Opportunities to improve watershed conditions by implementing BMPs on haul roads were identified. The work would be prioritized based the benefit to native fisheries and protection of beneficial uses.

Fish Populations & Habitat

Analysis Area

The project area encompasses two sixth code subwatersheds: Yaak River (170101030206) and Burnt Creek (170101030301). The cumulative effects boundary was delineated at a point in the watershed where downstream effects of proposed activities cannot be discerned. Watersheds included in the cumulative effects analysis include Burnt Creek, Cool Creek, Lang Creek, Lucky Creek, Yaak River #14. Yaak River #15, Yaak River #21 and Yaak River # 23. Potential effects within these subwatersheds are not great enough in magnitude or duration to be distinguishable beyond their boundary (Vanosdall 2007).

Analysis Methodology

Existing conditions were determined through surveys and review of existing data sources to develop effects analysis for fisheries resources in each watershed. Effects to fish populations were assessed based on effects to habitat. This analysis was done to the nearest point of effect for all threatened, endangered, or sensitive species.

The Montana Fish Wildlife and Parks (MFWP) historic stocking records, MFWP Fisheries Information System (MRIS), Aquatic Biota Information System (ABIS) and Three Rivers Ranger District stream surveys (USDA Forest Service 2005b) were reviewed to determine current known fish distribution and habitat condition in the project area drainages. The surveys focused on distribution, connectivity and habitat quality of native fish species in the project area.

Riparian management objectives (RMOs) as established by INFS for forested systems include pool frequency, large woody debris, temperature, and width-to-depth ratio. Actions that retard attainment of these RMOs, whether existing conditions are better or worse than objective values, are inconsistent with the Inland Native Fish Strategy (INFS; USDA Forest Service 1995).

Riparian habitat conservation areas (RHCAs) were delineated on all known streams, ponds, lakes, reservoirs, wetlands, landslides, and landslide-prone areas within the project area. RHCA widths are defined by whether a stream is fish bearing and/or perennial, and by the size of the water-body. Widths of RHCA buffers are based on current scientific literature that documents them to be adequate to protect streams from non-channelized sediment inputs and provide for other riparian functions. These riparian functions include delivery of organic matter, large woody debris recruitment, and stream shading.

Project area baseline conditions were developed to evaluate the effects of proposed actions. This baseline includes current fish distribution, road density and the number of road/stream crossings, pool frequency, large woody debris (LWD), channel stability, percent fine sediment, and equivalent clearcut area (ECA). Existing channel conditions were evaluated during the 2005 field season and obtained from existing stream survey data.

Five variables were used to quantify effects of proposed activities on fish habitat quality. These variables include number of pools per mile, amount of LWD per mile, width-to-depth ratio, streambank condition, and water temperature. These items were chosen as they best address the pertinent disturbance and indicators determined to be appropriate for evaluating effects to fish species and habitat (Western Montana Level 1 Team). The remaining habitat indicators are addressed by the default RHCAs.

The cumulative effects analysis was based on habitat changes from the baseline condition as a result of past activities, proposed activities, ongoing projects, and other reasonably foreseeable Federal, State and private activities. Effects to population resiliency and consequently the probability of species persistence within the planning area were based on this cumulative analysis.

Regulatory Framework

Endangered Species Act

The Endangered Species Act (ESA) of 1973 declares that "...all Federal departments and agencies shall seek to conserve endangered species and threatened species and shall utilize their authorities in furtherance of the purposes of this Act." Under the Act, Federal agencies must consult with the Secretary of the Interior whenever an action authorized by such agency is likely to affect a species listed as threatened or endangered. Bull trout (*Salvelinus confluentus*) are currently listed as threatened and white sturgeon (*Acipenser transmontanus*) are listed as endangered under the ESA.

Kootenai Forest Plan

The Inland Native Fish Strategy amended the Kootenai NF Forest Plan in 1995. INFS established stream, wetland, and landslide-prone area protection zones called riparian habitat conservation areas (RHCAs), setting standards and guidelines for managing activities that potentially affect conditions within the RHCAs. INFS also established RMOs that provide guidance with respect to key habitat variables.

Sensitive species are managed under the authority of the National Forest Management Act and are administratively designated by the Regional Forester (NFMA, FSM 2670.5). The Forest Service is directed to maintain viable populations of native species and to avoid actions that may cause a species to become threatened or endangered. Sensitive fish species identified to exist on the Kootenai National Forest include interior redband trout (*Oncorhynchus mykiss gairdneri*) and westslope cutthroat trout (*Oncorhynchus clarki lewisi*). See the specialist report for the biological evaluation of the Grizzly Project which analyzes the potential effects to Kootenai NF sensitive fish species and their habitat as a result of the preferred alternative.

National Forest Management Act and Other Federal Regulations

The National Forest Management Act (16 USC 1604) directs that the Forest Service must maintain viable populations of all native and desired non-native wildlife, fish, and plant species in habitats distributed throughout their geographic range on National Forest System Lands. In order to support viable populations of native and desired nonnative fish, "...habitat must be provided to support, at least, a minimum number of reproductive individuals and that habitat must be well distributed so that those individuals can interact with others in the planning area". Executive Order 12962 mandates disclosure of effects to recreational fishing.

Affected Environment

The fisheries habitat within the Grizzly planning area consists of the Yaak River and its tributaries: Cool Creek, Pheasant Creek, Lang Creek, Little Creek, Burnt Creek**,** Whitetail Creek, and Grizzly Creek.

Native fish present in the Grizzly planning area are the interior redband trout (*Oncorhynchus mykiss gairdneri*), westslope cutthroat trout (*Oncorhynchus clarki lewisi*), mountain whitefish (*Prosopium williamsoni*), longnose dace (*Rhinichthys cataractae*), largescale sucker (Catostomus

macrocheilus) and the slimy sculpin (*Cottus cognatus*). Interior redband trout and westslope cutthroat trout are currently listed as sensitive species by the Forest Service. Non-native fish present include coastal rainbow trout (*Oncorynchus mykiss irideus*) and eastern brook trout (*Salvelinus fontinalis*). The Yaak River does not support a subpopulation of bull trout above Yaak Falls; the nearest known subpopulations inhabit O'Brien and Callahan Creeks, approximately 10 river miles upstream of the Yaak River confluence with the Kootenai River (USDA Forest Service 2000). White sturgeon do not inhabit the Yaak River above Yaak Falls.

Threatened, Endangered and Proposed Species

White Sturgeon - Endangered

No streams within the project area provide sturgeon habitat. The nearest potential habitat is in the Yaak River below Yaak Falls, approximately 15 miles downstream from the project area. Surveys have not found this species within the Yaak River. Due to the distance of occupied habitat from the planning area, no downstream effects would occur; therefore, white sturgeon would not be affected by the proposed activities. A finding of "no effect" was determined for sturgeon for all proposed activities. For these reasons, sturgeon will not be discussed further in this document.

Bull Trout - Threatened

No streams within the project area provide bull trout habitat. The nearest potential habitat is in the Yaak River below Yaak Falls, approximately 15 miles downstream. Surveys have not found this species within the planning area. Due to the distance of occupied habitat from the planning area, no downstream effects would occur; therefore, bull trout would not be affected by the proposed activities. A finding of "no effect" was determined for bull trout for all proposed activities. For these reasons, bull trout will not be discussed further in this document.

Sensitive Species

Westslope Cutthroat Trout

Distribution and Abundance

The distribution and abundance of westslope cutthroat trout (*Oncorhynchus clarki lewisi*) has declined from historic levels across its range, which includes western Montana's Kootenai River drainage (Liknes and Graham 1988). Historically, westslope cutthroat trout dominated all streams in the Yaak drainage except the East Fork of the Yaak. In Montana, it was estimated that westslope currently occupy almost 13,000 miles (39 percent of the considered historical range) and genetically unaltered westslope occupy almost 3,000 miles (9 percent of historical range) (Shepard et al. 2003). Introduced brook trout and coastal rainbow trout have displaced westslope cutthroat trout in lower gradient reaches of many tributaries and the main stem Yaak River, isolating existing populations of westslope cutthroat trout. Hybridization causes loss of genetic purity of the population. Some of these remaining genetically pure populations of westslope cutthroat trout are found above fish passage barriers that protect them from hybridization, but isolate them from other westslope cutthroat trout populations. Genetically pure populations are known to persist in Grizzly, Pheasant, and Burnt Creeks. Westslope cutthroat trout generally predominate in higher gradient reaches of tributaries and are common on the Kootenai National Forest.

Westslope cutthroat trout were stocked into Burnt Creek in 1936 and 1940. Westslope cutthroat, Yellowstone cutthroat, coastal rainbow and brook trout were stocked into the Yaak River above Yaak Falls and many of its tributaries beginning in the 1930s. Recent genetic analysis reveals

hybridization is occurring between redband, coastal rainbow, and westslope cutthroat trout in many of the streams in the Yaak drainage.

Habitat Associations

Westslope cutthroat trout reside in small mountain streams, main rivers, and large natural lakes. They require cool, clean, well-oxygenated water. In rivers, adults prefer large pools and slow velocity areas with some form of cover. Juveniles of migratory populations may spend 1 to 4 years in their natal streams then move (usually in spring or early summer, and/or in fall in some systems) to a main river or lake where they remain until they spawn (McIntyre and Rieman 1995). Many fry disperse downstream after emergence (McIntyre and Rieman 1995). Juveniles tend to overwinter in interstitial spaces in the substrate. Larger individuals congregate in pools in winter.

Westslope cutthroat trout spawn in small tributary streams on clean gravel substrate with a mean water depth of 17 to 20 cm and a mean water velocity of 0.3 to 0.4 m/sec. They tend to spawn in natal streams in March-July, depending on elevation, at water temperatures near 10°C (McIntyre and Rieman 1995).

Westslope cutthroat trout exhibit both migratory and resident life histories on the Kootenai National Forest. They are capable of traveling over 100 miles on their spawning migration. Adfluvial populations live in large lakes in the upper Columbia drainage and spawn in lake tributaries. Fluvial populations live and grow in rivers and spawn in tributaries. Resident populations complete their entire life history in tributaries. All three life-history forms may occur in a single basin (McIntyre and Rieman 1995). Migrants may spawn in the lower reaches of the same streams used by resident fishes. Maturing adfluvial fishes move into the vicinity of tributaries in fall and winter and remain there until they begin to migrate upstream in spring. Of migratory spawners, some remain in tributaries during summer months but most return to the main river or lake soon after spawning (Behnke 1992).

Threats

Hybridization with other (introduced) cutthroat subspecies and with introduced rainbow trout has caused a drastic loss of genetically pure populations, especially in Montana. However, USFWS (2000) concluded that extant headwater populations of westslope cutthroat trout are relatively secure from colonization by non-native fishes (and from adverse effects of human activities).

Westslope cutthroat trout are affected by loss/degradation of habitat from logging, road construction, mining, and grazing (Spahr et al. 1991), which may result in sedimentation and increased water temperature. They are sensitive to pollution and generally to siltation of streams (some populations may persist despite abundant sediment). Dams, irrigation diversions, and other migration barriers have negatively affected habitat and probably have interfered with metapopulation dynamics (McIntyre and Rieman 1995). Populations have become increasingly fragmented.

Description of the Population in the Planning Area

Surveys were conducted in the planning area by Forest Service personnel in 2005 (USDA Forest Service 2005b). Data on species presence was also gathered from the Montana Fish, Wildlife and Parks (MFWP) website and is shown in Table 29. This data is extrapolated for the project area streams, not from specific stream surveys of these streams. MFWP surveys are ongoing and range from 1990 to present. Westslope cutthroat trout are found in Little Creek, Burnt Creek,

Grizzly Creek, Pheasant Creek, Cool Creek, Lang Creek, and Whitetail Creek in the planning area. Only the Burnt, Grizzly, and Pheasant Creek populations are genetically pure.

Table 29. Fish Surveys within the planning area

Stream	Source	Species
Little Creek	FS 2005	WCT
Burnt Creek	FS 2005	MWF, RB, EBT, WCT*
	MFWP	RBT
		WCT*
Grizzly Creek	FS 2005	WCT*
Pheasant Creek	FS 2005	WCT*, EBT, RB
	MFWP	WCT*
Cool Creek	FS 2005	WCT
Lang Creek	FS 2005	EBT

WCT=Westslope cutthroat trout; EBT=Eastern brook trout; RB=Rainbow trout; MWF=Mountain whitefish; RBT=Redband trout.
*Determined to be a genetically pure population

Interior Redband Trout

Distribution and Abundance

The interior redband trout (*Oncorhynchus mykiss gairdneri*) is a widely distributed western North America native salmonid. Resident Interior redbands can be further divided into two forms - the adfluvial interior redband or "Kamloops rainbow" that annually migrates between a lake and tributary river in order to complete its lifecycle, and the fluvial interior redband that remains in a river system throughout its life (Moyle et al. 1989). Both forms exist in the Upper Kootenai Subbasin.

The historic range of the interior redband included freshwaters west of the Rocky Mountains, extending from northern California to northern British Columbia, Canada (Behnke 1992). Presently, populations of pure strain redbands in the Upper Kootenai Subbasin occur in the Callahan watershed, the East Fork Yaak watershed, east Cabinet face drainages, the Fisher River, Libby Creek and the upper portion of Wolf Creek.

Habitat Associations

Redband trout winter habitat includes deep pools with extensive amounts of cover in third-order mountain streams (Muhlfeld et al. 2001). Summer surveys indicated that low gradient, medium-elevation reaches with an abundance of complex pools are critical areas for production (Muhlfeld et al. 2001). In the Kootenai River drainage in Montana, 23 redband trout monitored from October to December had home ranges of 5 to 377 m (mean 67 m) (Muhlfeld et al. 2001).

Redband trout are spring spawners, and spawn as flows decline after peak runoff and as maximum daily water temperatures exceed 44°F. Fry emerge from the stream bottom approximately two months after spawning and begin a stream residence that may last one year to a lifetime (Muhlfeld 2002). Adfluvial and migratory fluvial redband juveniles will typically move downstream to their ancestral lake or river after one to three years of residence in the headwaters. Sexual maturity typically occurs at three to five years except in cold or hot climates where life expectancy is shortened. Where native interior redband and westslope cutthroat trout are sympatric, the two species appear to have evolved strategies to limit introgression as evidenced in the East Fork Yaak River tributaries.

Threats

Many stocks in the Columbia River basin are threatened by mainstem passage problems, habitat damage (due to logging, road construction, mining, agriculture, and grazing, which decrease water quality and increase siltation), and interactions with hatchery fishes (Nehlsen et al. 1991). One species that ranks high on the threat scale to redband is the coastal rainbow trout. The widespread culture and stocking of coastal rainbow stocks, or hybrid redband, steelhead and rainbow, throughout the redbands range has lead to substantial losses of the native genotype (Behnke 1992).

Description of the Population within the Planning Area

Historically, redband trout were likely distributed throughout the Yaak River and its tributaries. The current redband trout population within the planning area is similar to the historic distribution and is composed of a resident population in Burnt Creek and fluvial populations in the main Yaak River.

The overlap of redband trout and westslope cutthroat trout in some streams has resulted in a unique case of hybridization of two native species. The redband's spawning timing and rapid development of eggs is similar to that of the westslope as documented in the East Fork Yaak River drainage (Muhlfeld 2002). MFWP genetic testing conducted in 1992 of the Burnt Creek population showed hybrid redband trout.

Surveys were conducted in the planning area by Forest Service personnel in 2005 (see project record). Data on species presence and abundance was also gathered from the Montana Fish, Wildlife, and Parks (MFWP) website and is shown in Table 29. Forest Service surveys did not include data on abundance and water use**.**

Non-Native Species

Rainbow Trout

Description of General Population and Habitat Status

The coastal rainbow trout *(Oncorhynchus mykiss irideus*) is a widely distributed western North America native salmonid that is closely related to the interior redband trout (*Oncorhynchus mykiss gairdneri*) (Behnke 1992). Rainbow trout can also be further divided into two forms - the adfluvial rainbow that annually migrates between a lake and tributary river in order to complete its lifecycle, and the fluvial rainbow that remains in a river system throughout its life. The potential for both exists in the Kootenai River Basin.

The native range of the coastal rainbow trout is along the North American coast from the Kuskokwim River of Alaska to Baja California. Hatchery reared coastal rainbow trout have been successfully introduced into suitable waters all over the world (Behnke 1992). The widespread culture and transplanting of coastal rainbow stocks, or hybrid rainbow, steelhead and rainbow, throughout the range of other native trout species has lead to substantial losses of the native interior redband genotypes (Behnke 1992).

Rainbows are spring spawners (March-June); fry emerge from the stream bottom approximately two months after spawning and begin a stream residence that may last one year to a lifetime. Adfluvial and migratory fluvial rainbow juveniles will typically move downstream to their ancestral lake or river after one to three years of residence in the headwaters. Sexual maturity typically occurs at 3 to 5 years except in cold or hot climates where life expectancy is shortened.

Description of the Population within the Project Area

Coastal rainbow trout were planted yearly into the mainstem Yaak River above Yaak Falls beginning in 1934. The current rainbow trout population within the planning area is composed of a resident and fluvial component that rears in the Yaak River and its tributaries. Rainbow trout are abundant in the Yaak River.

Watershed Existing Condition

The interior redband and westslope cutthroat trout are the only potentially affected endangered, threatened, or sensitive fish species in the Grizzly project area. This analysis centers on their habitat needs. In an effort to minimize repetition, only select watershed condition information is summarized as it relates directly to the local threatened, endangered, and sensitive fish populations. For a thorough review of the existing hydrologic condition, please refer to the Hydrology section.

Habitat Indicators

The following descriptions correspond to the 19 habitat indicators listed on the FWS matrix for bull trout, KNF-2670-BT3 (USDI Fish and Wildlife Service 1998). Stream surveys were conducted within the planning area in 2005. Existing conditions for each habitat indicator are described and rated based on stream surveys conducted in the planning area in 2005 (see project record). The streams are summarized based on their 6th -code watershed HUC: Yaak River (Pheasant Creek, Cool Creek, Lang Creek and Gus Creek) and Burnt Creek (Burnt Creek and Grizzly Creek).

1) **Temperature:** Water temperatures were taken as a single measurement during stream surveys in June/July.

   - **Yaak River:** Water temperature averaged 51.8°F in Gus Creek, 59°F in Lang Creek, 63.5°F in Cool Creek and 58.5°F in Pheasant Creek. A long stretch of the Yaak River does flow through naturally open meadows at low gradients, so it is not known to what extent riparian area changes have affected stream temperature.
   - **Burnt and Grizzly:** Water temperature averaged 70°F in Grizzly Creek and 57.4°F in Burnt Creek.

2) **Sediment:** Substrate composition is dominated by larger material in the cobble to boulder size class. The percentage of smaller materials is probably similar to that found in other streams in the Kootenai system. Those streams are typically low in fine sediments, even in managed systems.

   - **Yaak River:** Water quality data collected within the Yaak River subwatershed has documented fine sediment (less than 6 mm) levels averaging 7 percent within Pheasant and Cool Creeks, 22 percent within Lang Creek and 9 percent within Gus Creek.
   - **Burnt Creek:** Water quality data collected within the Burnt River subwatershed has documented fine sediment (less than 6 mm) levels averaging 3 percent in Burnt Creek and 2 percent in Grizzly Creek.

3) **Nutrients and Contaminants:** Many mining camps were established in the Yaak River drainage in the 1890s after the discovery of gold. The largest mining camp in the Yaak River drainage, associated with a patented placer gold claim, developed into the town of Sylvanite, which was located about 6 river miles upstream of Yaak Falls. The town of Sylvanite had two quartz mills in operation in the late 1890s. The forest fires in 1910 destroyed much of

Sylvanite and only small-scale mining continued after the fires of 1910. It is not known to what degree water quality was contaminated by mining, but there are currently no active mines in the Yaak River drainage.

There are no streams within the planning area listed on the 2006 State of Montana 303(d) list for water quality impaired streams.

4) **Physical Barriers:** The westslope cutthroat trout populations in Grizzly Creek and upper Burnt Creek are isolated above barrier culverts that limit westslope movement but protect genetic purity.

5) **Substrate:** Substrate embeddedness in rearing areas has not been quantified, however based on fine sediment data it is unlikely to be an issue.

6) **Large Woody Debris (LWD):** Surveys conducted in 2005 in the Grizzly project area indicate high total number of pieces of LWD in all streams surveyed (see project record). The numbers of LWD pieces greater than 12 inches in diameter were above INFS objectives in all streams but two reaches of Burnt Creek (see Table 30 below for LWD data).

7) **Pool Frequency:** Pool frequencies in the project area streams do not meet INFS objectives in Lang Creek, Cool Creek, Reach 1 of Pheasant Creek and Reach 1 of Burnt Creek (see Table 30 below for pool data). Pools are not common in the Yaak River as a function of stream size.

8) **Pool Quality:** Stream surveys identified that most pools where generally shallow (less than 3 feet in depth). Habitat complexity is good and deep pools are often associated with large woody debris pieces and aggregates. Pools generally support low levels of fine material.

9) **Off-channel Habitat:** There are areas of isolated backwaters on Cool Creek and braided sections of Pheasant Creek. However, based on the natural channel types and the narrow V-shape of the valley bottom, these streams do not likely provide off-channel habitat.

10) **Prime Habitat (refugia):** Project area streams provide good fish habitat with good bank stability, cover, and woody debris

11) **Pool width-to-depth ratio:** Pools in the project area have a considerable amount of cover, although most lack enough depth to provide refuge for large fish and rearing habitat for young of the year and subadults. Data from the 2005 stream surveys indicate that pool width-to-depth ratios generally meet the INFS objectives with a few exceptions (see Table 30 below for pool width/depth data).

12) **Streambank conditions:** Habitat surveys completed in 2005 indicate bank stability generally meets INFS objectives with a few exceptions. Six of the 10 sites surveyed had greater than 80 percent for bank stability (see project record).

13) **Floodplain connectivity:** Floodplain connectivity information was not available within the planning area.

14) **Peak and Base Flows:** The stream channels in the project area show some evidence of altered peak flow as the result of past vegetation management activities. Water routing from the existing road network has led to localized effects that have affected the timing and magnitude of the flow regime.

15) Drainage Network: There are approximately 25 total miles of roads within RHCAs in the planning area. Yaak Valley Highway follows an extensive portion of the Yaak River through the planning area. Given the road density in this drainage there is a high probability that the drainage network in this watershed is measurably altered.

16) Road Network: Road 472 follows the main stem of Burnt Creek for its entire length but is generally located outside the riparian area, which limits the roads effects on shading, litterfall and riparian plants communities. Other streams in the project area have several stream crossings especially in the headwater areas that interrupt debris and nutrient flow. Pheasant Creek and its tributaries have 15 road/stream crossings. Burnt Creeks and its tributaries have 56 road/stream crossings.

- **Yaak River:** The road density is 3.76 miles per square mile with a stream crossing density of 4.04 stream crossings per square mile.
- **Burnt Creek:** The road density is 2.27 miles per square mile with a stream crossing density of 2.87 stream crossings per square mile.

17) Disturbance History: The current ECAs for the planning area range from 3 percent in the Yaak Creek subwatershed to 24 percent in the Lang Creek subwatershed. Sixteen percent of the planning area has been regeneration harvested over the past 50 years. Three percent of the watershed has burned since 1990. Refer to Table 28 in the Hydrology section.

18) RHCAs: Riparian harvest and road building has occurred along most streams in the project area. Other impacts to RHCAs include firewood harvest, developed and dispersed campgrounds, and private land development in the RHCA. Riparian road density in the planning area is 3.42 miles per riparian square mile.

19) Disturbance Regime: Scour events, debris torrents, and large-scale fires have been localized events that have occurred in several parts of the project area. Resiliency of habitat to recover from environmental disturbances is moderate. Although frequent flood events have occurred over the last couple of decades, based on recent survey data the watersheds appears to be absorbing the effects and maintaining function (see project record).

Table 30. Data Collection Summary (USDA Forest Service 2005b)

Stream	Reach	LWD >12 inch diameter/mile	Pools per Mile	Average Wetted Width (feet)	Pool Width-to-Depth Ratio	Percent Bank Stability
INFS RMO		20/mile > 12" diameter	96/mile for 10-19' width		<10	>80% stable
Lang Creek	1	21	62	10.3	6.9	61
Cool Creek	1	58	58	11.5	6.2	85
	2	24	73	12.3	7.4	87
Pheasant Creek	1	85	57	16.2	9.4	72
	2	190	126	11.9	6.2	81
Gus Creek	1	148	148	7.0	6.6	74
Burnt Creek	1	18	53	19.7	8.7	91
	3	16	98	18.2	9.5	79
	4	62	155	15.3	7.5	84
Grizzly Creek	1	109	109	10.3	6.0	86

The fish habitat data above shows that conditions within the Grizzly project area meet or exceed INFS riparian management objectives with the exception of pool frequency. Pools frequency is low in most reaches as a function of stream size and smaller diameter LWD. However, LWD levels and recruitment sources are available in the project area, and would not be affected by the proposed actions; therefore, pool frequency is expected to improve. Bank stability is also good throughout much of the length of streams surveyed.

Environmental Consequences

Recreational Fishing

The affected watersheds provide a moderate level of opportunity for recreational fishing on National Forest lands. Alternatives that degrade fish habitat can limit the number of adult fish available for fishing. Recreational fishing opportunities would not change as a result of any of the alternatives. There may be some short-term adverse effects to fish habitat as a result of proposed the road decommissioning work. However, these effects are not expected to affect entire fish populations and would result in a long-term upward trend in fish abundance. INFS standards would be met for all alternatives; therefore, there would be no direct, indirect or cumulative effect to recreational fishing. Most streams in the analysis area do not provide a high degree of recreational opportunity for fishing because of their small size. There are no other known potential effects to recreational fishing.

Timber Harvest and Associated Activities

Sediment entering stream channels can affect channel shape and form, stream substrates, the structure of fish habitats, and the structure and abundance of fish populations (Chamberlin et al. 1991). Increased sediment loads can also affect fish populations by suffocating eggs and newly hatched larvae living in gravels and by abrading sensitive gill membranes of both young and adult fish. Increasing sediment production is generally associated with ground-based harvest systems and particularly road construction. Sediment decreases habitat diversity, degrades spawning and rearing habitat and consequently fish reproduction and survival. It also reduces aquatic insect production.

The density of salmonids in rearing habitat has been shown to be inversely proportional to the level of fine sediment (Bjornn and Reiser 1991). Fine sediment can greatly reduce the capability of winter and summer rearing habitats and when levels reach 30 percent or more, survival to emergence is significantly reduced (Shepard et al. 1984). Fine sediment may have the greatest impact on winter rearing habitat for juvenile salmonids. Fine sediments can cap or fill interstitial spaces of streambed cobbles. When interstitial rearing space is unavailable, juvenile salmonids migrate until suitable wintering habitat can be found (Muhlfeld et al. 2001). Fine sediment has also been shown to cause alterations in macroinvertebrate abundance and diversity. No road construction, landings, skid trails, or tree harvest would occur within RHCAs. In fish-bearing streams, RHCA widths would be 300 feet on both sides of the stream channel. Research suggests that buffer widths of 300 feet would be adequate to protect a stream from sediment in a worst-case scenario (Belt et al. 1992).

Alternative 1 - No Action

Direct and Indirect Effects. No direct effects on westslope cutthroat trout or redband trout would occur. Indirect effects would occur from existing roads continuing to contribute sediment at the current rate. Vegetation in previously harvested units would mature over time resulting in gradually decreasing water yield for all watersheds. This recovery should improve overall

watershed conditions. If wildfires are suppressed and no prescribed burning occurs, fuel loadings would increase resulting in increasing risk of high-intensity fires that could affect watershed conditions. Existing roads would continue to channel surface flow and sediment to the streams. This would keep flows elevated until a majority of vegetative recovery has occurred and hydrologic recovery begins. If these problems were not corrected, they would continue to contribute to habitat degradation. Peak flow increases would never fully recover to a natural condition with the existing road system in place. Undersized culverts could plug and wash out resulting in large increases of sediment to the streams.

Alternatives 2 and 3

Direct and Indirect Effects. Based on the potential level of effects to fish habitat and fish populations there is a slight difference among the action alternatives. The level of harvest, burning, temporary road construction, road maintenance work and watershed rehabilitation treatment is nearly identical with the action alternatives with respect to their effects to fisheries.

Indirect effects to westslope cutthroat trout and redband trout would occur if any of their habitat parameters were affected by the project. Those parameters most likely affected by timber harvest, fuels reduction and road work would be large woody debris (LWD), water quality (sediment), water yield and temperature/shade.

Timber Harvest and Associated Activities

Under the action alternatives timber harvest, machine piling and slash burning would occur in the watersheds of Yaak River and Burnt Creek. Precommercial thinning would have no effect on the fish species, and is not discussed further.

RHCAs would protect the streams from non-channelized sediment inputs. A review associated with INFS concluded that non-channelized sediment flow rarely travels more than 300 feet and that 200 to 300 foot riparian buffers are generally effective at protecting streams from sediment from non-channelized flow (USDA Forest Service 1995).

Typically, there is a three- to four-year increase in nitrogen and phosphorus in streams draining a newly harvested area resulting from the decomposition of logging slash, the flushing of some soil nutrients normally taken up by trees, and in some cases due to slash burning. These short-term indirect water quality effects do not generally extend very far downstream because of mitigation by instream sediments and uptake by plants and animals (Murphy and Meehan 1991). However, these nutrients are generally in short supply in the affected area and the potentially affected waters downstream would increase aquatic productivity for a short time.

Past studies suggest that the most obvious and immediate response of a watershed to a forest management activity is change in water yield due to the change in total ecosystem evapotranspiration. Associated with this increase in runoff is elevated nutrient and sediment loading to streams (Sun et al. 2005). According to the hydrology report, the presence of high intensity rainfall during late summer and fall can exceed the infiltration capacity of the soils without a litter/duff cover removed during thinning activities. Soil infiltration would also decrease from treatment-related compaction. Evapotranspiration rate of the treatment area would decrease from removal of a portion of the vegetation resulting in more water in the soil profile. This could cause localized temporary increases in groundwater tables that is typically manifested in emergent or increased area of hillside seeps, or base flow in channels.

Large wood is important to the aquatic environment because it routes and stores sediment, provides habitat complexity, and acts as a substrate for biological activity. The potential to reduce recruitment would occur where trees are removed from the area having the highest potential for delivery to the system. Both McDade et al. (1990) and Van Sickle and Gregory (1990) reported that more than 90 percent of instream wood identified as coming from adjacent riparian sources came from within approximately one site potential tree height for mature stands. Site potential tree height for wet sites is approximately 150 feet. The current INFS riparian management objective for streams such as those in the planning area is to maintain at least 20 pieces of LWD (12 inches in diameter and 10 feet long) per stream mile. Surveys conducted in 2005 showed existing levels of LWD in the planning area meet INFS RMOs with the exception of two reaches in Burnt Creek (see project record). The proposed activities would not reduce potential recruitment availability; therefore, conditions are expected to improve over time.

Since no trees would be harvested within 300 feet of perennial streams and 100 feet of intermittent streams and fire intensity is expected to remain low, no change in LWD would occur from the project.

Harvest activities within RHCAs that result in reduction of forest canopy can reduce shade and affect stream temperature, cover, primary production, and habitat (Belt et al. 1992). Summer stream temperature increases due to the removal of riparian vegetation has been well-documented (Belt et al. 1992). Measurements by Hewlett and Fortson (1983) under winter conditions also indicate that removal of riparian vegetation can reduce temperatures by about 10°C. This project does not propose to harvest in RHCAs. Since trees would not be removed from the stream buffer and fire intensity is expected to remain low, no trees contributing to shade or stream canopy would be removed, therefore no changes to shade or temperature would occur.

Riparian values for all watersheds such as temperature, filtration of sediment and contaminants, large woody debris recruitment and stream bank condition would not be compromised due to the implementation of RHCAs. The implementation of RHCAs on all stream channels would insure that this project would not retard the attainment of riparian management objectives.

Temporary Road Construction and BMPs

All action alternatives would result in temporary road construction that would be obliterated following project activities; 2.1 miles of temporary road is proposed in Alternative 2 and 1.9 in Alternative 3. Alternative 2 would result in approximately 54 miles of road maintenance and BMP work and Alternative 3 would result in approximately 49 miles. BMP work on existing roads in the Grizzly project area would improve surface drainage, and sediment that is channeled to streams by roads would be reduced. Roadwork may include replacement and installation of drain dips and culverts, constructing or cleaning catchbasins, blading, dust abatement, buttressing cutslopes and fillslopes and resurfacing. This would improve the drainage network and reduce the likelihood of sediment introduction from failed culverts. Roadwork involving culvert replacements would occur in the drier months (July – September) to minimize any potential sediment inputs to streams. In addition, all disturbed areas would be seeded. Nonetheless, short-term increases in sediment from disturbed areas are possible because of the risk of rain events occurring before the vegetation is established.

Fuel Treatments

Alternatives 2 and 3 propose natural fuels reduction treatments that include machine-piling, hand piling, underburning, lop and scatter and jackpot burning. RHCAs would be established on all streams within the proposed burn units. During underburning, no ignitions would take place

within the RHCAs. However, fire would be allowed to back into the RHCA buffer to remove some of the smaller conifers and allow recovery of aspen. Generally, areas with riparian vegetation burn poorly, especially due to the moist habitat in the spring or fall when prescribed burning would take place. This could have a minimal temporary (about 1 year) affect to sedimentation where it burns into the RHCAs. BMPs are designed to ensure that management activities that include site preparation and prescribed burning are also designed and implemented to avoid adverse effects on soil and water quality. Specific guidelines for soil cover retention and soil conditions during the implementation of these activities are included in burn plans and contracts. The proposed burning would not result in an increase in ECAs; therefore, there would be no effect to fisheries habitat.

Watershed Rehabilitation Work

Proposed road decommissioning includes removing culverts and reestablishing the stream channel, weed spraying, ripping the roadbed, recontouring in unstable sections and revegetation. Long-term storage could remove culverts and reestablish stream channels, weed spraying, scarification of the roadbed, installation of waterbars for drainage and revegetation. Watershed rehabilitation is proposed under all action alternatives. Mileage to be actively decommissioned, placed into intermittent stored service, or converted to trails varies slightly by alternative. Proposed road decommissioning and intermittent stored service would cause similar effects to redband and westslope cutthroat trout for all action alternatives.

Road decommissioning that includes removal of stream crossings is beneficial to watershed and riparian function in the long term, but results in disturbance within the RHCAs and therefore has a potential for increasing sediment input to streams in the short term. Following culvert removal, the channel would also be reconstructed to minimize the channel's adjustment process and resulting sedimentation. Large rocky substrate and woody debris would be used to armor the new channel. Additionally, mulch and seeding disturbed areas would also minimize sediment input. Both Alternatives 2 and 3 propose actively decommissioning 30 miles of road including 2.7 miles occurring within RHCAs. A total of 31 culverts would be removed; 18 on perennial nonfish-bearing streams and 13 on intermittent streams. Timing restrictions and BMP implementation would be most beneficial in reducing effects to redband and westslope cutthroat trout. Because increasing sediment production can decrease habitat diversity, degrade spawning and rearing habitat, and reduce aquatic insect production, the proposed roadwork could involve short-term effects to fish. Monitoring done during stream crossing improvements on the Libby RD has documented that the increase in turbidity and sedimentation is of very short duration (USDA Forest Service 1998a). Associated sediment transport is also very limited. The long-term benefits of reducing water routing and sediment input and restoring fish passage would outweigh the short-term effects of roadwork.

Restoring stream and riparian function would increase depth, complexity and shading within the affected streams providing for cooler water temperatures, reduced evaporation, and potentially more stable flows through the summer low flow period. Similar benefits would occur during winter low flows. Intact riparian communities provide an insulation that prevents streams from freezing during extreme cold. Deeper water also provides better rearing habitat as it is also less likely to freeze completely. An increase in the frequency of LWD not only can enhance instream complexity but also serves as a long-term nutrient supply. LWD generally also increases available habitat that in turn provides increased carrying capacity.

Westslope cutthroat trout and redband trout habitat elements would benefit in the long term from the watershed rehabilitation work including: embeddedness, increased pool depth, decreased

width to depth ratio, improved streambank condition, restored drainage network, and reduced road density.

Cumulative Effects

The cumulative effects analysis was based on habitat changes from the baseline condition as a result of past activities, proposed activities, ongoing projects, and other reasonably foreseeable Federal, State and private activities. Effects to population resiliency and consequently the probability of species persistence within the planning area were based on this cumulative analysis.

Past Actions and their Effect on Current Conditions: Past timber harvest and road construction greatly influenced the watersheds and fisheries within the project area mainly through increased sedimentation and water yield. Timber harvest has elevated water yields by reducing the canopy and allowing more water to reach the stream, which has caused the streams to widen through increased in-channel erosion. Roads have acted much the same way by intercepting ground water and routing increased water down ditches to the streams.

There has been a marked shift in the last 10 years to more intermediate harvest and greater crown retention. Since the INFS amendment (1995) to the Forest Plan riparian buffers are left intact, thus limiting the effects to riparian habitat and stream channels. Recent projects incorporate watershed rehabilitation projects that include upsizing of culverts and removal of fish passage barriers, implementing BMPs and decommissioning roads to decrease erosion and sediment delivery to streams. Based on hydrologic recovery rates applicable to the analysis area, effects of projects implemented more than 30 years ago are assumed to be revegetated and not expected to contribute to sedimentation.

Since the late 1980s, protection measures for the threatened grizzly bear have markedly decreased the amount of road available for motorized public travel and management activities, while increasing security for grizzly bears as well as other wildlife species. The creation of grizzly bear core security areas has resulted in roughly half of the National Forest lands in the district being unavailable to motorized travel during the active bear year. Within the analysis area, roads were closed after the harvests in the 1980s, and have been relatively stable since.

Contrasting Effects of Proposed Actions with Past Actions: Proposed treatments in the Grizzly project include both regeneration and intermediate harvest using a variety of harvest methods including helicopter, tractor and skyline. These treatments include specific design criteria to minimize adverse effects to soil and hydrology, and therefore fisheries habitat. Implementation of RHCAs will help protect fisheries habitat. This is a substantial departure from past actions that removed vegetation along streams, allowed equipment to operate adjacent to and through streams, and provided little protection to streams and streambanks. The proposed road decommissioning would have positive long-term benefits to water quality and fisheries in the analysis area. Road decommissioning was not included in or considered in past activities.

Effects of Ongoing and Reasonably Foreseeable Actions: These activities may occur regardless of which alternative is selected for implementation. Currently, the only reasonably foreseeable actions are the proposed replacement of the ford crossing with a bridge on road 472X, and fuels reduction activities in the Obermayer Fuels Project. Private land development may increase as access is improved on road 472X, which could increase pollution, riparian disturbance, and water withdrawals. The Obermayer Project includes specific design features to improve water quality through the implementation of BMPs, similar to the Grizzly Project. There

is a very low risk that implementation of any action alternative in the Grizzly Project would adversely water quality conditions or beneficial uses in the main Yaak due to the project design features, but other actions on private lands may adversely affect water quality.

Combined Effects of Past, Proposed, Ongoing and Foreseeable Actions: Implementation of this project in conjunction with the past and proposed activities in the project area would not measurably affect fisheries populations or habitat. Habitat conditions measured during the 2005 field season currently are near or meet INFS standards. Ongoing and proposed activities would not change this.

Fuels treatments would help to reduce fuel loadings in specific areas within the project area. The overall effects of this burning would be minimal since the burns would be done in the spring. This would reduce the likelihood of excessive crown reduction and would stimulate grass and shrub growth. Site preparation associated with regeneration units would not occur in any RHCA.

With the implementation of the road decommissioning proposed in this project, there would be a reduction of 31 stream crossings throughout the project area. This would prevent large increases in stream channel sediment from potential culvert failure. Although none of the culvert removals occur on reaches of streams that are fish-bearing, removing culverts and reconstructing the stream channels where these culverts were located would begin to restore stream channel function and fish habitat downstream. Short-term negative effects from watershed rehabilitation would be addressed and mitigated through timing restrictions and BMP implementation. Approximately 54 miles of roads would receive BMP improvements. Many of these roads currently act as sediment sources contributing to in-stream sediment. In subsequent years, this road decommissioning and BMP work would cumulatively decrease water routing and sediment input from roads. The proposed roadwork is not likely to affect other features of the aquatic habitat, such as temperature, cover or nutrient supply as the proposed work would not be removing any vegetation adjacent to the creeks.

Regulatory Consistency

Endangered Species Act

The Grizzly Vegetation and Transportation Management Project is consistent with the Endangered Species Act (ESA). No federally listed fish species are located within the analysis area therefore formal consultation is not required. The specialist report and biological evaluation in the project record document compliance with existing federal regulations on Forest Service actions with regard to aquatic species and aquatic habitat.

Determination of Effects

White Sturgeon and Bull Trout:

The proposed project would have **no effect** on white sturgeon or bull trout. No streams within the project area provide sturgeon or bull trout habitat. The nearest potential habitat for these species is the Yaak River below Yaak Falls approximately 13 river miles from the project area.

Westslope Cutthroat Trout and Redband Trout:

Based on the preceding discussion of westslope cutthroat trout and redband trout distribution in the project area and the potential for a minimal increase in sediment due to prescribed burning and culvert removal within RHCAs, the proposed activities **may impact individual westslope cutthroat trout and redband trout or their habitat but would not likely contribute to a trend**

towards federal listing or cause a loss of viability to the population or species. RHCAs would be implemented on all stream channels within the project area to limit adverse effects to fish populations by protecting habitat.

Kootenai National Forest Plan:

The Grizzly Vegetation and Transportation Management Project is consistent with the Forest Plan for the Kootenai National Forest (USDA Forest Service 1987). Current conditions in the Grizzly project area generally meet or exceed RMOs established by INFS, with the exception of pool frequency. The proposed activities do not reduce or retard continued attainment of these RMOs and is therefore consistent with INFS.

Wildlife

Introduction

This analysis assesses potential impacts to wildlife that are federally listed threatened and endangered species, management indicator species (MIS) as designated in the Forest Plan, and serves as a biological evaluation of impacts to USDA Forest Service Region 1 sensitive species (Hamann 2007).

Analysis Area

The analysis area used for direct and indirect effects is limited to the project area for most species as the effects are localized to the area of activity. The exceptions to this are the analysis areas for grizzly bears and lynx, which were established as a result of formal consultation with USDI Fish and Wildlife Service, and by direction from the Lynx Conservation Assessment and Strategy (Ruediger et al. 2000). The specific analysis areas for these species are described in the species-specific sections. The cumulative effects analysis area for most species is the project area as the effects are localized to the area of activity, except where noted as different. The project area is sufficient in size to address cumulative effects on habitat components. The analysis area for determining viability is the Kootenai National Forest.

Analysis Methodology

Pre-field reviews were conducted to determine which species are known to occur in the area or have suitable habitat present and could potentially occur. Sources reviewed include Montana Natural Heritage Program, Forest occurrence databases (NRIS FAUNA database), and species distribution information. Vegetation analysis is based on stand data in the Timber Stand Management Record System (TSMRS). This database contains basic site and stand information and was updated between 1997 and 2004.

Wildlife surveys completed include goshawk, incidental amphibian, and old growth verification. Proposed units were field reviewed by the district biologist during the summer 2005, and TEAMS biologist in May 2006 (see project record). Additional goshawk surveys were done in the summer of 2006. Observations recorded during all of these surveys have been incorporated.

Other sources of information include the Kootenai National Forest's Conservation Plan (KNF WFB Steering Group 2004), the "Cumulative Effects of Past Projects on Wildlife" assessment (Johnson 2006a), a Conservation Assessment for four species in the Northern Region (Samson 2005), the Draft Comprehensive Evaluation Report (CER; USDA Forest Service 2006c),

Cumulative Effects of Past Projects on Wildlife (Johnson 2006a), geographic information systems (GIS) data, and other references as cited throughout this document.

Moving windows analysis was used for the grizzly bear analysis, consistent with the "Biological Opinion on the 2004 Forest Plan Amendment for Motorized Access in the Selkirk and Cabinet-Yaak Grizzly Bear Recovery Zones" (USDI Fish and Wildlife Service 2004). A moving windows analysis is a spatial analysis of route density distribution used to determine the status of open motorized route density (OMRD), total motorized route density (TMRD) and core habitat in relation to bear management unit (BMU) standards.

The Kootenai National Forest staff developed a process to identify lynx habitat and lynx analysis units on the Forest (USDA Forest Service 2000a). The results from that process were used to assess changes to lynx habitat.

The Forest has a Conservation Plan (KNF WFB Steering Group 2004) that assessed population and habitat trends for threatened, endangered, sensitive and management indicator wildlife species that exist or have the potential to exist in the Forest. The models used were designed to select habitat based on stand components (such as structure or canopy cover) or features (such as slope or elevation) favorable to each species. This Conservation Plan was based on eight planning units across the Forest. The project area is in the Yaak Planning Unit, which roughly correlates to Bear Management Units 11-15 and encompasses the upper Yaak River drainage.

In 2005, the Regional Office produced a Conservation Assessment of the Northern goshawk, black-backed woodpecker, flammulated owl, and pileated woodpecker in the Northern Region (Samson 2005). This analysis also calculated the amount of habitat available for these species, but was based on forest inventory and analysis (FIA) data. FIA data is consistent across the Region and the state, but it was not developed to address site-specific stand conditions for a project area. In some cases, these two assessments vary widely in the amount of habitat present for a specific species.

For this analysis, habitat evaluation was done based on TSMRS data and FVS and FVS-FFE (Forest Vegetation Simulator and Fire Fuels Effects) modeling (as described in the Vegetation Section). As mentioned previously, TSMRS data was used to evaluate changes in habitat, as discussed for each species.

Timeframes used for the analysis include disturbance effects due to increased traffic, human activity, and equipment use during project activities. Project activities are expected to take several years, with seasonal operating periods of June 15 until fall when operators are rained out. The harvest may be done under a few timber sale contracts, while the precommercial thinning would be in another contract, which may overlap with the harvest. Planting would be done after all site preparation activities are done. Road decommissioning is expected to occur later in time, as there are several years of work already scheduled. Changes in vegetation and habitats are also considered during the analysis. These changes include decreases in forested canopy cover, and increases in understory shrubs. Over the long term (10 years or more), there would be increases in species like aspen and birch some units. Finally, changes in access were assessed.

Analysis Assumptions

- Timing of project activities is important in predicting effects. No mechanized activities would begin prior to June 16 (the end of the grizzly bear spring use season), except for four units that are proposed for winter harvest. Timber harvest, precommercial thinning, and weed management would generally start June 16 and continue until wet fall weather ends the

season. Road work would generally occur from July 1 to September 15. Burning is usually done in the fall and spring. Planting would occur in April, May or June, would be done by hand and would take approximately one week per unit.

- Harvest generally occurs during the first season, site preparation generally occurs during season 2 or 3, and planting occurs the following season.
- Some of the access roads would need some reconstruction, including clearing. Temporary road construction would be of short duration; they would be reclaimed, and are not considered new access for this analysis.
- Activities behind gates would be minimized during the first week of hunting season.
- Helicopter harvest would result in sporadic disturbance, but would be completed within one season.
- Two currently bermed roads (8021C to access Unit 33 and road 593R to access unit 11) would be opened for harvest activities.
- The 902Z spur would be bermed just north of unit 44 and 902Y spur would be bermed just north of unit 47. The lower part of these spurs would remain open to the public.
- All other roads behind gates that would be used as haul roads would be closed at the end of daily work activities and on the weekends to restrict public access.
- All berms would remain in place for a minimum of 10 years, to contribute to grizzly bear core habitat.
- Road decommissioning might not start for four years (2010) due to a backlog of three seasons of work.
- Small wetlands found during unit surveys have been excluded from proposed units, where possible (i.e., unit 17 was modified to exclude wet areas).
- Precommercial thinning would occur in sapling stands that originated from stands harvested in the 1970s, 1980s, and 1990s. Effects of disturbance during precommercial thinning activities will be addressed for those species that may be affected (grizzly bear, bald eagle, and big game).
- Timber harvest results in changes in stand structure, or fragments mature forest into early seral stands. In addition to habitat alteration as a result in changes in stand age, this can result in edge effects (windthrow, increased predation, etc.) or affect habitat connectivity for some species. Most species analyzed are not tied to specific habitats (habitat generalists) or are very mobile species and would not be affected. Fishers and brown creepers, which are associated with mature forests, may be affected by changes in habitat connectivity or edge effects, respectively.

Regulatory Framework

Applicable requirements and other direction guiding the management and protection of wildlife and habitat may be found in the Endangered Species Act (ESA), National Forest Management Act (NFMA), and USDA Forest Service manuals. The Forest Plan provides Forestwide and site-specific standards and guidelines for maintenance of habitat for wildlife species. The Forest Plan was developed to be consistent with ESA, NFMA and USDA Forest Service manual direction. Kootenai Forest Plan direction has been incorporated into the project design where appropriate.

Threatened and Endangered Species

A current species list for the Kootenai National Forest was obtained from the U.S. Fish and Wildlife Service (USFWS) website (http://montanafieldoffice.fws.gov) dated 7/17/2006. Species status in the influence area of the proposed project is shown in Table 31.

Table 31. Threatened and endangered wildlife species

Common Name	Scientific Name	ESA Status	Status in Analysis Area
Grizzly bear	*Ursus arctos horribilis*	Threatened	Known
Canada lynx	*Lynx canadensis*	Threatened	Known
Gray wolf	*Canis lupus*	Endangered	Known
Bald eagle	*Haliaeetus leucocephalus*	Threatened	Known

Grizzly Bear

Grizzly bear population ecology, biology, habitat description, and relationships identified by research are described in Annual Progress Reports for the Cabinet-Yaak Recovery Areas (Kasworm et al. 2004). Demographic and population trend information is described in Wakkinen and Kasworm (2004). Linkages have been assessed in Servheen et al. (2003) and in the Interagency Grizzly Bear Committee Report (IGBC 2004).

Grizzly bear occurrence data comes from recent District wildlife observation records, Forest historical data (NRIS FAUNA database), and other agencies (USFWS and MDFWP). The analysis area boundary for project impacts to individuals and their habitat are Bear Management Units (BMUs) 11 and 14. The boundary for cumulative effects and making the effects determination are the BMUs where proposed activities would occur.

Affected Environment

The proposed project is in the Cabinet-Yaak grizzly bear recovery zone (USDI Fish and Wildlife Service 1993). Project activities would occur in portions of BMUs 11 and 14. The grizzly bear population for the Cabinet Yaak Ecosystem is currently estimated at 30 to 40 bears (Kasworm et al. 2005), with a 91 percent probability of a downward trend (Kasworm et al. 2006). The population estimate for the entire Yaak portion of the recovery zone is of 20 to 30 grizzly bears (Dood et al. 2006). Fifty-four percent of known mortality in the Cabinet-Yaak from 1983 to 2002 was human-caused (Wakkinen and Kasworm 2004). The human-caused mortality resulted from self-defense, mistaken identity, unknown but human-caused, poaching, management removal, and research. Ten of the 13 known-location human-caused mortality occurred less than 500 meters of a road open to public travel. Rates of human-caused mortality were 0.71 mortalities per year from 1983-1998 and 2.14 mortalities per year from 1999-2005 (Kasworm et al. 2006). The known human-caused mortality (female bear) in BMU 11 in 2005 was a case of mistaken identity by a hunter on private land along the Yaak River. The CYE does not yet meet recovery goals (USDA Forest Service 2005). Recent bear activity in these BMUs is shown in Table 32.

Table 32. Bear activity

BMU	Year	Credible Sightings	Sightings of Female with Cubs	Sightings of Females with Yearlings or 2-year olds	Human Caused Mortality
BMU 11	2005	4	0	0	1
	2004	7	0	1	0
	2003	4	0	0	0
BMU 14	2005	1	0	0	0
	2004	NA[1]	NA	NA	NA
	2003	2	0	0	0

1 NA = not available

Habitat Standards

The Forest Service and USFWS established standards applicable to BMUs within the recovery zones. They are percentages for core habitat, open motorized route density (OMRD), and total motorized route density (TMRD)[2]. Table 33 shows the existing habitat conditions in relation to the standards. These standards were based on Wakkinen and Kasworm (1997). Johnson (2007) assessed the use of the Wakkinen and Kasworm (1997) paper as the "best science" to set these standards. He concluded that their work is the best science available, and that these standards are applicable to grizzly bear habitats in the CYE. As shown in Table 33, BMU 14 currently meets all three standards, while BMU 11 does not meet TMRD or core standards.

Table 33. Existing grizzly bear habitat conditions by BMU (Wakkinen and Kasworm 1997)

BMU	OMRD		TMRD		Core	
	Existing	Standard (maximum)	Existing	Standard (maximum)	Existing	Standard (minimum)
BMU 11	28%	33%	29%	26%	52%	55%
BMU 14	28%	33%	26%	26%	56%	55%

These standards were incorporated into the Forest Plan with a Forest Plan Amendment in 2004. This amendment was litigated, and a recent District Court decision enjoined that amendment. As a result, compliance with management direction for grizzly bears that were in place prior to the Plan Amendment (2004) will also be addressed in the effects analysis. These requirements come from the 1987 KNF Forest Plan, consultations since 1987, the 1995 Amended Biological Opinion and Incidental Take Statement on the 1987 Forest Plan, the Selkirk/Cabinet-Yaak Grizzly Bear Areas Interim Access Management Rule Set (12/1/1998), and the 3/25/2001 Settlement Agreement with the Alliance for the Wild Rockies (Johnson 2006).

[2] OMRD is a calculation made with the moving window technique that includes open roads, other roads not meeting all restricted or obliterated criteria, and open motorized trails. The percent of the analysis area in relevant route density is calculated. TMRD is a calculation made with the moving windows technique that includes open roads, restricted roads, roads not meeting all reclaimed criteria, and open motorized trails. The percent of the analysis area in relevant route density classes is calculated. Core area is an area of secure habitat within a BMU that contains no motorized travel routes or high use non-motorized trails during the non-denning season and is more than 0.3 miles (500 m) from a drivable roads. Core areas do not include any gated roads but may contain roads that are impassible due to vegetation or constructed barriers. Core areas strive to contain the full range of seasonal habitats that are available in the BMU.

There are six recovery objectives to be addressed, based on management direction that was in place prior to the Plan Amendment in 2004 (Johnson 2006). These objectives, along with measures and standards or guidelines for each measure (where appropriate) are shown in Table 34. Currently, habitat effectiveness (HE) is 74 percent and 76 percent for BMUs 11 and 14, respectively. Linear open road density (ORD) is 0.44 and 0.58 for BMUs 11 and 14, respectively.

Table 34. Recovery objectives (pre-2004 standards)

Objective	Measure	Management direction
1. Provide adequate space to meet the spatial requirements of a recovered grizzly bear population	Habitat effectiveness	≥ 70%
	Linear open road density	≤ 0.75 mi/sq mi
	OMRD	No net increase
	TMRD	No net increase
	Core	No net decrease
2. Manage for an adequate distribution of bears across the ecosystem	Opening size	Normally less than 40 acres. Where larger, no point in opening more than 600 ft from cover
	Movement corridors	Unharvested corridors > 600 ft in width between proposed harvest units and existing harvest units and natural openings
	Seasonal components	Schedule proposed activities to avoid spring habitats during the spring use period (4/1 – 6/15).
		Schedule winter activities to occur when bears are in the den (11/30 – 3/31). Avoid activity in close proximity to known den sites during the denning period.
3. Manage for an acceptable level of mortality risk.	Achieved by meeting objectives 1, 2 and 6.	
	Evaluate possibility of project creating food attractants (i.e., seeding clovers on open roads)	
4. Maintain/improve habitat suitability with respect to bear food production.	Achieved by meeting objectives 1 and 2.	
	How does project improve food sources (especially huckleberries)	
5. Meet the management direction outlined in the Interagency Grizzly Bear Guidelines for Management Situations 1, 2 and 3.	Achieved by meeting objectives 1, 2, 3 and 4.	
6. Meet the interim management direction specified in the July 27, 1995 Forest Plan Incidental Take Statement to avoid exceeding authorized incidental take levels.	Achieved by meeting OMRD, TMRD and core standards as addressed under objective 1.	
	Total motorized trail density	No increase in existing density of open motorized trails.

Movement Corridors

The Cabinet-Yaak Ecosystem lies between the Northern Continental Divide and the Selkirk Recovery Areas. Linkages between these areas have been assessed in two different analyses (Servheen et al. 2003, and IGBC 2004). These analyses looked at the larger linkages between recovery areas, and do not look at this specific area. However, factors that they identified that result in habitat fragmentation include human activities such as road building, and residential, recreational, and commercial developments.

Within the project area, a movement corridor has been identified that lies along Spread Creek from the north, crosses the highway and Yaak River and passes into Shine (Pheasant) Creek to the south (based on movements of radio-collared bears as shown in Kasworm et al. 2004, Kasworm et al. 2005, and Kasworm pers. comm.). Features contributing to fragmentation in this corridor include traffic on highway 508, recreational developments (Whitetail Campground) and development on private land. Another local movement corridor lies between the Grizzly Peak IRA and Sheepherder Mountain and Roderick IRA to the east and southeast. Forest road 472 bisects this corridor.

Spring use of habitat components by radio-collared grizzly bears was studied in the CYE (Kasworm et al. 2005). In the Yaak River drainage, spring habitat use was dominated by closed timber, timbered shrubfields, graminoid sidehill parks, and mixed-shrub cutting units. They used lower elevations in April and May. They used all aspects, probably due to the lower elevations in the project area, as compared to the Cabinet Mountains. Based on this study, we can assume that the entire project area provides spring grizzly bear habitat due to its low elevations and the wide range of habitats that exist (forest and non-forest types, all aspects, all structures and canopy closures).

Environmental Consequences

Alternative 1

Since the No Action Alternative would not implement any action, BMU 11 would continue to not meet core and TMRD standards (Wakkinen and Kasworm 1997). The existing core areas provide displacement habitat for ongoing projects and recreational uses, although BMU 11 is below the core standard.

Currently, there are approximately 3,115 miles of existing road in the project area; 47 percent of the miles are open or gated with administrative use, the other 53 percent are barriered with no administrative use or are impassable to motorized vehicles. Recovery objectives of habitat effectiveness and linear open road density currently meet standards.

Production of understory vegetation has decreased due to increases in tree canopy cover and age. Huckleberry is a common understory shrub in the moist habitat types, which are found across VRU 5 where the harvest is proposed. The trend of declining understory vegetation would continue and huckleberry and other species favored by grizzly bears would continue to decline, until some natural disturbance (i.e., wildfire) opens the stands back up.

Alternatives 2 and 3

Disturbance/Displacement: The point source disturbances from timber harvest, slash treatment, and burning actions may displace grizzly bears during the period of activity. No mechanized project activities would occur during the spring bear use season (April 1 to June 15). Only planting would occur during this period. No motorized use would be allowed on restricted roads

for this activity. Because of the low elevations, the whole project area may provide spring habitat for bears. Planting in these regeneration units may cause temporary displacement during this period, and may take one week per unit.

Grizzly bears may be displaced as a result of traffic on roads and mechanical equipment in the units. The effects of road use have been accounted for through the road density and core standards and associated mitigation for this project.

Five units (13, 13a, 15, 18 and 20) are proposed for winter harvest to reduce effects to soils. These would not occur during the active bear season, beginning April 15 and would have no disturbance effects. There are no known den sites in the project area, so there would be no project-related activity in close proximity to any dens.

Road decommissioning of 6100 and 6131/6132 road systems would not occur at the same time as harvest in the Burnt Creek drainage. This would ensure that there would be areas outside of the zone of influence that would still function to provide displacement habitat.

Both alternatives include the same proposals for decommissioning of roads and placement into intermittent stored service. After the project, 47 percent of the miles would be open or gated with administrative use; the other 53 percent are barriered with no administrative use or are impassable to motorized vehicles. This is the same as the existing condition.

Most units were designed to maintain cover between them, except units 49 and 50 in Alternative 2, which would result in a 126-acre opening. In Alternative 3, these two units were modified to three 20-acre units with forest cover left between them.

Both action alternatives also include designation of some trails as nonmotorized. This includes trails 193 and 547 in the Roderick IRA and trail 182 in the Grizzly Peak IRA. This would maintain these areas as secure (core) habitat for grizzly bears into the future.

Displacement/Disturbance in BMU 11: Because BMU 11 is currently deficient in core habitat, road 6715B would be bermed prior to harvest activities to create additional core in the Lucky Point area. In addition, core habitat would be added along the ridge to the north of Grizzly Point, prior to project activities, by the installation of berms on roads 902A, 902B and 903 where they junction with road 902. These additional areas of core would provide displacement areas due to disturbance from project activities.

In addition, there are some timing design features to reduce the effects of displacement. Road decommissioning of the 6100 and 6131/6132 road systems would not occur during the same seasons as harvest in the Burnt Creek drainage. Each road system is expected to take a season to complete.

Harvest in the upper units in the Burnt Creek drainage (units 55a-55g, (57, 57a and 60 in Alternative 2 only)) would occur in one season in order to reduce the number of seasons that bears using this area would be affected. Units 34, 57, 57a and portions of 50 are proposed for harvest by helicopter. Unit 34 is located in the Lucky Point core habitat and unit 57 and 57a is on the edge of the Roderick core habitat area. Harvest of these units would occur during the same season, and would take a maximum of two weeks for each unit. Assuming a zone of influence of 1 mile, about half of the Lucky Point core habitat may become ineffective for the two weeks it takes to harvest unit 34, but the additional core created on the north end (by berming of 6715B) would offset this and provide a displacement area. A small portion of unit 57 is in core, but with a

1-mile zone of influence, it may affect a small percentage of the large Roderick core area for two weeks.

Disturbance/Displacement in BMU 14: Roads 6840 and 6840B would be put into intermittent stored service to offset the effects of activities associated with harvest in units 1 and 2, which are partly in core habitat. A temporary road would be needed to access these units; it would be reclaimed upon completion of activities. The core area affected is small, and displacement to the core area to the east (ridge between Whitetail and Pete Creek) if burning or precommercial thinning is not underway, or to the larger core area to the northwest would be expected.

Huckleberry Regeneration: Huckleberries are found as an understory component in many moist, warm habitat types. Initial decreases in huckleberries in logged areas are common. In general, overstory removal increases berry production, with population numbers increasing slowly. Where mechanical site preparation takes place, it is likely to reduce the frequency and cover of huckleberries for several years. Huckleberries are an understory species in the dominant habitat types proposed for harvest.

Grapple piling may have the most impact on existing huckleberry plants, due to the disturbance to root systems from the mechanical site preparation. Alternative 2 would have the potential to impact more acres than Alternative 3 (refer to Table 25 for acres of grapple piling).

Foliage has a low flammability, allowing for survival after low-severity fires, with top-killing resulting from higher severity fires. Top-killed plants will resprout from rhizomes. In preferred habitats, it will survive low to moderate severity fire and attain pre-burn coverage within 3 to 7 years, with stem number and density increasing. Moderate to severe fires may kill underground rhizomes. Objectives and prescriptions for the wildlife burns (G, H and I) and underburning would be developed to favor huckleberry regeneration.

Potential for Conflicts with Humans: Human-caused mortality of grizzly bears in the CYE results from self-defense, mistaken identity, unknown but human-caused, poaching, management removal, and research (Wakkinen and Kasworm 2004). Both alternatives would meet standards for OMRD, TMRD, and core habitat, which were based on increasing core (secure) habitat to reduce conflicts with humans. Two currently gated roads would be open for public use (firewood gathering) during project activities. While project activities may displace bears from this area, there is some potential for encounters with bears. Timber contract clauses on sanitation and waste disposal have been prescribed for this project to reduce the potential for human-bear conflicts.

Specific design features include the use of a seed mix that does not include clover. Using this mix on or adjacent to open roads (Units 11, 12, 12a, 17, 43, 50, 55 and 55a-g for both alternatives, and Unit 60 in Alternative 2 and Unit 61 in Alternative 3) will not provide a food attractant, and therefore would not increase the potential for mortality.

Habitat Standards: Both action alternatives would result in meeting core, TMRD, and OMRD standards (Wakkinen and Kasworm 1997) upon completion of the project, and would move in a positive direction during project activities as a result of access management requirements (Table 35).

Table 35. Grizzly bear standards by BMU for Alternatives 2 and 3 (Wakkinen and Kasworm 1997)

BMU	OMRD (standard ≤33%)			TMRD (standard ≤26%)			Core (standard ≥55%)		
	Existing	During	Post	Existing	During	Post	Existing	During	Post
11	28%	28%	28%	28%	27%	26%	52%	54%	55%
14	28%	29%	28%	26%	26%	26%	56%	55%	56%

For the recovery objectives (pre-2004), both BMUs meet the habitat effectiveness and linear open road density direction during and after the project (Table 36). In addition, the standards of no net increase for OMRD and TMRD, and no net decrease in core are met as shown in Table 35. Opening size direction would not be met in Alternative 2, as units 49 and 50 are adjacent clearcut units and would create a 126-acre opening. Treatments were proposed because the stands are dominated by dead and dying lodgepole pine. Regeneration harvest is the most effective treatment to address stand health concerns. These two units also do not meet the movement corridor direction, as unharvested buffers would not be left between them. Alternative 3 would meet this direction as these two units were redesigned to meet both opening size and movement corridor objectives.

Total motorized trail density does not increase; both alternatives designates 38.8 miles of existing open routes for non-motorized trails.

Table 36. Grizzly bear standards by BMU for Alternatives 2 and 3 (Pre-2004)

BMU	Habitat Effectiveness (standard ≥70%)			Linear Open Road Density (standard ≤ 0.75)		
	Existing	During	Post	Existing	During	Post
Alt 2 - BMU 11	74%	70%	74%	0.44	0.48	0.48
Alt 2 - BMU 14	76%	76%	76%	0.58	0.58	0.57
Alt 3 - BMU 11	74%	71%	74%	0.44	0.48	0.48
Alt 3 - BMU14	76%	76%	76%	0.58	0.58	0.57

Both BMUs meet the habitat effectiveness and linear open road density direction during and after the project. In addition, the standards of no net increase for OMRD, TMRD and no net decrease for core are met as shown in Table 36.

Corridors: The Spread Creek/Shine (Pheasant) Creek corridor would be only minimally impacted by actions under either alternative. The only activities include precommercial thinning in a few units to the east of the corridor, and putting a portion of road 6715B into intermittent stored service. This road is currently gated, but a berm would be installed on the western-most stream crossing on this road. These actions would be expected to be of short duration (about two weeks per unit for precommercial thinning, 5 units for a total of 10 weeks, assuming each unit would be completed consecutively) and installation of a berm prior to harvest activities (would occur early in the project timeline and would take one day).

The other local movement corridor would potentially be impacted by harvest in unit 60 and construction of temporary road to access the unit, as well as improvement of road 472 for hauling in Alternative 2. Harvest in unit 60 would result in disturbance in this corridor and could disrupt movements of bears between the Grizzly Peak and Sheepherder/Roderick core areas during road work, harvest, and site-prep activities. Longer-term effects would be felt as a result of improving

the road to access unit 60; an improved road could result in more public use in the future. Alternative 3 does not include unit 60 and road improvements to that unit.

Other actions in this vicinity include road decommissioning (road 6108, and the 6100 and 6132 road systems) and harvest of the upper units of 55 (55c through 55g). Harvest of the units in Burnt Creek (which includes 55 and 60) would not occur during the same season as the road decommissioning to provide areas free from disturbance.

Actions in Core Habitat: Several actions would occur in core habitat and these are shown in Table 37 and displayed on Map M-4 (in the Map Appendix). Only active decommissioning, where drainage work is needed before decommissioning, is shown. Passive decommissioning only entails installation of a berm at the beginning of the road; no additional work on the road would be needed.

Units 34, 57 and 57a are helicopter units, unit 34 being located in the Lucky Point core habitat and units 57 and 57a being on the edge of the Roderick core habitat area. Harvest of these units would occur during one season. Units 57 and 57a are only in Alternative 2, so the effects in Alternative 3 would be reduced as fewer disturbances would occur from helicopter activities.

Table 37. Actions proposed in core habitat

Action	Location	Effect	Duration
		BMU 11	
Harvest	Unit 34	Disturbance from helicopter	3 weeks
Harvest	Unit 57, 57a (Alt 2 only)	Disturbance from helicopter	3 weeks
Wildlife burn	Units G and H	Disturbance from helicopter	4 days
Road decommissioning	Road 6100	Disturbance from equipment	One season
	Road 6131/6132	Disturbance from equipment	One season
	Road 6108	Disturbance from equipment	Less than one season
	Roads 6084B, 5951A	Disturbance from equipment	Less than one season
Non-motorized trail designation	Trails 182, 193 and 547	No on the ground effect Limits disturbance to low levels of non-motorized recreational use	Into the foreseeable future
		BMU 14	
Harvest/underburn	Unit 1	Disturbance from equipment	One season harvest, one day underburn
Harvest/harvest	Unit 2	Disturbance from equipment	
Temporary road	Unit 2	Disturbance from construction through reclamation	Road may be open two seasons
Road decommissioning	Road 16135	Disturbance from equipment	Less than one season

Units G and H are wildlife burns. The lower part of G is lodgepole pine with lots of windthrow. The upper part has a larch component. The lower part of unit H is two-storied with conifer reproduction in the understory. The upper part is dominated by lodgepole pine. The objective would be to regenerate shrubs by reducing conifers and competition for sunlight. These units are located in the middle of the Grizzly core habitat area, but activities would be focused in the air, as units would be burned by helicopter. To meet the objectives, these burns would most likely occur in the fall, and may take up to four days. They may not be four consecutive days, due to weather and fuel conditions needed to meet the burn prescriptions.

Cumulative Effects

Alternative 1 (no action) would not contribute any cumulative effects to grizzly bear or their habitat. The overall percent core for the Cabinet-Yaak recovery zone remains at 59 percent (Bear Year 05[3] as reported in Monitoring and Evaluation Report FY05). Alternatives 2 and 3, in combination with the baseline conditions and reasonably foreseeable projects do not change the over all recovery zone core percent.

Within the project area, there are areas with little human activity, including roadless areas that provide habitat security (core). Past harvest and wildfire has created a variety of age classes and successional stages across the project area. These actions result in increases of forage species, such as huckleberries. The older harvest areas (1960s and 1970s) are providing cover and corridors for bears. Harvest of timber up through the 1980s resulted in increased road building. Since then, open road densities have dropped as a result of closing roads to facilitate grizzly bear recovery. The Analysis of the Management Situation (USDA Forest Service 2003) found that Forestwide, total miles of roads with unrestricted access decreased by 30 percent between 1987 and 1997.

Forest Plan monitoring OMRD standards for both BMUs have been met (with the exception of BY 01 for BMU14) since 1998 (Table 38). BMU 14 has met core standards throughout the monitoring period, and BMU 11 has been below throughout most of the reporting period.

Table 38. Grizzly bear standards in affected BMUs since 1998 (Forest Plan Monitoring Report 2005)

BMU Standard*	BY 98	BY 99	BY 00	BY 01	BY02	BY 03	BY 04	BY 05	Post - project
11 Core	52	52	55	54	54	53	53	53	55
11 OMRD	32	33	29	29	31	30	29	28	28
14 Core	58	60	56	56	56	57	57	56	56
14 OMRD	31	32	28	35	28	27	28	28	28

* Core Standards 55% or greater; OMRD 33% or less

BMU 11: The only other actions that have occurred or may occur in the near future in BMU 11 are the Roderick wildlife burns and harvest of Obermayer fuels reduction units. Most burn units have been treated, but one (Roderick 401) may be burned next season. The objectives of these burns are to increase grasses, forbs, and shrubs to benefit big game and bears. The Obermayer project is located adjacent to open roads and private lands.

BMU 14: Actions that have occurred in the past in BMU 14 are West Yaak burns, North Pole salvage, and South Spread harvest. These actions increased grasses, forbs and shrubs in the understory, improving forage conditions. There are no reasonable foreseeable future actions in this BMU.

Cabinet Yaak Ecosystem: Both alternatives would meet standards for OMRD, TMRD and core habitat, which were based on increasing core (secure) habitat to reduce conflicts with humans. The project would not increase the potential for mortality during hunting season (which can lead to deaths from self-defense, mistaken identity, and poaching).

[3] A bear year is the period from April to November 30.

There have been conflicts with bears due to sanitation issues in 17-mile Creek and Pipe Creek within BMU 11. Timber contracts would include clauses for waste disposal direction to reduce the potential for conflicts.

Regulatory Consistency

The project would comply with ESA. This statement is based on meeting all terms and conditions established by USFWS (2004). In the Biological Opinion for the Forest Plan amendment for motorized access (USDI Fish and Wildlife Service 2004), terms and conditions were developed. These terms and conditions (short version), and how they are addressed are shown in Table 39.

Forest Plan: Management direction for MA 14 (grizzly bears and timber harvest) includes guidelines for use of displacement areas, road closures, broadcast burning for site preparation where favorable and maintenance of corridors (600 feet) between cutting units. Units 31 through 37 are in or partially in MA 14. This direction was considered during the development of the proposed action and alternatives. Direction for habitat effectiveness and linear open road densities are also met, as shown in Table 36. The project-level habitat impacts would contribute to improving overall Forestwide trends in grizzly bear habitat as discussed in the cumulative effects section.

Statement of Findings

Both action alternatives may affect, but are not likely to adversely affect the grizzly bear. This determination is based on 1) both BMUs meet core, OMRD and TMRD standards after project completion; 2) project design features would be incorporated to reduce disturbance, 3) both alternatives meet most other direction (except for 2 units in Alternative 2 that don't meet opening size and movement corridor retention direction); and 4) both action alternatives would meet terms and conditions as shown in Table 39 on page 128.

Canada Lynx

Lynx population ecology, biology, and habitat description and relationships are described in Ruggiero et al. (2000) and Ruediger et al. (2000). In addition, the final lynx-listing rule (USDI Fish and Wildlife Service 2000a) gives population and habitat status on a national scale. Lynx occurrence data comes from Forest historical records (NRIS FAUNA database), and other agencies (MNHP, MFWP[4], USFWS).

The Lynx Conservation Assessment and Strategy (LCAS; Ruediger et al. 2000) Project planning objectives and planning guidelines (pp. 7-1 thru 7-17) were considered and used, when appropriate for the proposed project activities during alternative development.

The effects analysis follows the standards and guidelines established in the LCAS. Only the standards and guidelines applicable to the proposed project are analyzed, and they only applied to lynx habitat on federal lands (in compliance with the LCAS). Standards and guidelines considered but found "not applicable" are found in the project file. Lynx habitat in impacted LAUs was mapped using the timber stand database version of the Kootenai National Forest model with LCAS definitions. Connectivity was evaluated by visually examining lynx habitat and past management activities to determine possible movement areas and potential areas where lynx travel may be hindered. Ridgelines and draws were considered high-value movement areas. The scale for direct, indirect and cumulative effects analysis is the impacted LAUs and adjacent LAUs for connectivity effects.

[4] MNHP = Montana Natural Heritage Program, MNFWP = Montana Fish Wildlife and Parks

Table 39. Terms and conditions of the BO (USDI Fish and Wildlife Service 2004)

Term and Condition	How Addressed
Habitat Management	
1.A. OMRD, TMRD and core standards are identified for each BMU along with direction on percentages that must meet the standards in a given timeframe.	Either of the action alternatives would maintain the standards for BMU 14 and bring BMU 11 into compliance with the standards upon implementation of the access management actions.
For all BMUs	
1.B.i. Core habitat must remain in place for at least 10 years to be functionally effective for grizzly bears.	This has been incorporated into the project development and no other actions that would affect the effectiveness of core are proposed within the next 10 years.
1.B.ii. Core habitat within BMUs shall not be impacted (i.e., shifted or moved) by activities more frequently than once every 10 years, except for decommissioning or stabilizing an existing, closed road.	This has been incorporated into the project development and no other actions that would affect the effectiveness of core are currently proposed within the next 10 years.
1.B.iii. The Forest Service may enter core habitat within a BMU more frequently than once per 10-year time frame for the sole purpose of completing road decommissioning or stabilization activities resulting in long-term improvements of core habitat.	Both action alternatives incorporate active road decommissioning of the 6100 and 6131/6132 road systems that are located in core habitat. It is expected that it would take one year for the activities on the 6100 road system, and another season for the other road system. Combined, these account for one entry into core as per meeting with USFWS 6/22/06.
1.B.iv. Except for Biii above, impacts or losses of existing core habitat within individual BMUs shall be compensated for with in-kind replacement of core habitat concurrently with or prior to incurring the impacts to or loss of the existing core habitat.	In BMU 11, road 6715B would be bermed prior to harvest to create additional core habitat in the Lucky Point core area. In addition, berms would be placed on roads 902A, 902B and 903 where they junction with road 902 to increase core habitat along the ridge to the north of Grizzly Point. In BMU 14, a small area of core would be created by berming roads 6840/6840D to offset disturbance created by harvest in units 1 and 2.
For BMUs Exceeding (being better than) the Standards for Core Habitat (BMU 14)	
1.C.i. No permanent net losses of core habitat shall occur within any individual BMU.	There would be no permanent loss of core habitat in BMU 14. Temporary road used to access Units 1 and 2 would be obliterated and reclaimed upon completion of activities.
1.C.ii. Temporary reductions of core habitat may only occur under the following conditions:	
1.C.ii.a. Temporary reduction of core habitat within individual BMUs shall not decrease core habitat below the minimum core habitat standard within the BMU, without compensation as described in B.iv.	In BMU 14, a small area of core would be created by berming roads 6840/6840D to offset disturbance created by harvest in units 1 and 2. BMU would continue to meet standards during project activities and post project.
1.C.ii.b. Activities resulting in temporary reductions of core habitat shall be compressed in time so no more than 3 consecutive years of the 10-year time span are impacted within individual BMUs.	Table 37 displays the actions proposed in core habitat in BMU 14.
1.C.ii.c. Temporary reductions of core habitat shall only occur once (i.e., one action/project) per 10-year time frame per individual BMU, unless the activity is to decommission/stabilize an existing closed road.	Temporary reduction of core in BMU 14 would be offset by berming of roads and creation of new core areas, prior to project activities.
1.C.ii.d. The Forests may enter core habitat within a BMU more frequently than once per 10-year time frame for the sole purpose of completing road decommissioning or stabilization activities resulting in long-term improvement in core habitat.	The very end of road 16135 is located in a small core area of BMU 14.
1.D. Roads closed to create core habitat will be put in a condition such that a need for motorized access for maintenance is not anticipated for at least 10 years.	Any needed watershed work would be done prior to berming.
1.E. Road use associated with completing administrative activities shall not exceed 57 vehicle round trips per active bear year per road, and use shall be apportioned as follows: ≤19 round trips in spring (April 1 thru June 15); ≤23 round trips in summer (June 16 thru September 15); and ≤15 round trips in fall (September 16 thru November 15).	Included as a design feature.
1.F. The Forest shall submit annual reports…	Not applicable at the project level.

Affected Environment

On March 24, 2000, the U.S. Fish and Wildlife Service listed the contiguous U.S. distinct population segment of the Canada lynx as threatened (USDI Fish and Wildlife Service 2000). National population and habitat status descriptions in that document are incorporated by reference. There is one occurrence of lynx documented within the Obermayer area in (NRIS FAUNA database 1997).

In compliance with the LCAS, the Kootenai National Forest delineated 47 LAUs, each of which approximates a lynx home range size. At the end of 2005, all LAUs on the Forest except two met the LCAS primary habitat standards (greater than 10 percent denning habitat; less than 30 percent unsuitable habitat; less than 15 percent changed to unsuitable condition in last 10 years; USDA Forest Service 2005a).

Lynx habitat in the project area LAU(s) was mapped in compliance with LCAS project planning standard 1. Table 40 displays the current lynx habitat conditions in the project area, and Map M-5 in the Map Appendix displays the location of these LAUs in relation to the project area. Both of these LAUs meet LCAS direction. All proposed actions occur within the Skookum LAU, no actions would occur in Baldy LAU, therefore this LAU will not be considered further.

Table 40. Lynx habitat by LAU

LAU	Percent of LAU within Project Area	Percent Denning Habitat	Percent Unsuitable Habitat	Percent Change within 10 Years
Standard		>10%	<30%	<15%
14405 Skookum	59%	31%	4%	2%
14403 Baldy	4%	33%	2%	0%

There are no identified linkage corridors (USDA Forest Service 2004a, Figure 1-1) in the project area or potentially impacted LAUs or adjacent LAUs.

Environmental Consequences

No Action

The No Action Alternative would not result in any actions, and the LAUs would continue to meet LCAS standards.

Alternatives 2 and 3

The LCAS Programmatic planning standards (1, 2, 3, and 4) and LCAS Programmatic planning guidelines (1, 2, and 3) have been met at the Forest scale through previous consultation with the USFWS (see LCAS for description of these standards and guidelines).

Unsuitable Habitat: Project planning standard 1 states: “Management actions (e.g., timber sales, salvage sales) shall not change more than 15 percent of lynx habitat within a LAU to an unsuitable condition within a 10-year period.” Programmatic planning standard 5 states: “limit disturbance within each LAU as follows: if more than 30 percent 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 activities by federal agencies.”

Most of the proposed treatments are below 4,000 feet elevation and are not in LAUs or lynx habitat (see maps M-5 in Map Appendix). However, some of the units are in LAUs. It is expected

that all proposed harvest units would become "currently unsuitable condition" as defined in the LCAS. The proposed wildlife burns would be expected to be patchy with residual cover left in unburned areas and would continue to provide lynx habitat as mapped (this category has the necessary vegetation to support lynx reproduction and survival but does not meet the criteria for lynx denning or foraging habitat).

The proposed activities under either action alternative would increase the existing level of unsuitable habitat by 170 and 114 acres (Alternative 2 and 3, respectively); however, there would be no increase in the percent of unsuitable habitat, and therefore no change in percent when measured over the LAU. Both alternatives would meet the standards.

Denning Habitat: Project planning standard 2 states: "Within a LAU, maintain denning habitat in patches generally larger than 5 acres, on at least 10 percent of the area that is capable of producing stands with these characteristics. Where less than 10 percent of the forested lynx habitat within a LAU provides denning habitat, defer those management actions that would delay achievement of denning habitat structure."

The Skookum LAU would continue to meet the denning standards under both action alternatives. Some modeled denning habitat would be removed (24 and 17 acres, Alternative 2 and 3, respectively) however overall percent denning habitat would remain at 31 percent within the LAU, well above the 10 percent minimum standard.

Habitat Connectivity: Project planning standard 3 states: "Maintain habitat connectivity within and between LAUs." This standard would be met. Habitat connectivity within the impacted LAUs is generally good because most previous harvest activities occurred over 20 years ago and now provide cover. Newer harvest units include buffers between units that were not providing cover at that time, as well as maintained the RHCA buffers along riparian areas. There is an identified linkage corridor (USDA Forest Service 2004a, Figure 1-1) to the east of the project area but the activities proposed in this project would have no effect on that linkage.

Aspen Management: Project planning standard 4 states: "In aspen stands within lynx habitat in the Cascade Mountains, Northern Rocky Mountain and Southern Rocky Mountains Geographic Area, apply harvest prescriptions that favor regeneration of aspen." This standard applies. Aspen is a component of several of the stands, and is a species targeted for improvement. Units 57 and 57a, which have an objective to improve aspen, are not located in lynx habitat (not in a LAU).

Cumulative Effects

Past harvest has provided a variety of age classes and successional stages across the project area. Presently, younger stands harvested in the 1970s and 1980s are providing good foraging habitat. More recent sales (i.e., Dutch Oven and Obermayer) are located at lower elevations and are not in lynx habitat.

Actions proposed in the Skookum LAU include the Roderick wildlife burns. About half of these are below 4,000 feet and are not in the LAU, but some acres are. Most of the units have already been burned, but one unit (401) may be burned in the spring of 2007. These burns are focused on more open areas, with an objective to increase forbs, grasses and shrubs and lynx habitat would not be affected.

The minimal effects of the action alternatives, in combination with existing conditions and reasonably foreseeable future actions discussed above (Roderick wildlife burns) would not result in cumulative changes in or loss of lynx habitat.

Regulatory Consistency

- This project would comply with the Forest Plan direction on T&E species that applies to the lynx (pp. II-1 #7, II-22).
- This project would be consistent with LCAS standards as shown in the analysis.

Statement of Findings

The action alternatives may affect, but are not likely to adversely affect the lynx. This determination is based on compliance with LCAS direction as outlined above.

Gray Wolf

Strategies to protect and recover wolf populations in Montana, as well as the ecology, biology, and habitat descriptions for wolves are outlined in the Northern Rocky Mountain Wolf Recovery Plan (USDI Fish and Wildlife Service 1987). The Northwest Montana (NWMT) Recovery Area is one of three wolf recovery areas identified for the Northern Rocky Mountain wolf population. The Kootenai National Forest is within the NWMT Recovery Area. Information for this recovery area is provided by the Rocky Mountain Wolf Recovery 2005 Annual Report (USDI Fish and Wildlife Service et al. 2006). Wolf occurrence data comes from recent District wildlife observation records, Forest historical data (NRIS FAUNA), and other agencies (USFWS, MFWP).

The analysis boundary for direct effects to the Candy Mountain wolf pack and their habitat is the project area. Indirect and cumulative effects will be assessed on this project area, and BMUs 11 and 14 because the exact home range of the pack has not been defined.

Measurement indicators for this wolf analysis include the following key habitat components found in the Wolf Recovery Plan (USDI Fish and Wildlife Service 1987):

1) **Sufficient, year-round prey base for big game or alternate prey:** This component can be measured by adhering to Forest Plan big game management recommendations. For this planning area, both white-tailed deer and elk management recommendations were applied. The recommendations include cover/forage ratios; road densities; opening sizes; key habitat features; movement areas; habitat effectiveness levels, and security levels. See the MIS section for details.

2) **Suitable and somewhat secluded denning and rendezvous sites:** Sensitivity to disturbance at den sites and subsequent abandonment varies greatly among individual wolves. One incident of human disturbance at the den may cause abandonment for some wolves, while other wolves will tolerate some human disturbance (Thiel et al. 1998) and may not abandon dens unless there are repeated or severe incidents of disturbance (Claar et al. 1999). One recommendation for protection of den sites from human disturbance includes restricting human access within a 1.5-mile radius of an occupied den from four weeks prior to whelping to the end of denning activity. Closure area would be irregular in shape to avoid pinpointing den locations. MFWP is not recommending any localized closures near wolf den or rendezvous sites on public lands outside national parks (Sime 2002), and early surveys in northwest Montana indicated that public support to recover wolves would dwindle if recreational or public lands were restricted to promote recovery (Tucker and Pletscher 1989). MFWP encourages land management agencies to consider the locations of wolf den and rendezvous sites and habitat security in their future planning activities in the same context as considering the locations of ungulate winter range or bald eagle nests (Sime 2002).

Assumptions with this method would include maintaining the habitat integrity of the denning and rendezvous sites.

3) **Sufficient space with minimal exposure to humans:** This component is associated with reducing the risk of human-caused mortality to wolves. Human disturbance and accessibility of wolf habitats (i.e., road densities) are the principle factors limiting wolf recovery in most areas (US Fish and Wildlife Service 1987). These components can be generally measured by maintaining open road density standards required by the Forest Plan as well as maintaining any security habitat recommended in the big game habitat recommendations.

Affected Environment

At the end of 2005, there were 46 wolf packs in all of Montana, with 19 meeting breeding pair criteria. These packs contained a minimum estimate of 256 wolves (USDI Fish and Wildlife Service et al. 2006). The Montana portion of the NWMT Recovery Area supported 19 of those packs (10 were breeding packs). This area includes the Kootenai National Forest. There are currently five packs (three breeding packs) using the Forest for all or part of their territories. These packs had a total 34 wolves at the end of 2005 (ibid). This is an increase from last year. There were two known mortalities in the packs using the Forest this past year.

The Yaak pack began using the area around the Grizzly area beginning in 2001. In 2003, the name was changed to Candy Mountain pack. Both the male and female were radio-collared and tracking has shown that their territory includes the Yaak River Valley. Since the pack was established in 2001, there have been no known depredations on livestock attributed to this pack, and in 2002 and 2003, there were five known wolf mortalities. These mortalities were all human-caused mortalities. Currently, the pack includes five adults and four pups (USDI Fish and Wildlife Service et al. 2006).

A new proposal for delisting of Northern Rocky Mountain wolves was issued on February 8, 2007 (USDI Fish and Wildlife Service 2007)

Prey Base. The project area supports both summer and winter habitat for most big game species. White-tailed deer are the most abundant big game species. This mix of species provides a good year-round prey base for wolves. See the MIS species section of this document for more information on deer and elk habitat conditions and population status in the project area. Both elk and white-tailed deer were chosen as MIS species for this project. The management recommendations for these species are generally being met in this project area (see MIS section).

Den and Rendezvous Sites. There are no known den sites or rendezvous sites in the project area.

Sufficient Space with Minimal Exposure to Humans. Open road densities currently meet Forest Plan standards within the project area (0.61 miles per square mile). Security habitat recommendations for elk are above the minimum recommended levels (see MIS section for details). The project area includes all of the Grizzly IRA, and a portion of the Roderick IRA. These areas also roughly correspond to grizzly bear core areas. Fifty-two percent of the project area provides elk security habitat, which would also provide secure habitat for wolves.

Environmental Consequences

Alternative 1

This alternative would maintain current conditions for prey habitat and human access within the project area. Not implementing proposed road restrictions would maintain existing habitat

security (52 percent elk security across the project area). A number of existing young timber stands would develop cover values over time.

Alternatives 2 and 3

Denning/Rendezvous Sites: There is no known denning or rendezvous sites within the project area. Suitable habitat for denning or rendezvous sites would remain available following either action alternative.

Prey Base: As discussed in the effects analysis for white-tailed deer and elk (see Tables 45 and 46), these alternatives would generally maintain habitat conditions for the wolves' prey base. Cover/forage ratios would improve, thermal cover would decrease, but habitat security and open road densities would be kept at current levels.

Sufficient Space with Minimal Exposure to Humans: Open road densities would meet Forest Plan standards in either alternative (see MIS section). Some temporary increases in risk from human-caused mortality would accompany localized increases in ORD during harvest activities. However, Cool Creek (road 595) and Lang Creek roads (road 6084), which are currently gated, would be closed at night and on weekends, to restrict public access. Gates would not be put on temporary roads, so some public use could occur during harvest activities. This increased risk would be immeasurable during harvest activities. Effects would be limited to avoidance by wolves of activity areas and transient use would still occur.

Across BMUs 11 and 14, road density (TMRD, OMRD) and core standards would be met post-project. This would improve habitat for prey species across their home range, as well as providing areas with minimal exposure to humans.

Cumulative Effects

Past timber harvest and road construction projects and natural events have created much of the existing habitat conditions found within the project area and across the pack's territory. Past timber harvest has increased forage and decreased cover for prey species (these past actions are calculated into the existing condition for elk and white-tailed deer). Road construction and restrictions on road use affect the amount of area with minimal exposure to humans. Both of these actions (timber harvest and roads) can influence vulnerability to hunters.

Other actions outside of the project area, but within BMUs 11 and 14, include construction of a bridge across Burnt Creek to access private property, and a powerline along the Vinal Lake road. The powerline would have no effect on wolf habitat and isn't considered further.

Prey Base: The Candy Pack's territory includes the Yaak River drainage. Most big game habitat management direction is being met and no changes in prey populations are expected from this proposal. The analysis for Northeast Yaak determined that the alternatives would improve habitat conditions for elk (NE Yaak DSEIS; USDA Forest Service 2006d).

Sufficient space with minimal exposure to humans: At the completion of the proposed actions in either alternative, both BMUs would meet core standards for grizzly bears. These core areas also provide secure habitat for wolves with minimal exposure to humans.

Private land occupies approximately 3 percent of the project area. Land development, including the construction of roads, the clearing of vegetation, the construction of residences, and the installation of improvements, can create a variety of changes to the landscape. Depending on the magnitude, type, and location of developments and the amount of private land on the landscape,

these activities can have varied effects, including the loss of hiding cover and localized disturbance on wolves and their prey species. There is one proposal to rebuild a bridge across Burnt Creek on Road 472X. This would be built to the minimum standard and would not support extensive subdivision of the private lands.

Past trends in land development here would suggest that development would continue to occur at a low rate and would have minor impacts on wolves and their prey species within the analysis area over the next 10 years.

Hunting: Ongoing hunting activities are regulated by the MFWP. The Forest Service influences hunter access through road management. The Forest Service also identifies areas where hunters with disabilities are allowed to drive restricted roads. Currently, this program includes the 6715 road system in the project area.

Effects from hunting vary with activity levels and can include short-term disturbance. Mortality risk to the wolf is increased through hunting. The level of hunting within the analysis area is not expected to significantly change due to the proposed action. Hunting activities on private land are limited due to the low percentage of private land within the project area. With the generally limited amount of these activities on private lands, potential effects to the wolf would be minimal.

Regulatory Consistency

Forest Plan:

- The project would comply with Kootenai Forest Plan direction that applies to the gray wolf (pp. II-1 #5, II-23) and their prey base (pp. II-1 # 3, #7, #12; II-7, II-22-23).
- The project-level habitat impacts would contribute to improving overall Forestwide trends in gray wolf habitat as discussed in the cumulative effects section. Populations are expected to continue to increase.

Endangered Species Act:

- The project is consistent with the Endangered Species Act.

Statement of Findings

Implementation of either action alternative may affect, but is not likely to adversely affect the gray wolf or its habitat. This is based on 1) proposed access management, which would increase habitat security within the project area (designation of nonmotorized trails), 2) mortality risk to the wolf is not expected to measurably increase during project activities and would decrease slightly after post sale activities are completed, 3) alternatives would not affect known denning/rendezvous sites, 4) there may be a short-term avoidance of areas of activity, however, transient use would still continue, and 5) alternatives generally meet Forest Plan big game management recommendations.

Bald Eagle

Bald eagle population ecology, biology, habitat description, and relationships identified by research are described in Habitat Management Guide for Bald Eagles in Northwestern Montana (MBEWG 1991). That information is incorporated by reference. Eagle occurrence data comes from recent District wildlife observation records, Forest historical data (NRIS FAUNA database), and other agencies (USFWS, MDFWP).

Habitat management guidelines from the Montana Bald Eagle Management Plan (MBEMP; Montana Bald Eagle Working Group 1994) serve as the measure for bald eagle habitat management on the Kootenai National Forest. The analysis area boundary for project impacts to individuals and their habitat is all lands within the project area that fall within the consultation boundaries agreed to by the USFWS. The analysis area for making the effects determination is the consultation area agreed to by the USFWS for bald eagles of the Kootenai National Forest. Bald eagle habitat is generally within one mile of major lakes and rivers.

Affected Environment

Bald eagles occur as both seasonal migrants and year-round residents within the boundaries of the Forest. Nesting has increased significantly over the last two decades; only one active nest was known to occur in 1978, whereas 35 nests were known and monitored in 2004. Nest success for active nests over the last 20-year period is about 83 percent, with an average of 1.3 fledglings per active nest (Kootenai Forest bald eagle monitoring records).

Wintering bald eagle numbers have fluctuated over the years depending on food sources (fish from open waters and dead animals along roads and railroad tracks) and winter conditions (open verses frozen water for foraging habitat). Mid-winter bald eagle counts have averaged 96 bald eagles over the past 20 years (Kootenai Forest bald eagle monitoring records).

The project area falls within the Upper Columbia Basin Management Zone (Zone 7) of the Pacific Bald Eagle Recovery Area (USDI Fish and Wildlife Service 1986). Approximately 11,416 acres of the bald eagle consultation area occur in the project area. Forestwide potential bald eagle habitat covers about 564,558 acres (based on USDI Fish and Wildlife Service 2001). The Fish and Wildlife Service will make a final decision on whether to remove the bald eagle from the federal list of threatened and endangered species no later than June 29, 2007 (USDI Fish and Wildlife Service 1999).

MBEMP guidelines identify four general habitat categories and management concerns for bald eagles. They are nesting habitat, foraging habitat (including perch sites), winter habitat (including roost sites), and mortality risks.

Nesting habitat: is typically associated with mature forest stands in close proximity (less than one mile) to large bodies of water, including lakes and fourth-order streams, which provide an adequate prey base. There are no known nest sites in or near the project area.

Foraging habitat: consists of lakes, rivers, wetlands, and meadows, which provide open flight paths, perches and adequate prey. It also includes highway and railroad corridors (especially in the winter) due to dead animals found in these areas.

Winter habitat: is generally dictated by the presence and abundance of food, open water, and secure night roost sites (MBEWG 1994). The winter period is considered to be from late October through early March. Eagles are known to winter near the Yaak River.

Mortality risks: The MBEMP (1994) identifies bald eagle as shooting, accidental trapping, poisoning, diseases, and electrocution. On the Kootenai National Forest, bald eagles have also died from collisions with motor vehicles and trains. In the project area, all of these risks are present except the potential for collision with trains.

Eagles have been observed along the Yaak River in February, August, September, November and December (NRIS FAUNA database). Generally, nest building, courtship, and egg laying occur

from late winter until mid-April. Incubation extends from early March to the end of May, and the hatching and rearing of young takes place from early April to mid-August. Fledging can occur between late June and late August (MBEWG 1991). Reported sightings have generally been in the vicinity of the junction with Whitetail Creek, where there is slower water that is more suitable for foraging.

Environmental Consequences

No Action

The No Action Alternative would not affect any bald eagle habitat. It would remain as described in the existing condition.

Alternatives 2 and 3

Potential effects to bald eagles include 1) visual or auditory disturbance or displacement of individuals foraging along the Yaak River from machinery, vehicles and humans, and 2) long-term indirect effects to potential nesting, and summer and winter roosting habitat as a result of changes in vegetation in clearcut and shelterwood harvest units within one mile of the Yaak River.

Neither of the action alternatives would add to the bald eagle mortality risk factors identified by the MBEMP (shooting, accidental trapping, poisoning, diseases, and electrocution). The action alternatives would not impact any nest territories, as there are none on this section of the Yaak River. Actions proposed within one mile of the Yaak River are shown in Table 41.

Table 41. Acres of proposed actions within 1 mile of the Yaak River

Proposed Treatments	Alternative 2	Alternative 3
Regeneration harvest	357	318
Intermediate harvest	290	290
Precommercial thinning	360	360

Foraging habitat is found along the Yaak River. There would be no treatments within 300 feet of the Yaak River and perches used for foraging would not be affected. Most of the harvest would occur in the summer, after June 15. Most of the precommercial thinning would occur within one mile of the Yaak River. Disturbance associated with these activities may displace eagles foraging on affected sections of the Yaak River. These effects would be expected to be short term.

Regeneration harvest within one mile of the river would reduce available nesting and summer or winter roosting habitat in the future. Both alternatives include more than 300 acres of regeneration harvest, which is approximately 3 percent of the area within the one-mile buffer of the Yaak River (consultation area). Retention of snags and reserve trees would provide perch trees, but suitability for nesting or roosting would be reduced.

Intermediate harvest (thinning) would generally retain the larger overstory trees, as well as snags. These trees would continue to provide potential summer roosting or nesting habitat. Suitability for winter roosts would be decreased due to the loss of canopy and ability to moderate winter weather. This would affect approximately another 3 percent of the area within the one-mile buffer of the Yaak River (consultation area).

If a pair of bald eagles did attempt to nest along the Yaak River in the project area, the incubation period would be complete and nestlings would be present before project activities would begin after June 15. If detected, nest management direction would be followed.

Winter activities are limited. Five units are proposed for winter harvest, but only one (unit 12, 7 acres) is within one mile of the Yaak River (approximately ½-mile) and disturbance or displacement during the winter is not expected.

Cumulative Effects

The No Action Alternative would not contribute to any cumulative effects to the bald eagle or its habitat since there would be no direct or indirect effects. The action alternatives would contribute to cumulative effects by reducing potential roosting and nesting habitat within one mile of the Yaak River. Foraging habitat and riverside perches would continue to be available during mild winters when ice does not cover the Yaak River.

Past regeneration harvest has affected approximately 14 percent of the consultation area in the project area, most of which was harvested before the 1990s. This project includes another 3 percent that would be affected by regeneration harvest. This 17 percent of the consultation area would not provide suitable nesting or winter roosting habitat. The Obermayer project also falls within one-mile of the Yaak River. This project is predominately intermediate harvest, with retention of the larger overstory trees, as well as snags. These trees would continue to provide potential roost sites, although they may not be as effective in the winter because the more open stands wouldn't offer the same protection from weather. Because the project area includes only 2 percent of the consultation area across the Forest, the effects of this project along with Obermayer, would not be measurable at the Forest scale.

Regulatory Consistency

Forest Plan:

- The project would comply with Forest Plan direction on T&E species that applies to the bald eagle (pp. II-1 #5, II-22, II-23).
- The project would be consistent with the Endangered Species Act.
- The project would be consistent with the Bald Eagle Protection Act (16 U.S.C. 668-668C 1978).
- The project-level habitat impacts would contribute to current Forestwide trends for bald eagles as discussed in the cumulative effects section.

Statement of Findings

Implementation of either of the action alternatives may affect, but is not likely to adversely affect the bald eagle. This determination is based on: 1) there are no nest territories in or adjacent to the project area; 2) harvest would affect less than 1 percent of the consultation area on the KNF (nesting and roosting habitat); and 3) direct effects are limited to short-term displacement of foraging eagles.

Sensitive Species

The most current Northern Region Sensitive Species list was revised on 3/31/2005 (USDA Forest Service 2005d). Species on that list, which are documented or likely to be present on the Kootenai National Forest, are included in Table 42.

Table 42. Sensitive wildlife species on the KNF

Common Name	Scientific Name	Status in Analysis Area [1]	Comments
Black-backed woodpecker	*Picoides arcticus*	Suspected	
Coeur d'Alene salamander	*Plethodon vandykei idahoensis*	Potential	
Common loon	*Gavia immer*	Unlikely	Only transitory foraging habitat on Yaak River, no ponds or lakes large enough to provide habitat; not analyzed further
Fisher	*Martes pinnanti*	Suspected	
Flammulated owl	*Otus flammeolus*	Potential in small part of the project area	Modeled habitat present but owls not documented
Harlequin duck	*Histrionicus histrionicus*	Not suspected	Potential habitat further upstream on Yaak River but not in project area; not analyzed further
Northern bog lemming	*Synaptomys borealis*	Not suspected	There is occupied habitat in the Northwest Peak Scenic Area, but no suitable habitat in project area; not analyzed further
Northern goshawk	*Accipiter gentiles*	Known	
Northern leopard frog	*Rana pipiens*	Not suspected	No known historic or currently active breeding sites (KNF 2004);.not analyzed further
Peregrine falcon	*Falco peregrinus*	Potential foraging habitat	No suitable cliffs for nesting in the project area and no observations of foraging peregrines; not analyzed further
Townsend's big-eared bat	*Corynorhinus townsendii*	Known	No known caves or mines to provide winter hibernacula or maternity colony habitat
Western toad	*Bufo boreas*	Known	
Wolverine	*Gulo gulo*	Known	
Columbian sharp-tailed grouse	*Tympanuchus phasianellus columbianus*	Not expected	No habitat or occurrences on Ranger District or in project area
Woodland caribou	*Rangifer tarandus caribou*	Not expected	Habitat unlikely in project area and no occurrences

[1] Known are from KNF databases, suspected are those listed as known in the Yaak Planning Unit and suitable habitat is present in the analysis area (KNF 2004).

Black-backed Woodpecker

Black-backed woodpecker ecology, behavior and habitat identified by research are described in Samson (2005). Black-backed occurrence data comes from recent District wildlife observation records and Forest historical data (NRIS FAUNA database).

Black-backed woodpecker high-quality habitat was assessed based on the amount of area affected by wildfires or insect outbreaks in the last 10 years. High quality habitat is defined as recent (less than 10 years old) mixed-lethal or stand-replacement fire areas or stands recently killed by insects where an abundance of snags are available.

The analysis boundary for project impacts and cumulative effects to individuals and their habitat is the project area. The boundary for determining trend or viability is the Kootenai National Forest.

Affected Environment

Habitat for black-backed woodpeckers consists of boreal and montane forest. They are described as being opportunistic and respond to wood-boring and bark beetle outbreaks occurring as a result of disturbances caused by fire, wind, and disease (Samson 2005).

A conservation assessment for black-backed woodpeckers across the Northern Region assessed post-fire and insect-infested habitats by National Forest (Samson 2005). It found about 194,766 acres of these habitats on the Kootenai National Forest from 1990 to 1993. By 2000 to 2003, this had dropped to 88,345 acres (although there was an increase across the Region over these same time periods). On a Forestwide level, modeled black-backed woodpecker habitat is abundant, broadly distributed and amounts to 1,317,790 acres of general forest habitat (KNF WFB Steering Group 2004). They also modeled 202,658 acres of yearlong habitat in the Yaak Planning Unit.

As a primary cavity-nester, black-backed woodpeckers require dead or live trees with heartwood rot. They use a diverse mixture of conifer species but are often reported to be associated with pine, fir and larch-dominated forests (Samson 2005). According to Thomas (1979, p. 74), a snag level of 40 percent or more would maintain viable populations of birds dependent on cavities for nest sites.

Black-backed woodpeckers have been confirmed to breed in the project area latilong[5] (MBDC 1996) and have been documented in the Yaak Planning Unit (KNF WFB Steering Group 2004). There are no documented observations in the project area (FAUNA or District data), but it is expected to provide habitat.

In the project area, black-backed woodpecker habitat consists mainly of lower quality general forest habitat with small, scattered patches of snags produced by insect and disease. This lower quality habitat supports low populations of resident black-backed woodpeckers. In general, insects attack low vigor, stressed trees (drought, root disease, fire) and larger trees in dense stands, where microclimates favor bark beetles (Samman and Logan 2000). Using timber stand data, and assuming that stands over 100 years of age provide general forest habitat that would be more susceptible to insects, there are 21,324 acres or 48 percent of the project area in general forest habitat.

High-quality habitat in the form of recent (in the last 10 years) mixed lethal and stand-replacing wildfire areas consists of approximately 900 acres in the project area. The year 2000 was a big fire year on the District. This includes the Lucky Point wildfire that burned the Lucky Point to Roderick Mountain area. Insect monitoring in 2005 found that mountain pine beetle mortality was noted in significant-sized groups (1,000 acres) throughout the Yaak drainage, including western white pine near Grizzly Point (Meyer 2006).

Current density of snags 10 to 19 inches dbh is estimated to be 15 snags per acre, while densities of snags 20 inches or greater is estimated to be 0.4 snags per acre. The existing snag habitat level for the project area exceeds the requirement for 100 percent maximum potential populations in mixed conifer habitats (Thomas 1979).

[5] Latilongs are mapping units formed by successive lines of latitude and longitude, each at one degree intervals. The project area is in Latilong 1.

Environmental Consequences

No Action

Alternative 1 would allow the natural insect and disease processes to occur. Exclusion of fire in the past has resulted in changes in the way dwarf mistletoes and perhaps root diseases are affecting stands. General forest conditions for foraging opportunities would remain low quality. The potential for stand-replacing fires escaping initial attack would continue to increase as fuel levels increased. If a wildfire were to occur, prime black-backed woodpecker habitat would be created, and conditions would benefit this species. Local populations would experience an increase as bark beetles increased, lasting five to seven years, until beetle populations declined.

Alternatives 2 and 3

Both of the action alternatives would convert high-risk and dead lodgepole pine to western larch and white pine-dominated stands, and reduce the number of acres contributing to the current mountain pine beetle population.

The following potential effects to black-backed woodpeckers include: 1) regeneration harvest would remove or reduce general forest foraging opportunities; 2) thinning and salvage treatments would remove dead or dying trees and would reduce foraging habitat (not included in the high-quality habitat calculations as mortality is not concentrated and mapped); 3) any harvest is likely to reduce the abundance of snags (due to loss for safety reasons), which provide cavity nesting habitat; and 4) where units are burned, there may be individual trees that would be killed or weakened by fire, and then attacked by beetles.

Habitat reductions in the previously identified high quality habitat would not result following implementation of either of the action alternatives (recent fire or concentrated insect activity noted by researchers).

To meet Forest Plan direction, 30 snags greater than 10 inches dbh, 55 snags greater than 12 inches dbh, and 5 snags greater than 20 inches dbh per 100 acres would be required. This equates to a total of 0.9 snags per acre. This would be exceeded by implementation of project design features.

Both action alternatives include the wildlife and ecosystem burns, which may result in more dead and dying trees and would improve existing general forest foraging habitat. These burns would occur on 718 acres. Regeneration harvesting would reduce general forest foraging habitat by 543 acres and 419 acres, Alternative 2 and 3, respectively.

While not mapped as high-quality habitat due to the dispersed nature of the mortality, 680 acres in both alternatives of commercial thinning and salvage would focus on dead or dying trees, which are potential beetle habitat. Underburning and jackpot burning are proposed on 71 acres and 307 acres, Alternative 2 and 3, respectively. There may be some increase in dead or dying trees as a result of burning, but generally, slashing would occur prior to burning to reduce damage to residual trees.

A minimum of 91 percent of the existing general forest habitat and 100 percent of the identified high quality habitat would remain following implementation of either action alternative. Both alternatives would provide improved foraging trees on the wildlife and ecosystem burns. On a Forestwide level, the reduction in general foraging habitat would amount to less than 1 percent under either action alternative. Minor effects on distribution of habitat needed for viable populations of black-backed woodpeckers in the project area or the Forest would occur because

proposed activities would result in a small net loss of low quality habitat scattered throughout the project area and there would be no loss in high quality habitat.

Cumulative Effects

The cumulative effects of past and present land uses and natural random events have been incorporated into the analysis of current habitat within the project area. Within the project area, there were 57 acres burned in a wildfire in 1985, and 990 acres in the 1990s and 708 acres in 2000. These areas were not salvage harvested, but due to the condition of the standing dead trees, only the areas burned in 2000 and the areas of mapped concentrated insect activity would still be considered high-quality foraging habitat. None of these acres would be affected.

The existing situation provides adequate available habitat for black-backed woodpeckers based on the availability of potential territories that are of adequate size and even distribution (compared to reference conditions), and available snag habitat of 100 percent.

Normal road and trail maintenance activities have the potential to remove nesting and foraging trees if they are close to a trail or road and present a safety hazard. Effects would include removing site-specific, individual trees, and would not be expected to adversely affect black-backed woodpeckers.

Firewood cutting would remove snags and would reduce nesting and foraging habitat availability along open roads. The decrease in habitat would be limited to areas within about 150-200 feet of open roads. This loss of snag habitat was accounted for in the analysis of available snag habitat. Overall in the project area, well over minimum snag habitat levels would be available following the past, present, and foreseeable actions. This snag habitat level would maintain minimum viable population levels of cavity nesting birds, including the black-backed woodpecker; no adverse cumulative effects are expected.

Other actions in the Obermayer project would have some effect on black-backed woodpeckers or their habitat because treatments would make the remaining trees healthier and less susceptible to beetles in the future. However, due to the number of acres treated, in combination with this proposed project, no adverse cumulative effects from these types of activities would be expected.

Regulatory Consistency

Forest Plan

- Both action alternatives would meet Forest Plan direction for sensitive species (Vol. 1, p. II-1 #6).
- Both action alternatives are consistent with Forest Plan direction for old growth below 5,500 feet (Vol. 1, pp. II-1 #7; II-7; II-22 & II-23; Appendix 17; and Kootenai FSM 2432.22 Supplement No. 85).
- All alternatives would meet (exceed) Forest Plan direction for snags, by maintaining at least 60 percent of the maximum in riparian habitats and at least 40 percent of maximum in the other management areas.

Statement of Findings

Implementation of either of the action alternatives may impact black-backed woodpecker individuals and/or their habitat, but is not likely to contribute to a trend toward federal listing or loss of species viability. This determination is based on: 1) 91 percent of the existing general forest habitat and 100 percent of the identified high-quality habitat would remain following

implementation of either action alternative; 2) both alternatives would provide improved foraging trees on the wildlife and ecosystem burns; 3) on a Forestwide level, the reduction in general foraging habitat would amount to less than 1 percent under either action alternative; and 4) minor effects on distribution of habitat needed for viable populations of black-backed woodpeckers in the project area or the Forest would occur because proposed activities would result in a small net loss of low-quality habitat scattered throughout the project area and there would be no loss in high-quality habitat.

Coeur d'Alene Salamander

Coeur d'Alene salamander population ecology, biology, habitat description, and relationships identified by research are described in Maxell (2000) and Werner et al. (2004). Coeur d'Alene salamander occurrence data comes from recent District wildlife observation records and Forest historical data (NRIS FAUNA database) and other agencies (MFWP and MNHP). The analysis boundary for direct, indirect, and cumulative effects is the project area. The project area boundary is located along watershed boundaries and includes complete watersheds that drain into the Yaak River. Because the project area includes complete drainages and due to limited dispersal ability of this species, this area was considered appropriate for addressing cumulative effects. The boundary for determining trend or viability is the Kootenai National Forest.

Affected Environment

District and Forest Coeur d'Alene salamander observation and monitoring data indicates that there are no known occupied sites in the project area. The Kootenai Conservation Assessment (KNF WFB Steering Group 2004) shows Coeur d'Alene salamander presence confirmed in five of the eight planning units on the Kootenai at 29 different sites. Four of these sites are in the Yaak Planning Unit, but none is located in the project area (FAUNA database). Known populations on the KNF are isolated by miles of unsuitable habitat that cannot be crossed (based on Maxell 2000: 69 and Maxell et al. 2003: 40).

These salamanders live in cool, damp environments such as springs, seeps, waterfall spray zones, and damp streambanks near talus or fractured rock (Werner et al. 2004). Unlike all other salamanders in Montana, they do not have an aquatic larval stage; eggs are laid deep down in interstitial spaces between rocks (Werner and Reichel 1994). Management suggestions in Maxell (2000) include retention of a 30-meter (100-foot) buffer around known sites. There are no known sites, but all potentially suitable habitats would be located in the RHCA buffers or in nearby rock/talus slopes.

Environmental Consequences

Alternative 1

Since the No Action Alternative would not implement any actions, existing habitat suitability would be maintained; springs, seeps, waterfall spray zones, and fractured rock areas would not be affected.

Alternatives 2 and 3.

There are no known Coeur d'Alene salamander populations in the project area. Maxell (2000: 69) reviewed the risk factors relevant to this species. Timber harvest, fire, road and trail development and maintenance, vehicle use on roads, and isolation of populations are the critical factors. Proposed harvest and burn units would be located outside of riparian habitat conservation areas (RHCAs) sufficient to protect salamanders and their habitat from adverse effects associated with

logging and burning. Their habitat (springs, seeps, waterfall spray zones and fractured rock areas) would not be directly affected by project activities.

Both action alternatives include approximately 2 miles of temporary road construction, 18 miles of roads being put into intermittent stored service and 28 miles of active road decommissioning. Active road decommissioning would include removal of 31 existing culverts, 18 of which are on perennial drainages. Culvert removal could result in incidental mortality if salamanders were present and result in short-term, localized increases in sediment in the stream. Because this species does not have an aquatic larval stage, any short-term increases in sediment would not affect this species. Although there is a slight risk that individuals would be impacted, it is unlikely because there are no known nearby populations and they have limited dispersal ability.

Cumulative Effects

There has been regeneration and intermediate harvest within RHCAs in the past (Table 6). Most of this occurred prior to the 1990s before implementation of the Forest Plan and INFS requirements. Implementation of either action alternative would have no direct effects on riparian habitats. Either action alternative has the potential to indirectly affect downstream riparian habitat. However, RHCA buffers would minimize these effects. There would be no adverse cumulative effects on the Coeur d'Alene salamander population on the Kootenai National Forest from any foreseeable activities within the project area combined with the proposed actions.

Regulatory Consistency

Forest Plan:

- Both action alternatives would meet Forest Plan direction for sensitive species (Vol. 1, p. II-1 #6).
- Both action alternatives would be consistent with Forest Plan riparian standards and guidelines (Vol. 1 pp. II-28 to II-33) as amended by INFS (Inland Native Fish Strategy, USDA Forest Service 1995).

Statement of Findings

Implementation of either of the action alternatives may impact Coeur d'Alene salamander individuals or habitat, but would not likely contribute to a trend towards federal listing or cause a loss of viability. This determination is based on: 1) lack of known populations within the project area and low risk that individuals would be affected; and 2) maintenance of riparian habitats through RHCA buffers.

Fisher

Fisher population ecology, biology, habitat description, and relationships identified by research are described in Powell and Zielinski (1994) and Heinemeyer and Jones (1994). Fisher occurrence data comes from recent District wildlife observation records and Forest historical data (NRIS FAUNA database) and other agencies (MFWP). Fisher habitat was assessed using TSMRS vegetation data. The analysis boundary for direct, indirect and cumulative effects is the project area. The boundary for determining trend or viability is the Kootenai National Forest.

Affected Environment

The FAUNA database has no records of fishers for the project area. The Kootenai Conservation Assessment shows fisher presence confirmed in five of the eight planning units on the Kootenai, including the Yaak Planning Unit. Modeling fisher habitat identifies 62,294 acres of potential

winter habitat and 55,412 acres of potential yearlong habitat in the Yaak planning unit. Following the identification process outlined in Ruediger (1994), the project area has 6,503 acres of primary habitat (mature-to-old grand fir, cedar and western hemlock). In addition, there are approximately 16,255 acres of mature-to-old forest with dense canopy cover that would provide suitable habitat for this species (Powell and Zielinski 1994).

The project area is located in MFWP Trapping District 1. In the 2005/2006 trapping season, four fishers were trapped in the District (http://fwp.mt.gov/hunting/trapping/fbostatus).

Environmental Consequences

Alternative 1

The No Action alternative would retain existing fisher habitat, as described in the existing condition section. There would be no direct or indirect effects on fishers from this alternative.

Alternatives 2 and 3

The following potential effects to fishers include: 1) short-term direct effects during harvest, site preparation, temporary road construction and other project activities (visual or auditory disturbance or displacement of individuals from machinery, vehicles and humans); and 2) long-term indirect effects as a result of changes in vegetation, which provides foraging, denning and other seasonal habitats.

Each of the action alternatives proposes vegetation management activities that would reduce the amount of fisher habitat in the project area. Table 43 displays the amount of habitat affected by the alternatives. While research does not show fisher to be highly sensitive to human activity, the presence of people and machines during project implementation may still displace fishers using the suitable habitat near the proposed units (Powell and Zielinski 1994). The displacement would last until the machines are turned off or leave the area and the people are gone.

Table 43. Acres of fisher habitat in the project area

Habitat	No Action	Alternative 2	Alternative 3
Primary	6,503	6,459	6,459
Suitable	16,255	15,665	15,679

Approximately 44 acres of primary habitat (mature to old cedar, grand fir and hemlock) would be affected by harvest in both alternatives. This would leave 6,459 acres within the project area (or 99 percent of the currently available amount). The predicted decrease in the amount of suitable forest would result in approximately 35 percent of the project area being suitable (a 2 percent decrease). Project design features include retention of snags and downed wood, but suitability for fishers would be lost due to the reduction of overstory and lower amounts of snags and downed wood and recruitment potential.

Fishers are thought to avoid large forest openings, but have occasionally been found in managed forests with little overhead tree cover (Powell and Zielinski 1994). Habitat connectivity would be maintained by retention of forested cover in the RHCAs as well as forested buffers between units (except for units 49 and 50 in Alternative 2).

Heinemeyer & Jones (1994) show the most sensitive time for fishers is the breeding/denning/-rearing period (Feb. 15-June 30). Project activities would generally occur from June 15 to until

fall when weather prohibits operations, except for five units proposed for winter harvest (units 13, 13a, 15, 18 and 20). Of these, only unit 18 is primary fisher habitat (mature cedar) and fishers that might use this stand would be displaced.

Heinemeyer and Jones (1994) also state that impacts within 200 meters (660 feet) of perennial streams are especially important to avoid. Under either action alternative, perennial streams would have 600- or 300-foot buffers applied, with the larger streams having the wider buffer. No harvest or active fire ignition would occur within these buffers.

Both action alternatives may improve winter walk-in access to trappers on two road systems. Five units are proposed for winter harvest but are on gated road systems (595 and 6084). Gates would be closed at night and on weekends to restrict public access, but walk-in access would be available. However, fishers may be displaced during harvest activities and therefore, increased vulnerability to trappers is not expected.

Cumulative Effects

Either action alternative would cause very minor cumulative effects. Past timber harvest from the 1960s to 1980s and associated regeneration harvest in RHCAs reduced the amount of suitable fisher habitat within the project area. The Obermayer Project would complete fuels reduction activities on approximately 25 acres of mature cedar forest types (primary habitat). The action alternatives, in combination with the baseline conditions and reasonably foreseeable projects would result in retention of 99 percent of the currently available primary habitat.

Regulatory Consistency

Forest Plan:

- Both action alternatives would meet Forest Plan direction for sensitive species (Vol. 1, p. II-1 #6).
- Both action alternatives are consistent with Forest Plan riparian standards and guidelines (Vol. 1 pp. II-28 to II-33) as amended by INFS.
- Both action alternatives would be consistent with Forest Plan direction for old growth below 5,500 feet (Vol. 1, pp. II-1 #7; II-7; II-22 & II-23; Appendix 17; and Kootenai FSM 2432.22 Supplement No. 85).

Statement of Findings

Implementation of either of the action alternatives may impact individual fishers and/or their habitat, but would not likely contribute to a trend toward federal listing or cause a loss of viability to the population or the species. This determination is based on; 1) the low number of acres of primary habitat affected; 2) retention of forested stands in RHCA buffers and between units providing connectivity; 3) availability of secure suitable habitat during project activities; and 4) only 2 percent of the suitable yearlong habitat would be affected by this project and other reasonably foreseeable actions.

Flammulated Owl

Flammulated owl population ecology, biology, habitat description, and relationships identified by research are summarized in Hayward and Verner (1994). More recent research on nesting, food habits, home range and territories, and habitat quality conducted in Colorado, Idaho, and Montana is discussed in Linkhart (2001), Linkhart and Reynolds (1997), Linkhart et al. (1998), Powers et al. (1996), Wright (1996), and Wright et al. (1997). That information has been incorporated into

the Flammulated Owl Conservation Assessment (Samson 2005). Flammulated owl occurrence data comes from recent District wildlife observation records and Forest historical data (NRIS FAUNA database). Flammulated owl habitat was assessed using TSMRS vegetation data.

The analysis boundary for direct, indirect and cumulative effects is the project area. The boundary for determining trend or viability is the Kootenai National Forest.

Affected Environment

The breeding distribution of flammulated owls appears to overlap with the distribution of yellow pines (ponderosa pine). Nests have been found in ponderosa pine, Jeffrey pine, Douglas-fir and aspen across their range. A conservation assessment for flammulated owls assessed habitats by National Forest (Samson 2005). It found about 12,000 acres of flammulated owl habitats on the Kootenai (based on dominance groups, canopy cover, structure class, dry conditions and basal area). The assessment looked at changes in habitat over time – it found approximately 6 percent of the Forest's ponderosa pine and Douglas-fir cover types in sawtimber size class in 1940; this has increased to 17 percent today.

The Kootenai Conservation Plan, which includes the flammulated owl (KNF WFB Steering Group 2004), shows in the summary that potential habitat occurs across all eight planning subunits. Forestwide, there are 237,098 acres of potential habitat. The difference in these two assessments is likely based on use of different sources of data (FIA vs. TSMRS) as well as slightly different modeling parameters. Field surveys have confirmed flammulated owl presence in five of eight planning units. The population size on the Kootenai National Forest is unknown (KNF WFB Steering Group 2004).

Based on TSMRS data, there are approximately 1,628 acres of potential flammulated owl habitat in the project area (or 4 percent of the project area). However, it has been concluded that the association of flammulated owl productivity with higher densities of larger diameter trees suggests that flammulated owls are adapted to forests that were historically maintained by fire (Samson 2005). There are 1,295 acres in VRUs 2 and 3, which have warm and dry climates, with fire regimes that include nonlethal, low severity fire. There are 1,134 acres of ponderosa pine and Douglas-fir forest types in these VRUs (87 percent of the area). These areas are considered to provide the most suitable flammulated owl habitat.

Most available research on flammulated owls has been done in Colorado. Studies of flammulated owls on the Manitou Experimental Forest found home range sizes varied between 21 acres and 59 acres between years, but usually fell between 27 and 44 acres. Smaller home range sizes were believed to be due to less sampling effort (Linkhart et al. 1998).

There are no documented occurrences of flammulated owls in the project area. Surveys have not been done in the Whitetail area where the most suitable habitat is, but an evaluation of the stand sizes of the ponderosa pine habitat found that they are generally smaller than 40 acres, decreasing suitability for this species (based on Linkhart et al. 1998).

Environmental Consequences

There are no proposed harvest units in VRUs 2 or 3. Proposed ecosystem burns have the potential to affect flammulated owl habitat. Prescribed fires may have short-term (2 to 3 years) negative effects on the availability of habitat for prey species, but in the long term, habitat for prey species would be maintained and/or increased due to the vigorous shrub/forb layer that would result from the fire.

Alternative 1

Although overall tree species diversity is good, ponderosa pine has been decreasing in the overall composition of the area. The No Action Alternative has reduced habitat effectiveness due to lack of fire and stands have become denser. While these more dense stands may provide suitable roosting habitat, they probably seriously reduce foraging potential (Hayward and Verner 1994). Grass and small shrubs, which harbor numerous prey species, are being shaded out by the regeneration in the understory. The typical foraging maneuvers of the owls may be difficult to perform in closed stands.

Alternatives 2 and 3

These owls are very tolerant of humans, nesting close to occupied areas and tolerating observation by flashlight while feeding young. Nest abandonment is rare (Hayward and Verner 1994). Disturbance during prescribed burning will not be analyzed, since they appear to be tolerant of human activity.

There are no studies initiated or published on the effects of thinning or prescribed fire treatments of ponderosa pine or Douglas-fir on flammulated owls. But studies in Colorado have found that reproductive success is positively correlated with open ponderosa pine forests that appear similar to historic conditions, and negatively correlated with densely stocked stands of Douglas-fir (Linkhart and Reynolds 1997). Treatments of mature ponderosa pine and Douglas-fir that reduce stand density and move stands towards historical conditions and structure would be productive for flammulated owls in the future.

Both alternatives propose prescribed burning on 171 acres of ponderosa pine and Douglas fir stands in VRUs 2 and 3. This is 15 percent of the most suitable existing habitat. The objective of these ecosystem burns is to reintroduce fire and reduce fuels. They are expected to retain the larger and older ponderosa pine and Douglas-fir trees in the overstory while exhibiting a more open understory with increased grasses and forbs. Retaining large trees and snags in the overstory would preserve abandoned flicker and pileated woodpecker cavities, which are the primary nesting sites for flammulated owls.

Cumulative Effects

The existing condition includes the results from all past activities. Much of VRUs 2S and 3 in the Whitetail portion of the project area have been impacted by past regeneration or intermediate harvest. Alternative 1, when considered in association with the planned activities on both public and private lands, is expected to have no cumulative effects that would impact the flammulated owl because the alternative would not change the current availability of nesting and foraging habitat, potential nesting territories, or increase predation risk.

Alternatives 2 and 3, when considered in association with the planned activities on both public and private lands, are expected to have no adverse cumulative effects that would impact the flammulated owl. The Obermayer Project does not include flammulated owl habitat. There are no other reasonable foreseeable future actions in suitable habitat in the project area. Suitable nesting and foraging habitat would still occur on Forest lands, and sufficient habitat would or would not remain within the project area and Forestwide to support a number of nesting territories.

Regulatory Consistency

Forest Plan:

- Both action alternatives would meet Forest plan direction for sensitive species (p. II-1 #6).

- Both action alternatives would be consistent with Forest Plan direction for old growth below 5,500 feet (Vol. 1, pp. II-1 #7; II-7; II-22 & II-23; Appendix 17; and Kootenai FSM 2432.22 Supplement No. 85).
- Both action alternatives would meet Forest Plan standards for snags (pp. II-1 #8; II-22 & II-23; and Appendix 16).

Statement of Findings

Implementation of either of the action alternatives may impact flammulated owl individuals and/or their habitat, but would not likely contribute to a trend toward federal listing or cause a loss of viability to the population or the species. This determination is based on: 1) ecosystem burns proposed in 15 percent of the suitable habitat would maintain or improve that habitat.

Northern Goshawk

Goshawk population ecology, biology, habitat description, and relationships identified by research are described in McGrath et al. (2003) and Reynolds et al. (1992). Goshawk occurrence data comes from recent District wildlife observation records and Forest historical data (NRIS FAUNA database). Goshawk habitat was assessed using TSMRS vegetation. The analysis boundary for direct, indirect and cumulative effects is the project area. The boundary for determining trend or viability is the Kootenai National Forest.

Affected Environment

The Kootenai Conservation Assessment shows goshawk presence confirmed in all eight planning units and shows one known nest site in the Yaak planning area (KNF WFB Steering Group 2004). The most recent data show 34 known or suspected territories on the Forest (KNF goshawk data). There are four known in the Yaak Planning Unit, but none are located in the project area (KNF nest monitoring spreadsheet).

There are confirmed sightings from the project area. Existing roads were surveyed in 2005; there was one confirmed sighting on the west end of the project area (in the vicinity of unit 37), but no nest territory was found. Approximately 33 more miles were surveyed in 2006. There were a couple of observations of goshawks (Little Creek and Gus Creek areas) but no nests were found (see project record for survey data).

Irrespective of forest type, goshawk nest area habitat in North America is typically mature to old forest (Reynolds 2004). Goshawks have a broad geographic and elevational distribution in North America and can be found in many different forest types and forest stand conditions. Goshawks tend to nest in forest stands with large trees and moderate-to-high canopy closure relative to the available canopy closure (Andersen et al. 2005). More than habitat composition or any other factor (i.e., prey abundance), territoriality determines nest distribution, and spring weather determines nesting success (Samson 2006).

Based on TSMRS data, there is approximately 21,320 acres of potential goshawk nesting habitat (mature-to-old forest) in the project area (or 48 percent of the project area).

Environmental Consequences

Alternative 1

Implementation of the No Action Alternative would not cause any direct or indirect effects and would maintain habitat as described in the existing condition.

Alternatives 2 and 3

The following potential effects to goshawks include: 1) short-term direct effects during harvest, site prep, temporary road construction and other project activities (visual or auditory disturbance or displacement of individuals from machinery, vehicles and humans); 2) short-term potential direct effects due to loss of eggs or nestlings if nests are not found prior to harvest; and 3) long-term indirect effects as a result of changes in vegetation, which provides foraging and nesting habitats.

Few studies have directly assessed the impacts of timber management on goshawk populations, but limited data suggests goshawks can tolerate harvest in their nesting area down to a threshold, not to exceed 30 percent within the nest stand, coupled with a buffer up to 5 acres around a nest. McGrath et al. (2003) found goshawks in the northwestern United States use areas near human activities (in Samson 2006). Braun et al. (1996) reviewed existing goshawk management guidelines. They found no studies of human disturbance on breeding goshawks, but felt that the recommendation to minimize human activities in the nest area during the breeding season was a reasonable, conservative approach.

There are no known goshawk nest territories in the project area; there would be no effects to any known nest territories. If nests are found, a 40-acre, no-harvest buffer would be applied, as well as a 300-acre timing restriction (17-hectare and 120-hectare buffers recommended in Samson 2006) during the breeding period (which is considered April 1 to July 15).

Harvest would not begin prior to June 15 (except in five winter units when goshawks would not be present). The potential for loss of eggs or young due to tree-falling is expected to be very low. Nests for this species are fairly large, adults are vocal and often aggressive around their nests, and they are likely to be found before being affected.

Both action alternatives would harvest approximately 450 acres of mature to old forest through regeneration and intermediate harvest. Harvest on all of these acres would retain 20,875 acres of mature and old forest, or 47 percent of the project area. This is a 1 percent decrease in suitable nesting habitat over the project area.

There would be an additional 250 acres of mature forest treated by ecosystem burns (units B-F). The objective of these burns is to reduce conifers in the understory and to improve grasses, forbs, and shrubs. These treatments would be expected to maintain habitat components needed for nesting. There may be a shift in small mammals and birds using the stands due to changes in understory vegetation and downed material, however, prey species would still be available.

Cumulative Effects

Past timber harvest and wildfire has affected approximately 15,215 acres. These effects vary depending on the type of harvest and fire severity, but in general, regeneration harvest and stand-replacing wildfire eliminates nesting habitat. Intermediate harvest and lower severity wildfire may reduce nesting habitat due to decreases in stand densities, but foraging habitat may be maintained or improved (due to improved habitat for some prey species, and improved stand conditions increase room to maneuver when foraging). The Obermayer project would affect another 988 acres.

Approximately 48 percent of the project area currently provides potentially suitable nesting habitat; implementation of the Obermayer Project would drop it to 47 percent. Implementation of either action alternative of this project would drop this to 46 percent.

Regulatory Consistency

Forest Plan:

- Both action alternatives would meet Forest Plan direction for sensitive species (Vol. 1, p. II-1 #6).
- Both action alternatives would be consistent with Forest Plan direction for old growth below 5,500 feet (FP Vol. 1 II-1 #7; II-7; II-22 & 23; Appendix 17; and Kootenai FSM 2432.22 Supplement No. 85).

Statement of Findings

Implementation of either of the action alternatives may impact northern goshawk individuals and/or their habitat, but would not likely contribute to a trend toward federal listing or cause a loss of viability to the population or the species. This determination is based on: 1) retention of suitable habitat across the project area; and 2) direction to protect any nests that may be found.

Townsend's Big-eared Bat

Townsend's big-eared bat population ecology, biology, habitat description, and relationships identified by research are described in Montana Natural Heritage Program (nhp.nris.mt.us/animalguide) as well as the Kootenai Conservation Assessment (KNF WFB Steering Group 2004). Townsend big-eared bat occurrence data comes from recent District wildlife survey records (MNHP 1993) and Forest historical data (NRIS FAUNAdatabase) and other agencies (MNHP).

There are no known caves, mines, or tunnels in the project area. Old growth stands were identified using the Kootenai National Forest old growth GIS stand layer. The analysis boundary for direct, indirect and cumulative effects is the project area. The boundary for determining trend or viability is the Kootenai National Forest.

Affected Environment

District, Forest, and MNHP Townsend's big-eared bat observation and monitoring data indicate that this species is present in the project area. Surveys of the Kootenai National Forest (1993-1995) and by Hendricks et al. (1995, 1996) have located the species in all planning units (KNF WFB Steering Group 2004) but no key roosting sites such as caves or mines have been located. Population size on the KNF is unknown.

Caves and mines are used for maternity roosts and winter hibernacula; none are found in the area. Other habitats or features such as old buildings, bridges, rock cliffs, and large hollows in trees provide roosting habitat. Big-eared bats are known to feed along forest edges, and can be associated with either dry- or wet-type coniferous forests. The species shows a preference for old growth forest for roosting habitat. Young and mature forests are used for feeding (KNF WFB Steering Group 2004). This species has been documented foraging at three sites along the Yaak River (Hendricks et al. 1996).

As the Townsend's big-eared bat has the potential to roost in tree cavities, the larger diameter snags or trees with cavities in the area could be used for summer roosting habitat. As discussed in the Old Growth section of this document, the project area has 11 percent total old growth acres, both designated and undesignated. These stands and the remaining timbered habitat provide suitable roosting habitat in the form of large snags with cavities, as well as abundant foraging habitat across the forest landscape. The analysis for cavity habitat within the project area determined that the cavity habitat potential on NFS lands is currently over 100 percent.

Environmental Consequences

Alternative 1

No activities are proposed, and no Townsend's big-eared bats would be directly disturbed by any timber harvest or associated slashing and/or under burning. No effects to Townsend's big-eared bats would be expected.

Alternatives 2 and 3

There are no caves, mines, or tunnels present in the project area that would provide maternity habitat or winter hibernacula. Buildings and rock cliffs would not be affected. Some bridges would have increased traffic; individual roosting bats could be displaced to other roosts.

Neither action alternative would affect any old-growth habitat. Total old-growth acres, both designated and undesignated, would remain at 11 percent. This maintenance of old-growth habitat would provide large-diameter tree and snag habitat through time. Snag levels in harvest units would meet or exceed Forest Plan standards.

Disturbance or mortality of bats would occur if bats were using a tree or snag that was cut down or burned. Mortality would be expected to be low, as this is a mobile species and would likely fly when the tree was being cut. Effects would be site-specific, affecting individuals rather than colonies.

Regeneration and intermediate harvest activities have the potential to disturb or reduce day-roosting habitat (trees and snags with cavities or thick bark). Intermediate harvest that opened up suitable habitat, or created edge habitat may improve foraging opportunities for bats that use the area. Underburning, the wildlife burns, and ecosystem burns (751 acres) would both reduce and create snag habitat.

Cumulative Effects

No known maternity roosts or winter hibernacula concentrate bat use. Timber harvest activities and the removal of dead standing trees, as well as the removal of live trees with cavities, depending on their diameter, would reduce potential summer roosting sites for individual bats.

Increased traffic on bridges, as well as the proposed bridge replacement on Road 472X, could result in the displacement of individual roosting bats during project activities.

The only other actions that may affect roosting habitat is the Obermayer project. Obermayer focuses on removing understory trees, while retaining, the older, larger trees. These larger trees would be more likely to provide roosting habitat. The proposed project, in combination with Obermayer project would maintain habitat across the project area.

Regulatory Consistency

Forest Plan:

- Both action alternatives meet Forest plan direction for sensitive species (FP II-1 #6).
- Both action alternatives are consistent with Forest Plan direction for old growth below 5,500 feet (FP Vol. 1 II-1 #7; II-7; II-22 & 23; Appendix 17; and Kootenai FSM 2432.22 Supplement No. 85).
- Both action alternatives would meet Forest Plan standards for snags and down wood (pp. II-1 #8; II-22 & II-23, and Appendix 16).

Statement of Findings

Implementation of either of the action alternatives may impact Townsend's big-eared bat individuals or habitat but would not likely contribute to a trend toward federal listing or cause a loss of viability to the population or the species. This determination is based on: 1) The action alternatives would not affect key roosting or hibernation habitat associated with caves, mines, or any buildings, and no impact to the species natality or mortality rates is expected, 2) cavity habitat in the form of snags, wildlife trees, and leave trees would continue to be provided across the Forest in managed (no less than 40 percent snag habitat levels) and unmanaged areas, 3) a forested environment suitable for foraging would remain distributed across the project area and Forestwide, and 4) effects would be site-specific, affecting individuals rather than colonies.

Western Toad

Western toad ecology, biology, habitat use, status, and conservation are described and summarized in Maxell (2000) and Reichel and Flath (1995). Western toad occurrence data comes from District wildlife observation records and Forest historical data (NRIS FAUNA database) and other agencies (MNHP). The analysis boundary for direct, indirect, and cumulative effects to individuals and their habitat is the project area. The project area boundary is located along watershed boundaries and includes complete watersheds that drain into the Yaak River. Because the project area includes complete drainages and due to limited dispersal ability of this species, this area was considered appropriate for addressing cumulative effects. The boundary for determining trend or viability is the Kootenai National Forest.

Affected Environment

Western toads require over-wintering, breeding/rearing, and foraging habitat, and may also be dependant on habitats suitable for migration if the three required habitat types are isolated spatially (Maxell 2000:9). Adults are largely terrestrial, but are aquatic during breeding. As summarized in Maxell (2000), over-wintering may take place in underground caverns or in rodent burrows; breeding/rearing takes place in aquatic sites such as shallow areas of large and small lakes or temporary ponds; and foraging habitat is largely terrestrial uplands.

A Kootenai National Forest status summary of the western toad was documented in the Kootenai Conservation Assessment. This species was once common and widespread in western Montana, but now is uncommon and local. The species has been found in all eight planning units. The population size is unknown and direct measures of population trend on the Kootenai are not available. Surveys conducted between 1993 and 1995 located only 63 adults. Of the 134 wetland sites surveyed during the 1993-94 field season, only 10 had evidence of successful breeding (Werner and Reichel 1994); five additional sites were confirmed during the 1995 field season (Werner and Reichel 1996).

One breeding site is located just outside of the project area, along the Yaak River. Additional breeding habitat is likely to occur in temporal ponds and road ditches. One individual adult toad was observed in the Little Creek drainage in May 2006. The terrestrial habitat within the project area is considered upland foraging habitat.

Criteria used to compare the alternative impacts on the western toad and its habitat include the potential for breeding/rearing habitat to be impacted, the acres of upland foraging habitat harvested and burned, and the potential for effects to toads or their habitat.

Environmental Consequences

Alternative 1

Under Alternative 1, no actions would take place. No direct effect to the western toad would be expected with this alternative. Plant succession would continue on the sites. Indirectly, this would result in an increase in canopy closure and density of understory conifers. This increase in canopy closure and understory conifer density would have no direct, or indirect effect on breeding habitat, and little if any effect on upland habitat. Fuels would continue to accumulate on the upland sites. Should wildland fire occur, the aquatic breeding habitats would not be expected to be directly affected, however surrounding upland habitat could be burned. Western toads have been noted to recolonize burned areas the following year with vegetation regrowth (B. Maxell, Herpetologist, State Zoologist with MTNHP, personal communication April 2003, Troy Mt., J. Holifield (Libby District Biologist) personal observation).

Alternatives 2 and 3

Maxell (2000) found that the effect of timber harvest on amphibians in Montana has been studied only once. A review of the available literature by Semlitsch (2000) in the United States indicates timber harvest and road construction activities can impact aquatic breeding habitat by altering the hydrological cycle of wetlands, which can impair completion of larval metamorphosis through early pond drying, or through increased predation. Aquatic habitat quality can also be reduced by sedimentation and increased water temperatures.

The effects of timber harvest on upland habitats are summarized in Semlitsch (2000) and include elimination of shade, increase surface temperatures, disruption and compaction of soil structure, reduction in soil moisture and removal of coarse woody debris. The fragmentation of natural habitats from timber harvesting and road building may impede dispersal and decreases the probability of wetland recolonization (Semlitsch 2000). Western toads are considered terrestrial generalists (deMaynadier and Hunter 1998), and tend to be more tolerant than salamanders of forest edges, tree harvests, and declining patch size (Renkin et al. 2004).

The direct effects of prescribed fire on western toads have not been investigated. But many of Montana's amphibians are most active on the ground surface during moist periods in the spring and fall (Maxell 2000). While smaller adults are active during the day, most adults are usually active at night except during the spring and at high elevations. There are few reports of fire-caused injury to herpetofauna even though amphibians have limited mobility (Russell et al. 1999).

Prescribed burning would most likely occur in the fall when objectives may be more easily met. Toads may be active April through October (Werner et al. 2004), so there is overlap between prescribed burning and active periods. Most adults would be below ground in burrows during the day, when burning would occur. Road decommissioning could result in direct mortality of individuals on roadways or would result in short-term increases in sedimentation in breeding habitat due to culvert removal.

None of the proposed activities are near the known toad breeding area, which is on the edge of the project area. All activities associated with timber harvest and prescribed fire would be consistent with INFS guidelines and direct or indirect effects on riparian habitat (potential breeding sites) associated with the western toad would be unlikely. No harvest or burning would occur within RHCAs. In addition, there is a design feature that would place buffers on wet areas found in units during project layout.

There would be culvert removal associated with active road decommissioning; 31 culverts would be removed, 18 of which are on perennial drainages. This would result in short-term, localized increases in sediment. If a breeding pond was located downstream and activities occurred while eggs were incubating, eggs could be silted over and suffocate. However, it takes only five days for eggs to hatch (Maxell 2000), so the potential for these effects is small.

Upland habitats would be impacted by removal of shrub cover, downed wood, and soil compaction. Best management practices (BMPs) to reduce soil compaction have been incorporated into the project. Downed wood would be retained after treatment, and snags and other trees retained would eventually fall and provide downed material. These features would provide cover in the upland habitats affected by harvest. Precommercial thinning would be accomplished by chainsaws and this action is not likely to cause harm to western toads in upland area.

Both alternatives include timber harvest, prescribed burning and site preparation activities, approximately 2 miles of temporary road construction, as well as 30 miles of active road decommissioning. The proposed timber harvest and road construction and decommissioning activity could result in incidental mortality to western toads on upland habitats. Over the short-term, these activities may harm individuals; however, over the long term the effects of watershed and healthy forest restoration outweigh the risk to a few individuals.

Cumulative Effects

The reasonably foreseeable action (Obermayer Project) would treat approximately 988 acres. Suitable habitat would still occur on National Forest lands. Cumulatively, private and federal timber harvest activities and road construction, and the creation of openings would not affect upland toad habitat.

The risk of direct mortality to toads during burning is low, but it can occur. Toads typically seek refuge in moist habitats such as animal burrows and under rocks and logs where the fires would not burn (Russell et al. 1999). These cumulative increases in activities is expected to cause additional in-channel sediment production or cause changes in channel morphology due to stable stream types, so the proposed actions would not have a measurable effect on aquatic habitat. Upland terrestrial habitat would be impacted by the removal of travel corridors between existing regeneration units.

The action alternatives, when considered in association with the planned activities on both public and private lands, are not expected to have adverse cumulative effects that would impact the western toad. In the short-term, both timber harvest and slash and/or burn units would not provide habitat until shrub cover returned (2 to 3 years). The temporary reduction in habitat is not likely to result in a declining population trend for this species. Cumulative effects of all past, ongoing, and reasonably foreseeable activities are similar.

Regulatory Consistency

Forest Plan:

- Both action alternatives would meet Forest Plan direction for sensitive species (Vol. 1, p. II-1 #6).
- Both action alternatives would be consistent with Forest Plan riparian standards and guidelines (Vol. 1, p. II-28 to II-33) as amended by INFS.

- Both action alternatives would meet Forest Plan standards for snags and down wood (pp. II-1 #8; II-22 & II-23, and Appendix 16).

Statement of Findings

Implementation of either of the action alternatives may impact western toad individuals and/or their habitat, but would not likely contribute to a trend toward federal listing or cause a loss of viability to the population or the species. This finding is based on: 1) removal and partial consumption of coarse woody material in upland sites due to harvest activities and/or fire, 2) the longer-term recruitment of coarse woody debris due to snags falling over time, 3) no impact or change to the current availability of breeding habitat, 4) retention of riparian movement corridors, 5) the low risk of direct mortality during burning and the limited direct mortality risk during timber harvest activities, and 6) suitable habitat would remain in the project area and be distributed across the Kootenai National Forest.

Wolverine

Wolverine population ecology, biology, habitat description, and relationships identified by research are described in Banci (1994) and Butts (1992). Wolverine occurrence data comes from recent District wildlife observation records and Forest historical data (NRIS FAUNA database) and other agencies (MFWP). Wolverines are habitat generalists, except for denning habitat. Denning habitat is generally subalpine fir or spruce stands or rocky outcrops in areas that are usually snow covered in February through April (Ruediger 1994). Areas with minimal human disturbance are also important.

Researchers have generally agreed that wolverine habitat is probably best defined in terms of adequate year-round food supplies (primarily large mammal carrion, along with berries, small mammals, beetles, and insect larvae) in large, sparsely uninhabited areas, rather than in terms of topography or plant associations (Ruggiero et al. 1994).

The analysis boundary for direct, indirect and cumulative effects is the project area. The boundary for determining trend or viability is the Kootenai National Forest.

Affected Environment

Although there are no documented occurrences in the FAUNA database showing wolverines are likely to be present, the Kootenai Conservation Assessment shows wolverine presence confirmed in seven of the eight planning units on the Kootenai, including the Yaak.

The wolverine was petitioned for listing in 1994. In 1995, the USFWS determined that there was no information to indicate that the listing of the wolverine as threatened or endangered was warranted (USDI Fish and Wildlife Service 1995). There is little research on denning habitat for wolverines, but one recent study in Glacier National Park (Copeland et al. 2004) found that reproductive dens occurred in natural cavities under fallen trees covered by deep snow. These dens were found above 6,000 feet. All of the project area is below 6,000 feet but it is assumed that the higher elevations (over 5,000 feet elevation) may provide denning habitat.

Wolverines are often considered a species that avoids areas of concentrated human use. The whole area is sparsely inhabited, but the IRAs in the project area provide areas with little concentrated human use.

The project area is part of Montana Department Fish, Wildlife and Parks' Wolverine Management Unit 1. This includes all of northwest Montana from Butte to Helena to Great Falls and north to

the Canadian border. There is a harvest quota of five, and the quota was reached in the 2005-2006 trapping season.

Environmental Consequences

Alternative 1

The No Action Alternative includes a significant portion of secure habitats, centered on the IRAs. These IRAs provide displacement habitat for on-going projects and recreational uses.

Alternatives 2 and 3

The following potential effects to wolverine include 1) short-term direct effects during harvest, site prep, temporary road construction and other project activities (visual or auditory disturbance or displacement of individuals from machinery, vehicles and humans); 2) decreases in downed woody material used for denning and 3) designation of nonmotorized trails.

Each of the action alternatives would result in a reduction of downed woody logs, which are used for wolverine denning habitat. However, downed wood would be left to meet Forest Plan direction. All harvest units are outside of IRAs where the most secure habitat (and most likely denning habitat) is located.

Most literature (Joslin & Youmans 1999, Witmer et al. 1998, Copeland 1996, Weaver et al. 1996, Butts 1992) suggests that the wolverine is sensitive to human presence, which indicates that it is highly likely they would be displaced during project activities. Design features to reduce disturbance and displacement to grizzly bears would also reduce effects for wolverine.

The most critical period for wolverine is during denning (12/1-4/30). There are five units proposed for winter harvest (13, 13a, 15, 18 and 20). Planting would also occur in April, May or June. None of these actions would occur in any inventoried roadless areas, which are the most secure habitats. Therefore, no effects to denning wolverines are expected.

Both action alternatives also include designation of some trails as nonmotorized. This includes trails 193 and 547 in the Roderick Mountain IRA and trail 182 in the Grizzly Peak IRA. While nonmotorized use may cause displacement, limiting use would be expected to result in overall lower use levels and associated disturbance.

Both action alternatives may improve winter walk-in access to trappers on two road systems. Five units are proposed for winter harvest but are on gated road systems (595 and 6084). Gates would be closed at night and on weekends to restrict public access, but walk-in access may be improved. However, wolverines would likely be displaced during harvest activities and therefore increased vulnerability to trappers is not expected.

Cumulative Effects

Implementation of either of the action alternatives, in combination with the baseline conditions and reasonably foreseeable projects in the project area (Obermayer projects) would maintain secure areas, relatively free from disturbance. Over BMUs 11and 14, road density and grizzly bear core standards are moving towards standards. With implementation of either action alternative, both the core habitat and TMRD standards would be met for both BMUs. This would improve secure habitat for wolverines, providing areas with minimal exposure to humans.

Regulatory Consistency

Forest Plan:

- Both action alternatives would meet Forest Plan direction for sensitive species (Vol. 1, p. II-1 #6).

Statement of Findings

Implementation of either of the action alternatives may impact wolverine individuals or their habitat, but would not likely contribute to a trend toward federal listing or cause a loss of viability to the population or the species. This determination is based on: 1) location of harvest units outside of most secure habitats (IRAs); 2) maintenance of downed woody logs in harvest units; 3) designation of trails as nonmotorized in IRAs and 4) improvement of areas with minimal exposure to humans across the Yaak Planning Unit.

Management Indicator Species (MIS)

Table 44 shows the MIS selected for the Kootenai. It includes several threatened, endangered, and sensitive species (grizzly bear, gray wolf, bald eagle and peregrine falcon). These species are analyzed in other sections of this report, and the analysis is not repeated here. Mountain goats, which were also selected as MIS, are not present in the project area and are not analyzed. Elk and white-tailed deer (MIS for general forest habitat) and pileated woodpeckers (MIS for snags and old growth habitat) are analyzed in this section.

Table 44. MIS on the KNF

Common Name	Habitat Represented	Project Analysis
Grizzly bear	General forest	Addressed in previous section
Gray wolf	General forest	Addressed in previous section
Bald eagle	Rivers and lakes	Addressed in previous section
Peregrine falcon	Cliffs	No habitat in project area; not addressed
Elk	General forest	Included
White-tailed deer	General forest	Included
Mountain goat	Alpine	No habitat in project area; not addressed
Pileated woodpecker	Snags, old growth	Included

Elk and white-tailed deer are two MIS species that represent similar habitat. Summerfield (1991) recommends determining which big game species will be featured in a particular area, since species' winter requirements differ. For planning subunits in which elk are moderate emphasis (as is the case in this analysis), the project biologist will designate the general forest indicator, based on site-specific information about elk and deer use in the project area.

The project area has been divided into three winter range areas, based upon existing habitat use (Map M-6, Map Appendix). The winter range on the south side of the Yaak River in the Oberymeyer area will receive an emphasis for elk, because of elk use that occurs in the area. The winter ranges on the north side of the Yaak River and the north side of Burnt Creek will receive an emphasis for white-tailed deer.

Approximately 22 percent of the project area (9,880 acres in Management Areas (MAs) 10 and 11) is designated winter range in the Forest Plan. Big game winter ranges in the Grizzly Subunit were described as being in fair condition at the time of the Grizzly Watershed Assessment.

Encroachment by fire-intolerant species and the amount of browse decadence are factors contributing to this condition.

Elk

Affected Environment

Elk population ecology, biology, habitat description, and relationships identified by research are described in Toweill and Thomas (2002). Elk population and harvest data come primarily from Montana Fish, Wildlife & Parks (MFWP) data. Additional information used is from recent District wildlife observation records and Forest historical data (NRIS FAUNA database). The analysis boundary for project impacts to individuals and their winter habitat is the Obermayer portion of the project area. The analysis area for direct and indirect effects on year-round habitat is the project area. The boundary for determining cumulative effects and population trend and viability is the MFWP Elk Hunting District 100, Purcell Elk Management Unit (EMU), and the Kootenai National Forest.

The effects analysis is based on direction provided in the Kootenai Forest Plan as amended and Coordinating Elk and Timber Management (MFWP 1985). Additional guidance is provided by Hillis et al. (1991). Potential effects to elk habitat are identified by analyzing four effects indicators: cover/forage ratio, habitat effectiveness (open road densities), security, and key habitat components.

The project area is located in Elk Hunting District 100. The Kootenai Monitoring and Evaluation Report found that aerial survey data showed an increase in elk numbers over the Forest since the last report in 2002 and that elk habitat has been steadily improving (USDA Forest Service 2005). Population numbers are not known for the Purcell Elk Management Unit (EMU) and good winter range is lacking. Elk populations and distribution increased in the 1980s and early 1990s but stabilized and remained relatively constant over the last decade. The severe winter of 1996-1997 reduced the elk population and compromised calf production and recruitment until 1998. The elk population appears to be recovering slowly (MFWP 2004).

Forage production in the EMU has been improving. Major wildfires in 1994 and 2000 burned in the EMU (and portions of the project area), and prescribed burning for big game habitat improvement has increased forage production. In the Yaak River drainage, treatments have occurred in Seventeenmile Creek, Bunker Hill, Roderick, West Yaak, Wood/Rat, Whitetail drainages, and Rausch Point (MFWP 2004). The Roderick and Whitetail prescribed burns are adjacent to the project area.

Cover/Forage Ratios

Cover/forage ratio portrays the percentage of area that meets elk requirements for cover and forage. Two different types of cover provide protection from weather, predators, and humans. Hiding cover is defined as trees of sufficient size and density to conceal animals from view at 200 feet (USDA Forest Service 1987). Thermal cover is a stand of conifers that are 40 feet tall with 70 percent crown closure. Forage areas are those natural or man-made areas that do not qualify as cover (hiding or thermal; Thomas 1979). Recently, elk use of thermal cover and foraging areas has been reexamined and this research indicates that providing thermal cover is not a suitable solution for inadequate forage conditions (Cook et al. 1998).

The Kootenai Forest Plan recommends a cover/forage ratio of 30/70 percent for elk winter range (measured on the combined acres in MA 10 and 11 lands). Summerfield (1991) recommends

cover to be 60 percent on winter and summer range (measured on all MAs except 10 and 11). On elk winter range the cover should be at least 40 percent thermal cover (ibid). Summer range cover may be in any combination of hiding and thermal cover (ibid). The Forest Plan also identifies the general maximum size for an opening as 40 acres. Summerfield (1991) recommends that the opening size standard be the same as the standard for grizzly bear (a maximum of 600 feet to cover from any point inside an opening).

In this analysis, cover/forage ratios for winter range, the percent thermal cover on winter range, and the number of regeneration harvest units greater than 40 acres in size are the measures for effects. Cover/forage ratio for summer range (combined MAs 15, 16, 17) in the project was not analyzed as only MA 15 is found in the project area, and there are no proposed activities in this management area.

Currently, the cover/forage ratio is 0/100 percent for the winter range (MA 11) found in the Obermayer area. The Obermayer winter range lacks forage areas, as previously harvested stands are now into cover and the only forage areas were on private lands. However, the Obermayer Hazardous Fuels Reduction Project would result in an increase in forage areas (see cumulative effect section). Currently, there is approximately 17 percent thermal cover in MA 11, and approximately 50 stands providing forage areas in MAs 11 and 12 (which include summer and winter range). Most of these open stands are less than 40 acres; three are larger than 40 acres.

Habitat Effectiveness

The habitat effectiveness of an area refers to the percentage of habitat that is usable by elk outside of the hunting season that does not contain open roads. Numerous studies have shown that there is a strong negative correlation between elk use of an area and the density of open roads, even if those roads are only lightly traveled (Frederick 1991).

The Kootenai Forest Plan included direction for maximum open road densities in MA 12 (Big Game Summer Range and Timber) of 0.75 mile per square mile. This translates to a habitat effectiveness of 68 percent (Lyon 1984). In MAs 15, 16, 17 and 18 the Forest Plan open road density (ORD) standard is less than or equal to 3 miles per square mile, which equates to 38 percent habitat effectiveness.

Security

Security areas are defined as areas that are larger than 250 contiguous acres in size and more than one-half mile from an open road (Hillis et al. 1991). These areas offer elk refuge through reduced vulnerability during the hunting season and can greatly influence the age structure and composition of a herd.

The Kootenai Forest Plan has no standard for security. A panel of state and federal wildlife biologists convened in 1996 and produced, “Integrating Kootenai National Forest Plan and Fish, Wildlife & Parks Elk Management Plan Final Task Force Report” (KNF and MFWP Elk Task Force 1997: Appendix H-B). This document identified security as an important component in elk habitat and that the Hillis et al. (1991) method would be used to calculate it. This method recommends a minimum of 30 percent of an elk’s fall use area be maintained as security habitat. Since elk use in the fall could be any place within the project area, the 30 percent minimum is measured against the project area National Forest land acres. Currently, there is 52 percent of the project area in secure habitat.

Key Habitat Components

Wallows, wet meadows, and bogs will be avoided when constructing roads (Kootenai Forest Plan 1987; pp. III-44, III-49). When these areas are located, they will be mapped and managed as riparian areas. Unit 17 initially included a wet area used as a wallow, but unit boundaries were refined to exclude that area from harvest (G. Gill, District Biologist, pers. comm.).

Calving areas may be found in the project area, but no project activities besides planting would occur during the calving season (May 15 to June 15). Planting would be done by hand and no motorized use would be allowed on restricted roads for this activity. Because of these restrictions, there would be no effects from planting activities and effects to calving won't be addressed.

Environmental Consequences

No Action

Cover/forage ratios, habitat security and key habitat components would remain unchanged. The cover/forage ratios for summer, winter and the Obermayer winter range are lacking in forage areas. As trees and shrubs continue to grow and mature the number of acres of productive foraging habitat would further decline. As trees continue to grow in forage openings and tree canopies close, the quality of the forage and number of acres producing forage will decline. The increased tree density and continuous fuel profile from the ground up to the main canopy puts the area at risk of severe wildfire. If severe wildfires occur, it is likely that forage habitat would be greater than 600 feet from cover, making it less likely to be used by elk.

Alternatives 2 and 3

The difference between alternatives is slight, and is displayed below in Table 45. Minor differences in cover/forage ratios on the Obermayer winter range, and open road densities are discussed in the following section.

Prescribed burning (ecosystem and wildlife burns), which would occur primarily on south and west slopes that make up big game winter range. Burning would improve the palatability and enhance the quality of the forage produced on these acres.

Cover/forage ratios: winter range would move slightly toward the Forest Plan standard because of timber harvest in MAs 10 and 11. Alternative 3 would result in a percentage more forage on the Obermayer winter range due to the addition of unit 61, which is defensible space unit. Summer range cover/forage ratio would become 94/6 under both action alternatives.

Thermal cover on the Obermayer winter range is below recommendations by Summerfield and implementation of either alternative would reduce it another 2 percent. Cook et al. (2005) reviewed four studies specifically looking at thermal cover because it was unclear whether thermal cover really induced a biologically relevant improvement in survival or reproduction. They determined that there appeared to be little justification for retaining thermal cover as a primary component of habitat evaluation models for elk. Thus, the reduction of thermal cover is not expected to have any overall effect on elk distribution or population.

Size of openings: Alternative 2 includes two adjacent units that would result in a regeneration opening greater than 40 acres. This would result in an opening that may not be fully utilized by elk as foraging areas. However, stringers and groups of trees would be left within the units to provide screening and minimize the effect of the openings. In Alternative 3, these two units would be adjusted to three 20-acre units with forested cover left between them.

Table 45. Elk habitat components

Habitat Component	Direction	Alternative 1	Alternative 2	Alternative 3
Forest Plan Direction				
Cover/forage ratio winter range	30/70 in MA 10 and 11	94/6	83/17	83/17
Cover/forage ratio on Obermayer winter range (does not include Obermayer project)	30/70 in MA 10 and 11	100/0	98/2	97/3%
Open road density	<0.75 mi/sq mi in MA 12	Existing ORD in MA 12 is 0.62 mi/sq mi.	During activities, ORD would increase to 0.79 mi/sq mi, but would drop back down to 0.62 mi/sq mi post-project.	Same as Alt 2
Habitat effectiveness (MA 12)	≥ 68%	70% (measured over all MA 12 polygons)	70%	70%
Open road density	<3.0 mi/sq mi in MA 15	There is only one polygon of MA 15 and it is well below standard at 0.3 mi/sq mi	No change	No change
Size of openings	< 40 acres in MA 11 and 12	47 out of 50 existing openings are <40 acres	Units 49 and 50 are adjacent and would create an additional 126 acre opening	Units 49 and 50 are modified, no openings over 40 acres
Other Recommendations (Summerfield 1991; Hillis et al. 1991)				
Cover/forage ratio on summer range	60/40 in non-winter MAs	96/4	94/6	94/6
Thermal cover % over all three winter range areas	>40% in MA 10 and 11	30%	28%	28%
Thermal Cover % on Obermayer winter range	>40% in MA 10 and 11	17%	15%	15%
Security cover %	30%	52%	52%	52%

Habitat effectiveness: As shown in Table 45, open road densities would exceed Forest Plan standard during project activities, and then return to existing after project completion. A project specific amendment would be required, as there are no feasible opportunities to meet this standard during operations. The habitat effectiveness direction would continue to be met over the long term.

Open Road Densities

The project area contains 9,094 acres of allocated summer range (MA 12). There are 8.8 miles of open road in MA 12. The current open road density for MA 12 in the project area is 0.62 mi/sq mi. This meets the no more than 0.75 miles of open road per square mile standard.

During project activities, open road densities would increase, due to restricted roads being used for project activities. These roads would be needed to access units and road management proposals. During project activities during the summer period, the open road density would increase to 0.79 mi/sq mi. Post-project, all of these roads would be restricted, and open road densities would drop back to 0.62 mi/sq mi. A project-specific amendment would be needed for the project area as project activities would bring it out of compliance during the project.

Security: The project area exceeds the recommended minimum of 30 percent security areas, with 52 percent of the project area in security areas. Because of harvest-related activity, big game

security in the project area may decrease but would still meet the 30 percent minimum due to the large IRA around Grizzly Peak. Reductions in security would be temporary and extend only through the life of the activity. Upon completion of all projects related to this analysis, big game security in the project area would return to 52 percent. Secure displacement habitat exists in the Grizzly IRA as well as the adjacent Roderick IRA to the south. Access to secure habitat would be maintained throughout the life of the projects.

There may be short-term disturbances within identified big game travel corridors due to project-related activities. Timber management in riparian habitat conservation areas would follow INFS guidelines with retention of RHCA buffers and the state of Montana Streamside Management Zone law, ensuring the maintenance of travel corridors within riparian zones. Movement corridors would be maintained. Alternative 2 would require Regional Forester approval for the creation of large openings (over 40 acres).

Cumulative Effects

The Obermayer Hazardous Fuels Reduction Project is ongoing in this area. Units 5 and 19 of Obermayer are regeneration harvest for a total of 24 acres of new forage areas. Other treatments are intermediate harvest, and would result in a short-term increase in forage species in the understory. There are 952 acres of intermediate harvest in MA 11 in Obermayer. The analysis for that project determined that there would be a 90/10 cover/forage ratio after implementation of that project.

Most of the stands in the Obermayer winter range areas are being treated under the Obermayer Project to reduce fuels, through intermediate harvest. Thermal cover stands that are along riparian areas would not be treated and would be retained as functioning thermal cover. This project would be expected to change most of the stands from thermal cover to hiding cover (with short-term increases in forage). The reduction of thermal cover is not expected to have any overall effect on elk distribution or population, as discussed in the Direct and Indirect Effects section.

Purcell EMU: The major portion (95 percent) of this EMU is public lands. Plum Creek owns about 3 percent but has started selling off lands to private land developers. Most of these are in low-elevation areas, adjacent to waterways, which are also winter range areas for big game. The overall impact is minimal over the whole EMU (MFWP 2004).

Noxious weed invasion onto important elk winter ranges is having increased impacts on winter range forage production. Prescribed burning on winter ranges is an important tool, but burning on winter ranges is not done where they are heavily infested by noxious weeds. Weed control design features incorporated into this project would help to prevent the spread and reduce existing or new areas of noxious weeds.

One source of mortality is the Yaak highway. Speed is the primary factor contributing to vehicle-wildlife collisions (Gunther et al. 1998). This project would result in an increase in traffic on the highway (daily traffic to worksite, and log hauling) and has the potential to result in an increase in road-killed wildlife.

Predation may affect populations in the future. The EMU has healthy populations of mountain lions and black bears, a low number of grizzly bears, and increasing populations of wolves. All of these large carnivores combined, would likely have a depressing influence on the elk population with a subsequent reduction in elk hunter opportunity (MFWP 2004). Overall, elk populations across Purcell EMU would not be negatively affected by implementation of this project.

Cumulative Effects of Plan Amendments for Open Road Density (MA 12)

There have been 40 site-specific and 4 programmatic amendments to open road densities in MA 12 since the plan was approved (Johnson 2006). Of these, only 14 of the site-specific amendments remained in place for three or more years. These long-term amendments apply to 143,649 acres of MA 12 (or 31 percent of the total acreage of the MA). Since only one unit is being accessed by roads in MA 12 during the summer period, this amendment would only last one season.

The elk population has been increasing on the Forest. This may be due in part to the improving overall forest-wide habitat capability caused by reductions in unrestricted access roads (Johnson 2006). Because of the small acreage involved and the increasing population trend in spite of the Plan amendments for open road densities, this project would not affect the Forestwide trend of increasing elk populations.

Regulatory Consistency

Forest Plan

- Both action alternatives meet, or move towards Forest Plan direction for big game species (Vol. 1, p. II-1 #6). However, Forest Plan amendments would be needed for open road densities in MA 12 under both action alternatives. Forest direction would be followed to amend the Plan for these areas.
- Alternative 2, with its associated Forest Plan amendment and Regional Forester approval for the over-40-acre-unit request (adjacent units 49 and 50 in Alternative 2), is consistent with the Kootenai Forest Plan (1987).
- The project-level habitat impacts would contribute to overall Forestwide trends in elk habitat and populations.

State Elk Plan

The project area is located in the Purcell Elk Management Unit identified in the MFWP Statewide Elk Management Plan (2004). The proposed project incorporates the following habitat management strategies for elk security: manage winter range to accommodate current populations; achieve open road densities not to exceed 0.75 miles of road square mile in summer/fall range; maintain roadless area in Grizzly Peak and Roderick; and maintain or enhance winter range in several areas (including Whitetail Face). The strategy for no open roads on key winter range areas may not be met, as there are open roads (593, 435 and 472) on the edges of these winter ranges. They may be seasonally impassable to full-size vehicles due to weather and road conditions, but may be used by snowmobilers.

Statement of Findings

Based on the analysis for elk and the other general forest habitat indicators, and the KNF Conservation Plan (KNF WFB Steering Group 2004), habitat for general forest species would provide sufficient quality and quantity of the diverse age classes of vegetation needed for viable populations. Since sufficient general forest habitat is available, the populations of species using that habitat would remain viable.

White-tailed Deer

Affected Environment

White-tailed deer population ecology, biology, habitat description, and relationships identified by research are summarized in Mackie et al. (1998). For this analysis, white-tailed deer were selected as the emphasis species on two winter range areas, based on management emphasis data contained in the Kootenai Conservation Plan (KNF WFB Steering Group 2004) and site-specific knowledge of deer and elk use in the project area.

Indicators used to assess effects on white-tailed deer are cover/forage, opening sizes, open road densities, movement areas, and key habitat components. Data sources used in this analysis include Montana Fish, Wildlife and Parks research and plans, District vegetation layers, INFRA GIS roads layers, Summerfield (1991), and field surveys by District biologists and data collection crews.

The project area will be used to analyze general forest indicator species parameters and is sufficiently large enough to address potential effects of the proposed actions on white-tailed deer populations at a landscape level. Population information is based on hunting district data provided by MFWP.

The project area is within MFWP Hunting District 100. Population information in Hunting District 100 indicates an increasing population, showing a significant recovery from the effects of severe winter conditions of 1996-1997 (USDA Forest Service 2005). Habitat conditions show improvement in some areas and slight declines in others. A fluctuating population is typical of how the species responds to weather conditions in the northern heavy-snow regions, and does not appear to be directly related to management actions or implementation of the Kootenai Forest Plan winter range standards (USDA Forest Service 2005).

Mackie et al. (1998) did an assessment of white-tailed and mule deer habitat across the state. White-tailed deer predominate in densely forested river valleys and maritime-influenced mountain ranges in western and northwestern Montana (including the project area). In winter, they contend with an energy deficit and their primary strategy is to conserve fat reserves through specialized use of habitat. White-tailed deer in the maritime-influenced mountain ranges of northwest Montana usually experience less variation in precipitation and temperature during summer and winter. Deer must recover physical condition, reproduce, and accumulate fat reserves for the coming winter during a comparatively short summer growing season. Winter range was not the primary factor determining deer numbers and dynamics.

White-tailed deer usually rely on an energy conservation strategy during harsh winters and are more opportunistic during mild winters. In summer, reproductive requirements are met by using a diversity of vegetation communities centered near riparian areas (Mackie et al. 1998).

Cover/forage Ratios

The Kootenai Forest Plan recommends a cover/forage ratio of 70/30 percent for white-tailed deer winter range (measured on the combined acres in MA 10 and 11 lands). Summerfield (1991) recommends cover to be 70 percent on winter range and 60 percent on summer range (measured on all MAs not winter range). On white-tailed deer winter range, the cover should be at least 50 percent thermal cover (ibid). Cover/forage ratio for summer range (combined MAs 15, 16, 17) in the project was not analyzed as only MA 15 is found in the project area, and there are no proposed activities in this management area.

Cover/forage ratios for the two deer winter range areas in the project area, and percent thermal cover on the winter ranges are the measures for effects.

Within the project area, there are two areas of winter range receiving emphasis for deer. The Burnt Creek winter range includes approximately 5,260 acres of winter range in MAs 10 and 11. The cover/forage ratio is 94/6 because most of the previously harvested units have grown back into hiding cover. There are 1,717 acres within winter range that are currently estimated to function as thermal cover (33 percent of the winter range). In comparison to the desired minimum of 50 percent thermal cover, the current condition does not provide suitable cover during extreme weather conditions.

On the Whitetail Creek winter range, there are approximately 2,427 acres of winter range in MA 11. The cover/forage ratio is 88/12 because most of the previously harvested units have grown back into hiding cover. There are 590 acres within winter range that are currently estimated to function as thermal cover (24 percent of the winter range). In comparison to the desired minimum of 50 percent thermal cover, the current condition does not provide suitable cover during extreme weather conditions. The white-tailed deer population in the project area would be maintained, however, individuals could be impacted negatively during extreme weather if suitable thermal cover is not available.

Opening Sizes

In general, forage utilization decreases when big game is required to venture more than 600 feet from cover (Thomas 1979, p. 117). Within MAs 11 and 12, Forest Plan standards state that openings “should generally not exceed 20 acres for white-tailed deer”. In MA 10, timber harvest is generally only done to maintain or enhance big game winter range, thus opening size would be minimized. Summerfield (1991) recommends that the opening size standard be the same as the standard for grizzly bear (a maximum of 600 feet to cover from any point inside an opening).

Under MAs 11 and 12, approximately 50 previously harvested units are now providing forage; about 21 of these are greater than 20 acres in size. Available forage is not currently well distributed across the project area. Most winter range in the project area falls within Vegetation Response Units (VRUs) 2S and 5S, which are characterized by mixed-severity fires that create patch sizes of 20 to 200 acres (Gautreaux 1999). So, while almost half of the previously harvested units exceed the recommended 20 acres, they fit within what would have occurred under natural fire regimes.

Open Road Density

The Kootenai Forest Plan included direction for maximum open road densities in MA 12 (Big Game Summer Range and Timber) of 0.75 mile per square mile. In MAs 15, 16, 17 and 18 the Forest Plan open road density standard is less than or equal to 3 miles per square mile.

Movement Areas

For white-tailed deer, the corridor between openings should be as wide as the recommended opening size or two sight distances, but at least greater than 600 feet (Summerfield 1991). A cover/forage map using District GIS vegetation layers provides a visual identification of movement corridors and is found in the project file. Most existing openings have adequate adjacent cover available. Portions of the Lucky Point fire area may lack suitable cover, affecting the ability of some species to move freely or securely through the landscape. Movement corridors along drainage bottoms and ridgetops are especially important for many wildlife species; most of

these areas or travel ways are intact. The desired condition is to avoid harvesting before adjacent harvest units have reached hiding cover (Kootenai Forest Plan, p. III-49).

Key Habitat Components

Wallows, wet meadows, and bogs will be avoided when constructing roads (Kootenai Forest Plan, 1987; pp. III-44 & III-49). When these areas are located, they will be mapped and managed as riparian areas. Those found prior to this analysis have been excluded from proposed harvest units. Those that may be found during unit layout would be protected with a buffer or the unit boundary would be modified to exclude them.

Environmental Consequences

Habitat management guidelines for deer in mountain ecosystems include retention of conifer overstory on winter ranges, road management, and habitat enhancement through acquisition of easements for use of winter range in private ownership. Retention of conifers on winter range moderates temperate extremes, reduces wind velocity and radiant head loss, and provides snow interception, reducing depth of snow and providing easier access to foraging sites. While animal use apparently increases following winter range habitat enhancement projects, increases in numbers, productivity, and survival of deer were not observed (Mackie et al. 1998).

Most of the treatments proposed are in MAs 10 and 11 (big game winter ranges). While they would reduce conifer overstory in the units, they have been designed to meet Forest Plan direction as in Table 46 and described below.

Alternative 1

Forage availability would remain unchanged, and would continue to be below the desired levels and would eventually develop into hiding cover. The level of forage would decline over time unless harvest or other events, such as a wildfire or windstorm, created additional forage. Forage levels would not increase, and thermal cover would not be reduced. The potential for large-scale fires exists; however, the resulting juxtaposition of cover to forage following large fires would not be as favorable because forage could be long distances from cover due to larger opening sizes. Overall, white-tailed deer populations would probably be maintained, however, individuals animals may be more vulnerable to predation and hunting mortality in areas where large openings develop following wildfire. This impact would last until vegetation again provides hiding cover (about 15 to 20 years, depending on growing site).

Alternatives 2 and 3

Cover/forage: Alternative 2 would result in a slightly higher increase in forage availability due to the larger number of acres proposed to be treated. The desired condition of 70 percent cover in MAs 10 and 11 would not be met, but the action alternatives would move the existing condition towards the desired condition. Thermal cover would decrease on the Whitetail and Burnt Creek winter ranges. The resulting winter thermal cover percentage moves away from the Forest Plan desired condition in MAs 10, and 11. Individual animals may be affected by a localized loss of thermal cover under either action alternative; no overall change in population is expected.

Table 46. White-tailed deer habitat components

Habitat Component	Direction	Alternative 1	Alternative 2	Alternative 3
Forest Plan Direction				
Cover/forage ratio winter range	70/30 in MA 10 and 11	94/6	83/17	83/17
Cover/forage ratio Whitetail winter range	70/30 in MA 10 and 11	88/12	75/25	75/25
Cover/forage ratio Burnt Creek winter range	70/30 in MA 10 and 11	94/6	84/16	85/15
Open road density	<0.75 mi/mi2 in MA 12	Current ORD in MA 12 is 0.62 mi/sq mi.	During activities, ORD would increase to 0.79 mi sq mi. Post-project ORD would drop back down to 0.62 mi/sq mi.	Same as Alt 2
Size of openings	< 20 acres in MAs 11 and 12	21 existing openings exceed 20 acres	5 additional regeneration harvest units would exceed 20 acres	3 additional regeneration harvest units would exceed 20 acres
Other Recommendations				
Thermal cover % over all three winter range areas	>50% in MA 10 and 11	30%	28%	28%
Thermal cover % on Whitetail winter range	>50% in MA 10 and 11	24%	23%	23%
Thermal cover % on Burnt Creek winter range	>50% in MA 10 and 11	33%	29%	29%
Cover/forage ratio summer range	60/40 in non-winter range MAs	96/4	94/6	94/6

Opening Sizes: Both action alternatives would increase the numbers of openings larger than 20 acres. Alternative 2 would show the largest increase in the number of openings greater than 20 acres, both in individual unit sizes and by combining existing openings into larger patch sizes. Units 49 and 50 are adjacent units and are dominated by stands of lodgepole pine that are breaking up due to a mountain pine beetle infestation. These units include retention of some patches but overall it was designed to reduce the potential from increased blowdown and to increase economic viability. Over the short term, edge habitat favored by big game would be less available under this alternative than conditions where there were more numerous and smaller openings. Alternative 2 would result in some foraging habitat that is less available due to its distance to cover. Over the long term, stand structure in these two units would be improved and would provide hiding cover.

Alternative 3 would modify units 49 and 50 to create three 20-acre openings rather than two contiguous units that create a 126-acre opening. The other units (13, 13a and 18, also in Alternative 2) would result in 24 40-acre openings. Again, this would result in some foraging habitat that is less available due to its distance to cover. This loss in forage availability may be a short-term negative impact to individual animals.

Open Road Density: Morgan (1993) reported that roads in habitat used by white-tailed deer during summer to early autumn in northwest Montana did not negatively affect deer distribution

and use, except immediately adjacent to roads. In contrast to elk, effects of secondary roads on white-tailed deer are not well documented. Because of their secretive nature and smaller home ranges, white-tailed deer may be less subject to functional loss of habitat due to behavioral displacement than elk (Lyon 1979), especially where cover is dense. In contrast, road density likely increases white-tailed deer vulnerability to hunting season mortality by affecting hunter distribution and deer-hunter-encounter rates, and eliminating refugia (Idaho Department of Fish and Game 2004). Effects of open road densities on white-tailed deer would be the same as those discussed for the elk analysis.

Movement Areas: The overall ability of white-tailed deer to move through the landscape would not be affected by Alternatives 2 or 3. Individual animals may have to adjust their localized movement patterns, but no movement barriers would result. There are several proposed regeneration units larger than 20 acres and not all of the larger units may be effective for foraging due to distance to cover.

In summary, the effects of proposed activities on white-tailed deer habitat would result in improving cover/forage ratios. Open road densities would be maintained at current low levels. This would provide adequate cover and forage and secure habitat for maintaining current populations of vertebrate species requiring general forest habitat. Thermal cover would decrease over the summer range and the Burnt Creek and Whitetail winter ranges. Opening sizes would exceed desired sizes resulting in some forage being less available. The resulting available forage is adequately distributed across the project area. Movement corridors would be maintained in most areas resulting in localized changes in movement patterns of individual animals. Timing of activities would be designed to provide secure habitat during the winter use period (December 1 – April 30). Overall, no adverse effects to populations or habitat of white-tailed deer and the general forest species they represent are expected.

Cumulative Effects

The cumulative effects of past and present management activities as well as large-scale natural events have been incorporated into the description and analysis of existing conditions in the project area.

In most mountain ecosystems, deer persist under the potential influence of several effective deer predators. These commonly include coyotes, mountain lions, black bears and bobcats. In the project area, this also includes grizzly bears and wolves. The potential exists for predation to influence population trends in the mountains of northwest Montana (Mackie et al. 1998).

No action would maintain present populations of big game in the short term. In the long term (more than 25 years), this alternative has the potential to decrease numbers and distribution due to lack of a continued influx of high-quality forage assuming no natural recruitment of forage or management-created openings from other ongoing or foreseeable actions.

One source of mortality is the Yaak highway. Speed is the primary factor contributing to vehicle-wildlife collisions (Gunther et al. 1998). This project would result in an increase in traffic on the highway (daily traffic to worksite, and log hauling) and has the potential to result in an increase in road-killed wildlife.

There are no other reasonably foreseeable activities planned that would change the magnitude or scope of effects described in the white-tailed deer analysis (Obermayer Project is on Obermayer winter range, which is being managed for elk).

Regulatory Consistency

Forest Plan

Both action alternatives create forested openings larger than 20 acres, which exceed the 20-acre guideline in the Forest Plan. Both alternatives would increase ORDs above standards identified in the Forest Plan for MA 12 (less than 0.75 mi/mi^2) during project activities. Amendments would be needed for open road densities in MA 12. Forest direction would be followed to amend the Plan for these areas. New harvest openings would maintain alternative movement areas around previously harvested openings that have not recovered hiding cover status.

State Management

White-tailed deer and other ungulate populations are managed by Montana Fish, Wildlife, and Parks. Proposed actions would not prevent the State from continuing to manage these species as harvestable populations.

Statement of Findings

Based on the analysis for white-tailed deer and the other general forest habitat indicators, and the KNF Conservation Plan (KNF WFB Steering Group 2004), habitat for general forest species would provide sufficient quality and quantity of the diverse age classes of vegetation needed for viable populations. Since sufficient general forest habitat is available, the populations of species using that habitat would remain viable.

Pileated Woodpecker

Pileated woodpecker (PWP) population ecology, biology, habitat description, and relationships identified by research for the northern Rocky Mountains are described in McClelland & McClelland (1999), and Warren (1990). Research conducted in the Pacific and Inland Northwest is described by Bull (1987), Bull and Holthausen (1993), and Bull et al. (2005).

Kootenai Forest Plan direction for cavity habitat management is to maintain at least 40 percent of the potential population capacity of cavity-using species throughout National Forest lands, and at least 60 percent of the potential population capacity in riparian areas. A 100 percent potential population capacity level, which would equate to 225 snags per 100 acres, is considered the number needed to support full occupancy by cavity excavator species (Thomas 1979).

Pileated woodpecker occurrence data comes from recent District wildlife observation records, the Region One Landbird Monitoring Program (Avian Science Center, Univ. of Montana), and Forest historical data (NRIS FAUNA database). Habitat for this species was modeled using all designated and undesignated old-growth habitat and old-growth-replacement habitat, which has been mapped for the Kootenai National Forest.

Project impacts are evaluated based on impacts to important attributes of pileated woodpecker habitat, primarily impacts to designated and undesignated old-growth habitat. The overall assessment of habitat quality also accounts for potential negative factors discussed in the old-growth habitat analysis that relate to size and connectivity, and include fragmentation, edge effect, and lack of interior habitat. Risk to firewood cutting is also evaluated. Other stands (not designated as old growth) may have one or more important attributes of old-growth forests (snags and downed logs), or perhaps provide for connectivity and interior habitat. These stands were also reviewed as part of this analysis. The analysis boundary for direct, indirect, and cumulative effects is the project area. The boundary for determining trend or viability is the Kootenai National Forest.

Affected Environment

A detailed summary of old-growth habitat for the project area is displayed in the Old Growth section. Existing pileated woodpecker nesting territories would likely encompass a significant portion of this old-growth habitat.

Fire, insects, timber harvest, and firewood gathering have impacted snag densities. Wildfire and insect outbreaks have increased snag densities in some areas (see black-backed woodpecker section), while timber harvest and firewood gathering has reduced it in others. Regeneration harvest has had the most impact on snag densities; approximately 16 percent of the project area has been affected.

Pileated woodpeckers nest in large-diameter, dead trees, often found in mature forest with more than two canopy layers and large live trees to provide cover and replacement snags; and dead standing trees and downed logs for foraging on carpenter ants (Bull 1987).

No population data is available for pileated woodpeckers within the Kootenai National Forest. Breeding bird point count surveys have been conducted on the Kootenai Forest since 1994. In this program, transects consisting of multiple bird monitoring points are set up within a wide range of habitats distributed geographically across the Kootenai National Forest. This survey technique is not specifically designed to census woodpecker species, although all migratory and resident bird species detected by specialists trained in bird identification are recorded at each point on each transect. The rate of detection can vary greatly from year to year, especially for a wide-ranging species like the pileated woodpecker, that may or may not be anywhere near a given point on a given day. During the period 1994-2004, the pileated woodpecker was tallied 204 times at the 2,638 individual points surveyed. Observations by Forest biologists indicate that pileated woodpeckers are observed frequently on the Kootenai; this information suggests that pileated woodpeckers are widespread and relatively common there. In addition, monitoring - indicates that the Forest is meeting Forest Plan standards for old growth habitat (USDA Forest Service 2005).

Environmental Consequences

Alternative 1

Natural successional processes would continue to occur throughout existing old growth stands, and stands containing old growth attributes used by pileated woodpeckers. Habitat would be provided for pileated woodpecker nesting pairs that find suitable feeding and breeding conditions provided by the structural features and overall environment within these stands.

No potential pileated woodpecker nesting territories would be impacted by management activities. In relation to stand size and connectivity, conditions currently appear adequate to meet the behavioral and biological needs of the pileated woodpecker.

Replacement old-growth habitat currently provides less suitable stand conditions for territory occupation. Over the next several decades, in the absence of catastrophic fires or windstorms, these stands will develop better habitat features for pileated woodpeckers such as larger trees, larger snags, and more down logs. Also, higher levels of decadence will develop, producing better substrate for food resources such as carpenter ants and their larvae, one of the primary prey items for pileated woodpeckers in the Northern Rockies (McClelland & McClelland 1999, McClelland 1977) and in the Pacific and Inland Northwest (Bull et al. 1992a; Bull 1987, 1975; and Bull et al. 1980).

Continued disruption of the historic pattern of frequent fires in the drier ponderosa pine/Douglas-fir cover type will continue to result in ecological changes, such as the encroachment of Douglas-fir saplings in the understory. Eventually, these sites will develop a higher percentage of Douglas-fir trees, snags, and down logs more suitable as foraging habitat for pileated woodpeckers.

Over the next several decades, this successional trend may result in a reduction in quality pileated woodpecker nest trees (ponderosa pine), since Douglas-fir was not found to be important for pileated woodpecker nest cavity excavation in the northern Rocky Mountains (McClelland 1979, McClelland 1977; Weydemeyer & Weydemeyer 1928), in northeast Oregon (Bull 1987, 1975; Thomas 1979), or in British Columbia (Harestad & Keisker 1989).

Under this alternative, the impact of the existing road system on snags, an important attribute of the pileated woodpecker territory, will remain as described under the analysis for snags and old growth habitat. The effects of edge on pileated woodpecker habitat from adjacent regeneration units will also remain as described under the old growth analysis.

Alternatives 2 and 3

There would be no impacts to designated or undesignated old growth as disclosed in the old growth section. Timber harvest (units 20 and 60) and wildlife or ecosystem burn units (C and G) have incorporated a buffer where they are adjacent to old growth units, to reduce the potential for effects (edge effects, loss of trees to windthrow, loss of trees due to burning). Project activities (e.g. falling and yarding) may cause pileated woodpeckers to, at least temporarily, move away from the disturbed areas.

Temporary road construction would be used to access unit 60 in Alternative 2 but would not provide access into the nearby old growth stand. This activity is not expected to increase the risk of snag loss within old growth due to firewood cutting.

Both alternatives propose prescribed burning in 171 acres of ponderosa pine and Douglas fir stands. This is 15 percent of the most suitable existing habitat. The objective of these ecosystem burns is to reintroduce fire and reduce fuels. They are expected to retain the larger and older ponderosa pine and Douglas-fir trees in the overstory while exhibiting a more open understory with increased grasses and forbs.

Studies of thinning treatments have found foraging is highest in untreated stands, and lowest in stands that had been thinned and burned one to three years previously. The untreated stands and stands with mechanical removal provided significantly more foraging habitat due to more carpenter ants. The lower occurrence of carpenter ants in logs, snags and stumps in the prescribed burned stands suggests that either burning directly eliminated them, or made the habitat unsuitable (Bull et al. 2005). Alternative 3 proposes more underburning (269 acres) in treated stands than Alternative 2 (33 acres).

Both intermediate and regeneration harvests incorporate snag and downed log retention direction. Intermediate harvests would retain most live larger diameter trees in the units, as well as existing snags, which would provide foraging habitat after harvest. None of the harvested units would be expected to be suitable for nesting habitat in the next few decades due to decreased basal area and canopy closure.

Both action alternatives would harvest approximately 450 acres of mature-to-old forest through regeneration and intermediate harvest. Harvest on all of these acres would retain 20,875 acres of

mature and old forest, or 47 percent of the project area. This is a 1 percent decrease in suitable nesting habitat over the project area.

Cumulative Effects

None of the alternatives would affect designated or undesignated old growth habitats in the project area. Snag habitat would exceed Forest Plan direction. Approximately 48 percent of the project area currently provides potentially suitable nesting habitat (mature forest); implementation of the Obermayer Project would drop it to 47 percent. Implementation of either action alternative of this project would drop this to 46 percent.

There are no other reasonably foreseeable future actions proposed in the ponderosa pine and Douglas-fir forests in VRUs 2 and 3, which provide the most suitable habitat for pileated woodpeckers.

Regulatory Consistency

Forest Plan

- Both action alternatives would be consistent with Forest Plan direction for old growth (see old growth section in Silviculture Report)
- Both action alternatives would be consistent with Forest Plan direction for snags and down wood
- Both action alternatives would be consistent with Forest Plan direction to maintain diverse age classes of vegetation for viable populations (p. II-1 #7).
- The project-level habitat impacts would contribute to overall Forestwide trends in pileated woodpecker habitat and populations.

Statement of Findings

Based on the analysis for pileated woodpecker, old growth, and snags and down wood, and the KNF Conservation Plan (KNF WFB Steering Group 2004), habitat for old-growth forest species and cavity-habitat users would be provided in sufficient quality and quantity to meet the needs for viable populations. Since sufficient old growth forest, and snag and down wood habitat is available, the populations of species using that habitat would remain viable.

Neotropical Migratory Birds

Executive Order 13186 (January 10, 2001): “Responsibilities of Federal Agencies to Protect Migratory Birds” was issued by President Bill Clinton to perpetuate the purposes of the Migratory Bird Treaty Act, the Bald and Golden Eagle Protection Act, the Fish and Wildlife Coordination Act, the Endangered Species Act and the National Environmental Policy Act. This order requires including effects of federal actions on migratory birds as part of the environmental analysis process. On January 17, 2001, the USDA Forest Service and the USDI Fish and Wildlife Service signed a Memorandum of Understanding to complement the Executive Order.

The National Forest Management Act requires that Forest Plans “preserve and enhance the diversity of plant and animal communities…. So that it is at least as great as that which can be expected in the natural forest (36 CFR 219.27). Additional direction states that “management prescriptions, where appropriate and to the extent practical, shall preserve and enhance the diversity of animal communities, including endemic and desirable naturalized plant and animal species, so that it is at least as great as that which could be expected in a natural forest”. Furthermore, implementation regulations for the NFMA specify that “fish and wildlife habitat

shall be managed to maintain viable populations of existing native and desired non-native vertebrate species in the project area".

The boundary of analysis for neotropical migratory birds is the project area. This area is large enough to evaluate direct, indirect and cumulative effects on migratory birds and their habitat from proposed alternatives.

Affected Environment

Neotropical migratory birds are those bird species that migrate to more northerly latitudes to breed on the Forest each summer. In the fall, these species migrate south to spend the winter months. Of the approximately 205 bird species known to occur on the Forest as breeders, migrant, winter visitors, or transient, about 70 species could be classified as neotropical migratory land birds.

Environmental Consequences

Treatments, including no action, positively affect some species at the expense of others. It would be impractical to assess all the individual species. However, individual species' habitat needs are represented by other species discussed in the analysis (e.g., dry forest types are represented by flammulated owls; early seral species are represented by lynx; old growth associates by flammulated owl, pileated woodpecker, fisher, northern goshawk; and snag dependent species by black-backed woodpecker and pileated woodpeckers). Since habitat for those species is being maintained, it is assumed that sufficient habitat and populations of neotropical migratory land birds is also maintained.

Regulatory Consistency

There are no specific goals or standards for migratory land birds in the Forest Plan. It does include the goal to "Maintain diverse age classes of vegetation for viable populations of all existing native, vertebrate wildlife species" (Vol. 1, p. II-1, goal 7). All alternatives are consistent with the Forest Plan as a wide range of successional habitats would be available. The alternatives would comply with the Executive Order titled "Responsibilities of Federal Agencies to Protect Migratory Birds". In addition, as habitat for MIS is being maintained within the project area and across the Forest, their habitat contributes to the maintenance of habitat and populations of neotropical migratory bird species.

Proposed, Threatened, Endangered and Sensitive Plants

Introduction

Activities associated with timber harvesting, site preparation, fuels reduction, precommercial thinning, and road decommissioning have the potential to affect proposed, threatened, endangered and sensitive (PTES) plant populations (Arvidson 2006).

Analysis Area

The analysis area for direct impacts to PTES plant populations is the Grizzly Vegetation and Transportation Management Project (Grizzly Project) area, as this is the area where activities that have the potential to effect would occur. The analysis area for species viability is range-wide for each PTES plant species as directed in the regulatory framework.

Analysis Methodology

The following steps were taken to complete this analysis for PTES plants:

1) A map of areas with moderate to high potential for providing habitat for PTES plant species was completed for the Grizzly Subunit (for the PTES plant analysis, this area will be referred to as the analysis area). The map shows potential plant habitat at a large scale, and does not adequately map micro-sites that may also provide habitat (map available in the project record).

2) District records and Montana Natural Heritage Program data (MNHP 2006) were then reviewed and mapped to determine species already known to exist in the analysis area. Areas of proposed activity were overlaid on this map to determine actions with moderate to high potential to impact PTES plants.

3) Field surveys were completed for all proposed harvest units, burns, and temporary roads, with emphasis on areas with moderate to high potential to provide habitat for PTES plants (see project record). In general, these areas included streams, wetlands, and riparian zones, mesic coniferous forest with a component of mature western redcedar, moist cliffs, talus slopes, and dry meadows. Unique landscape features have more potential to provide habitat for rare plants than more common landscape features, so these are emphasized during surveys. Surveys have been completed in the proposed treatment units by qualified biological technicians during the field season of 2006 for the Grizzly project, as well as during past projects within this analysis area. When PTES plant species are discovered within any proposed activity areas, changes are made in the project design to protect the populations. Also, if any PTES populations are found during the layout phase of the project, additional mitigation will be applied to protect any new occurrences that may be found.

4) This analysis was completed using the maps, surveys completed to date, literature, experts, and personal knowledge about the requirements of each suspected plant species of concern.

Regulatory Framework

The Endangered Species Act (ESA) of 1973 declares that all Federal agencies "utilize their authorities in furtherance of the purposes of this Act by carrying out programs for the conservation of endangered species and threatened species listed pursuant to section 4 of this Act." The ESA requires Federal agencies to ensure that any agency action (any action authorized, funded, or carried out by the agency) is not likely to jeopardize the continued existence of any threatened, endangered, or proposed species. Agencies are further required to develop and carry out conservation programs for these species.

The National Forest Management Act (NFMA) directs the Forest Service to manage habitat to maintain viable populations of existing native and desired non-native vertebrate species. Forest Service Manual (FSM) 2670.22 requires the maintenance of viable populations of native and desired non-native species and to avoid actions that may cause a species to become threatened or endangered. A viable population is defined as one that has the estimated numbers and distribution of reproductive individuals to insure its continued existence is well distributed in the planning area, and the Kootenai National Forest.

Sensitive species are administratively designated by the Regional Forester (FSM 2670.5) and managed under the authority of the NFMA. FSM 2670.5 section 19 defines sensitive species as

"those plant and animal species identified by a Regional Forester for which population viability is a concern, as evidenced by a) significant current or predicted downward trends in population numbers or density, or b) significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.

The Forest Plan establishes forestwide goals, objectives, standards, guidelines, and monitoring requirements. Direction for sensitive species includes determining the status of sensitive species and providing for their environmental needs as necessary to prevent them from becoming endangered (Forest Plan, page II-1).

Affected Environment

No PTES plant species are known to occur in the Kootenai NF. *Silene spaldingii* (spalding's catchfly) is known to occur on private land in the Tobacco valley near National Forest lands. Two threatened plant species, *Howellia aquatilis* (water howellia), and *Silene spaldingii* (Spalding's catchfly), and one candidate species *Botrychium lineare* (slender moonwort) are suspected for the Kootenai NF. *Note:* "suspected" means that these species are believed to have potential to occur but, to date, have not been found in the Kootenai NF.

Of the 52 PTES plant species known or suspected for the Kootenai NF, 4 sensitive species are known to occur and 5 are believed to have potential to occur in the analysis area. These nine plant species plus *Howellia aquatilis*, *Silene spaldingii*, and *Botrychium lineare* are summarized in Table 47 and are addressed in this analysis. *H. aquatilis* and *S. spaldingii* are included because they are listed threatened species. *B. lineare* is included in this analysis because it is a candidate for listing under the ESA. As a candidate species *B. lineare* does not have any formal protection under the ESA, and it is not currently listed as a Forest Service sensitive species. However, because of this species' rarity and its potential to occur within the project area, it is included in the probability analysis, and will be searched for during the project surveys for rare plants. Mitigation measures will be applied to avoid impacts to *B. lineare* if it is located within any of the activity areas.

There are no known populations of sensitive plant species in any proposed treatment unit. Some USFS sensitive plant species were discovered adjacent to proposed units, and the units have been modified to avoid any direct or indirect impacts to population viability. This project will not impact any known PTES plant populations. There is one population of *Botrychium hesperium* (western moonwort), one population of *Heterocodon rariflorum* (western pearl-flower), one population of *Lomatium geyeri* (Geyer's biscuit-root) and one population of *Phegopteris connectilis* (northern beech-fern), within the analysis area.

Environmental Consequences

Alternative 1

Direct and Indirect Effects. This alternative proposes no ground-disturbing activity. The response of each of the PTES plant species to management activity varies by species, and in some cases, is not fully known. These rare plants and all the native vegetation of the Kootenai NF evolved with and are adapted to the climate, soils, and natural processes that took place prior to settlement of this area by Europeans. Any management (or lack thereof) that causes these natural processes to be altered may have a negative impact on native vegetation, including rare plants. An example of altered natural processes would be the removal of fire from the ecosystem. If the No Action Alternative is selected and fire is continuously excluded from the analysis area, there could be a negative impact on PTES plant species due to an unnatural build up of fuels, increased

canopy closure with a resulting decrease in light to the forest floor, and a decrease in naturally occurring open meadows. Increased fire intensity due to increased fuels is also likely to be detrimental to native and rare plant species.

Table 47. PTES plants with potential habitat within the project area

Species	Habitat	Conclusion	Justification
Proposed, Threatened, and Candidate Species			
Howellia aquatilis (water howellia)	Glacial ponds and river oxbows that dry in late summer	No effect	Habitat absent from activity areas; species not found on KNF
Silene spaldingii (Spalding's catchfly)	Palouse Prairie grassland	No effect	Habitat absent from activity areas
Botrychium lineare (slender moonwort)	Roadsides in early seral habitat	No impact	Surveys have been completed, and this species is not known to occur within the project area
Sensitive Species			
Botrychium ascendens (upward-lobed moonwort)	Roadsides	No impact	Surveys have been completed, and this species is not known to occur within the project area
Botrychium crenulatum (wavy moonwort)	Riparian forests, open wet meadows, and roadsides	No impact	Surveys have been completed, and this species is not known to occur within the project area
Botrychium hesperium (western moonwort)	Snow fields, moist road ditches, meadows and grasslands in the montane zone	No impact	Surveys have been completed, and the project design will protect the known population
Botrychium paradoxum (peculiar moonwort)	Mature western redcedar stands or grasslands and meadows	No impact	Surveys have been completed, and this species is not known to occur within the project area
Botrychium pedunculosum (stalked moonwort)	Old growth western redcedar in floodplains and meadows	No impact	Surveys have been completed, and this species is not known to occur within the project area
Corydalis sempervirens (pink corydalis)	Post fire plant communities and forest openings	No impact	Surveys have been completed, and this species is not known to occur within the project area
Heterocodon rariflorum (western pearl-flower)	Road shoulders, open soil areas near talus slopes, submaritime bedrock meadows	No impact	Surveys have been completed, and the project design will protect the known population
Lomatium geyeri (Geyer's biscuit-root)	Rock outcrops, submaritime bedrock meadows	No impact	Surveys have been completed, and the project design will protect the known population
Phegopteris connectilis (northern beech-fern)	Riparian forests, weeping walls	No impact	Surveys have been completed, and the project design will protect the known population

Alternative 2

Direct and Indirect Effects. There is one population each of *Botrychium hesperium*, *Heterocodon rariflorum*, *Lomatium geyeri*, and *Phegopteris connectilis* known to occur within the analysis area. There are no known populations of PTES plants within any treatment units, proposed burn units, or any other associated activity areas. Several treatment areas have potential to provide habitat for rare plants based on the probability mapping done for the analysis area. Many *Botrychium* species including *Botrychium ascendens*, *Botrychium paradoxum*, *Botrychium crenulatum*, and *Botrychium pedunculosum*, occur in bottomland habitats with a riparian influence, as well as moist/mesic habitats and micro-sites with a high component of western redcedar (MNHP rare plant guide). All riparian areas associated with streams and wetlands will be buffered, avoiding potential impacts to riparian habitats that have potential for the occurrence of sensitive plant species.

Treatment Units 4, 32, 33, 34, 36, 36a, 40, 42, 44, 43, 45a, 46, 47, 49, 55c, 55d, 55e, 55f, and 60 include a component of *Thuja plicata* (western redcedar) series habitat types. *Thuja* habitats have a moderate to high potential to provide habitat for sensitive *Botrychium* species. *Tsuga* series habitats with a high component of western redcedar can also provide low to moderate potential habitat for sensitive *Botrychium* species. It should be noted that many stands of western redcedar do not provide habitat for *Botrychium* species. These areas have the potential for the occurrence of *Botrychium ascendens*, *Botrychium paradoxum*, and *Botrychium pedunculosum*. These sites were surveyed in 2006 (see project record); where populations were identified, treatment units were modified to avoid sensitive species.

Precommercial thinning in old clearcut units will also occur. Fifty acres of precommercial thinning will occur in a portion of three of the old clearcuts that partially fall within the Otis Creek Special Interest Area (MA 21 SIA). The Otis Creek SIA was designated to protect populations and habitat for *Phegopteris connectilis* (northern beech-fern). The portion of the SIA proposed for thinning was included within the SIA boundary as a buffer for the populations and to protect the hydrologic processes adjacent to the *Phegopteris connectilis* populations. No *Phegopteris connectilis* plants occur within the activity areas, and hydrologic processes will be protected within this area.

Populations of *Borychium hesperium* and *Heterocodon rariflorum* are known to occur on a road shoulder along Road 472 that would be used as a haul route during this project. These populations would be flagged and direct impacts would be avoided when best management practices (BMPs) (i.e., road grading and other improvements) are implemented. Additional surveys would also be implemented in the summer of 2007 in potential roadside habitats within the project area, and design features included which will protect any populations found.

The action alternatives have the potential to spread noxious weeds by increasing disturbed areas that are vulnerable to weed infestation, and through increased vehicle traffic. Recreational and logging traffic, equipment, contaminated gravel, livestock, and wildlife can transport weed seeds into non-infested areas. Noxious weeds have a detrimental effect on PTES plant species and other native vegetation by more effectively competing for soil moisture, sunlight, and nutrients. Eliminating noxious weed seed transport mechanisms into populations of PTES plants can reduce these impacts. Design features to reduce the spread of noxious weed seeds are prescribed in Chapter 2.

Alternative 3

Direct and Indirect Effects. Alternative 3 proposes less direct impacts to potential habitat, and therefore would create less potential impacts to PTES species than Alternative 2 (if an undetected population occurs within a proposed treatment area).

Unit 40, 57, and 57a will be dropped because of the proximity to an inventoried roadless area, and unit 60 would be dropped to minimize fragmentation and the displacement of grizzly bears in the Burnt Creek drainage. This would also create less impact to potential *Botrychium habitat* (*Thuja* series habitat types). Fuels treatments in harvest units 20, 36, 37, 45, and the portion of unit 17, is proposed for under-burning, rather than excavator piling, to reduce impacts to the soil. This would more closely emulate the natural processes on these sites, and treatment with fire would benefit species that have developed with a historic association with wildfires (i.e., fire-dependent vascular plants such as *Corydalis sempervirens*, lichen species that require burned substrates, and mushrooms that require a burned environment). Units 49 and 50 have been reduced in acreage to meet MA 11 guidelines of 20-acre opening size. Fuels treatment in unit 61 has been added to implement defensible space along the Long Meadows Road. These units have habitat with low potential for PTES plant species.

Cumulative Effects for Alternatives 2 and 3

Past effects to sensitive plant species in the project area may have occurred due to soil disturbance, overstory removal, fire suppression, and the recent introduction of noxious weeds.

There are no records of extirpations of any PTES plant species within the analysis area. The first analysis that addressed PTES plant species that had potential occur within the analysis area was conducted for timber sales analyzed under the Upper Yaak EIS (USDA Forest Service 1990). Before this time no specific inventories were conducted for PTES plant species within the analysis area; any unique species would have been noted during other vegetation inventories. Whether any PTES species were impacted during these earlier projects is not known with certainty. The sensitive plant surveys conducted for the Yaak EIS found populations of *Botrychium minganense* (a sensitive species during that time) within the project area. The project was designed to avoid impacts to these *Botrychium* populations. Note that *Botrychium* species do not emerge every season, depending on seasonal weather variation; and populations of *Botrychium minganense* can indicate the presence of *Botrychium* genus communities that often include sensitive *Botrychium* species (Vanderhorst 1997). Therefore, the Grizzly Project activities are designed to avoid impacts to any known or newly discovered populations of *Botrychium minganense*, since these species may indicate the presence of undetected sensitive species.

Foreseeable activities include harvest activities that were analyzed for the Obermayer fuels reduction project in 1995. This project will not affect any known PTES populations. Other foreseeable activities include road maintenance, herbicide application, and fire suppression. These activities may impact rare plants through ground disturbance, toxicity, or removal of overstory canopy. Potential future impacts to PTES species include noxious weed invasion. Weed treatments have occurred within the project area, and additional mitigation to prevent noxious weed invasion is included in the project design. Therefore, this project will not contribute to cumulative effects from noxious weed encroachment. All proposed future ground-disturbing activities will be evaluated through surveys and biological assessments/evaluations as to their impact on PTES plant species. Based on the above information it is believed that this project will not contribute to any cumulative effects to any PTES plant species.

Regulatory Consistency

All alternatives comply with Forest Service policy on sensitive species (FSM 2670.32) and the ESA. The Forest Service is mandated to maintain viable populations of all native and desirable non-native species under the NFMA. Clause B(T) 6.25 - "Protection of Threatened, Endangered, and Sensitive Species", will be used in the timber sale contract to modify the action as necessary to protect PTES plant populations if missed by field surveys and found after the timber sale contract is awarded.

Precommercial thinning within MA 21, Otis Creek SIA is consistent with the designation of this area as a buffer to ensure hydrologic functions are not affected.

Statement of Findings

Based upon the evaluation conducted in the biological assessment and biological evaluation (available in the project record), and the available information on these species needs, the proposed project and associated activities will have **no effect** on *Howellia aquatilis*, and *Silene spaldingii*, and **no impact** on the viability of any known and suspected sensitive plant species of the Kootenai NF.

Noxious Weeds

Introduction

The spread of noxious weed species has been identified as a concern for the Grizzly Vegetation and Transportation Management Project. Forest Service Manual (FSM) 2080.5 defines noxious weeds as "those plant species designated as noxious weeds by Federal or state law. Noxious weeds generally possess one or more of the following characteristics: aggressive and difficult to manage, poisonous, toxic, parasitic, a carrier host of serious insects or disease, and generally non-native." The Lincoln County Weed Control Act (MCA 7-22-2101) defines a noxious weed as "any exotic plant species established or that may be introduced in the state which may render land unfit for agriculture, forestry, livestock, wildlife, or other beneficial uses or that may harm native plant communities and that is designated:

(i) As a statewide noxious weed by rule of the department; or

(ii) As a district noxious weed by a board, following public notice of intent and a public hearing."

Noxious weeds are often spread by human activities associated with vehicles and roads (Roche and Roche 1991), contaminated livestock feed, contaminated seed, and poor range management practices (Lacey et al. 1995). Noxious weeds can become established on unmanaged lands and spread to adjacent rangeland, forests, and farmlands, causing great environmental and economic impacts (Nelson 2007).

Analysis Area

The cumulative effects analysis area is the project area. The project area is a reasonably sized area to determine the effects of activities on the spread of noxious weeds, as all activities would occur in this area.

Analysis Methods

Noxious weed surveys and herbicide application records were used to identify weed species within the project area.

Regulatory Framework

FSM 2080.1 directs the national forests to conform to the Federal Noxious Weed Act of 1974, as amended. In addition, the Montana County Weed Control Act (MCA 7-22-2116) states that "it is unlawful for any person to permit any noxious weed to propagate or go to seed on his land" unless entered into an agreement with the county for management of those weeds. The goal of noxious weed management on the Kootenai NF is to comply with this law, and manage weeds in order to protect forests, rangelands, wildlands, and adjacent farmlands, and to cooperate with private individuals and county and state agencies concerned with managing noxious weeds (USDA Forest Service 1997). The Kootenai NF has entered into a participating agreement for weed management with the Lincoln County Weed District.

Affected Environment

Noxious weed surveys in the project area have located infestations of spotted knapweed (*Centaurea maculosa*), oxeye daisy (*Chrysanthemum leucanthemum*), Canada thistle (*Cirsium arvense*), orange hawkweed (*Hieracium aurantiacum*), meadow hawkweed (*Hieracium pratense*), common St. John's-wort (*Hypericum perforatum*), common tansy (*Tanacetum vulgare*), tall buttercup (*Ranunculus acris*), and sulfur cinquefoil (*Potentilla recta*) (see project record).

Spotted knapweed, one of the predominant noxious weeds in the project area, is a biennial or perennial forbs that can produce up to 18,000 seeds per plant per year under favorable conditions (Lacey et al. 1995). Spotted knapweed is adapted to a wide range of environmental conditions and is ranked the number one weed problem on rangeland in western Montana. On the Kootenai NF invasions of knapweed mostly occur on and along roads; however, infestations also occur on skid trails and other disturbed areas, and have spread into native plant communities, particularly big game winter range and other dry habitats.

Orange and meadow hawkweed are also prevalent in the area. These species threaten native plant and wildlife habitats due to their highly competitive nature. The spread of hawkweeds has increased substantially in the past decade throughout the District and northwest Montana. Orange and meadow hawkweeds reproduce through stolons and, once established, form dense mats that exclude most other forms of vegetation. These hawkweeds have been known to colonize and dominate understory vegetation in regeneration harvest units on the District.

Native vegetation provides forage; cover; and denning or nesting habitat for wildlife, including birds, and insects. Noxious weed species do not provide valuable forage or habitat for native animals (Trammell and Butler 1995) and insects, although some incidental use does occur. Noxious weeds are able to out-compete native vegetation, and can therefore reduce the ability of land to provide suitable habitat for animals, birds, and insects native to that ecosystem. Forty-two percent of the plant and animals listed on the endangered species list have been negatively impacted by invasive species (Wilcove et al. 1998). In studies that compared elk use of weed infested areas with non-infested areas, pellet group densities averaged between 98 and 81 percent lower in weed infested sites than in the non-infested sites (Trammell and Butler 1995).

Differences in rooting structure (fibrous root structure of many native plants compared to the tap root structure of many weed species) and the presence of allopathic chemicals in some noxious

weed species, which reduce plant diversity and increase the amount of exposed soil, are thought to be responsible for increased surface runoff and sediment yield on weed infested plots (Lacey et al. 1989). One study of road decommissioning found that a knapweed infested control plot contributed more surface runoff and sediment yield than other control plots. Infiltration on the knapweed-infested site was reduced about 20 percent when compared with the other two control plots (Hickenbottom 1997). Early surface runoff can result in lower summer flows and increase stream temperatures, affecting fish habitat and water quality (Asher 1998).

Noxious weeds may be spread via seeds that arrive at new sites on vehicles, humans, animals, road maintenance equipment, and contaminated road gravel. A study by Montana State University found that a vehicle driven several feet through a spotted knapweed infestation picks up about 2,000 seeds, which are then dispersed along the route driven (Trunkle and Fay 1991).

Noxious weeds are very effective competitors; hence, preventing invasions is the cheapest and best way to control them. Herbicide use is currently the most effective method of control for new or smaller populations of noxious weeds. Roads, railways, and waterways are common dispersal corridors for weeds, and spraying of these corridors can be effective in reducing the spread of weeds (Sheley and Petroff 1999).

In the past 10 years biological control agents, or biocontrols, have been released on the District to help control spotted knapweed, Canada thistle, St. John's-wort, and Dalmatian toadflax. Eleven different insect species have been released, although no releases have been made within the project area. Biocontrol agents require a number of years to increase their populations to a level that will noticeably impact their weed hosts, if they become established at all. One biocontrol insect, *Urophora affinis*, a seed head fly, is well established on the Forest and in Montana, and is currently decreasing seed production of spotted knapweed. Releases of *Cyphocleonus achates*, a root weevil that attacks spotted knapweed, appear to be reducing the number of plants along the Hensley Hill Road (Nelson 2004, personal observation). No biocontrol methods are currently available for invasive hawkweeds.

Environmental Consequences

Alternative 1

Direct and Indirect Effects. The management actions described in Chapter 2 would not be implemented. Soil disturbance as a result of management activities would not occur; therefore fewer sites would be available for weed infestation. However, long-term effects of no action are not obvious. Lack of management of fuel accumulations and ladder fuels may ultimately result in more intense wildfires, which could result in greater soil exposure and greater loss of native vegetation. These conditions could lead to widespread and severe establishment of invasive plants.

Where noxious weeds occur in the project area, particularly along roadways and streams, weeds would continue to spread. Seeds and plant parts would be vectored by vehicles, animals, and water to new areas, reducing native plant coverage and wildlife habitat.

Alternatives 2 and 3

Direct and Indirect Effects. All action alternatives would involve activities that have the potential to increase the spread of noxious weed species as a result of soil disturbance and lack of access for treatment, and may cause impacts to native vegetation and wildlife.

Logging and mechanical fuel treatments can increase the risk of spreading noxious weeds by driving equipment through infested areas while skidding, decking, and piling, or by transporting weed seed or parts into the harvest area on personal vehicles or equipment. Helicopter logging is generally less likely to spread weeds than ground-based systems due to reduced soil disturbance and reduced road construction and/or reconstruction needs as compared to conventional logging. The risk of weed spread due to equipment access for cable or skyline logging is the same as ground-based work, but cable logging has a reduced risk of weed spread within logging units, as a result of lower levels of soil disturbance and vectoring of weed seed.

The differences between the action alternatives in relation to potential effects for noxious weeds are the total number of acres harvested: 1,306 acres in Alternative 2 and 1,124 acres in Alternative 3. The reduced number of harvested acres in Alternative 3 is reflected in all harvest methods and treatment types compared with Alternative 2, with the exception of winter tractor logging, which is the same for both alternatives (158 acres).

Season of logging can also affect the spread of weeds. When tractor logging is used, winter logging generally protects understory vegetation and the soil surface better than summer logging. Thus harvesting during the winter would help reduce the impacts of logging on the spread of weeds. In both Alternatives 2 and 3, units 13, 13A, 15, 18 and 20 (a total of 158 acres) are scheduled to be winter logged to reduce impacts to the soil, and will therefore reduce the risk of weed infestation.

Post-harvest mechanical fuel treatment acres differ substantially between the two action alternatives. Alternative 2 proposes treatment of 67 percent of the post-harvest acres by grapple piling and burning piles. Alternative 3 proposes treatment of 30 percent of the post-harvest fuels in this manner, while another 30 percent will be treated by underburning. Only 3 percent of the harvested acres would be treated by underburning in Alternative 2.

In general, the risk of weed infestation and spread is greater with grapple piling than with underburning, although both can contribute to weed spread. Grapple piling can result in soil disturbance, compaction, and removal or damage of native vegetation, reducing competition and creating conditions conducive to weed infestation. Weed plant parts or seeds can also be carried in on piling equipment. Unlike tractor logging, it is not feasible to conduct fuel treatments in the winter, and often fuel treatments are accomplished a year or more after the harvest is finished and weeds may have already established in the unit, providing a seed source for further infestation. Underburning can result in removal or damage of native vegetation, and exposed soil, but does not compact or displace soil directly, and does not require the use of equipment that might introduce weeds seeds. The effects of fire on noxious weed spread vary with burn intensity, composition of understory vegetation, and presence or absence of weeds in the pre-fire stand. Burning within the burn prescription can reduce the risk of an underburn becoming too hot or consuming too much of the material on the forest floor, and therefore decrease long-term impacts to vegetation. Likewise, piling when soil conditions are least likely to result in damage can reduce compaction and soil disturbance. The equipment operator can also operate the machinery in ways to reduce soil and vegetation disturbance, particularly so on flatter terrain.

The road construction and reconstruction needed to provide access to units and haul routes would also create soil disturbance and a risk of weed spread. The level of reconstruction influences risk, with more reconstruction resulting in greater soil disturbance and greater risk of weed spread. Six acres would be disturbed due to temporary road construction for both action alternatives. Road reconstruction would occur on 162 and 138 acres in Alternative 2 and 3, respectively. Impacts from road construction on weed spread vary with the weeds present, the level of construction, and

ability to treat the weeds. Treating existing weed populations prior to reconstruction can minimize the risk of weed spread related to road work, as can equipment washing and using road materials from sources that are relatively weed free.

Proposed road decommissioning work is the same between the action alternatives. Decommissioning and intermittent stored service proposals in the action alternatives would result in soil disturbance to varying degrees and reduces access for weed treatments in the future, which may have a negative effect on the spread of weeds. Isolation of weed populations on decommissioned roads can result in populations expanding unchecked. Regardless of the alternative selected, any road decommissioning work needs to meet best management practices (BMPs) similar to those of road construction, including the treatment of existing weed populations along the roads scheduled for decommissioning. However, BMPs for decommissioning do not address weed populations that exist in off-road areas accessed by the road to be decommissioned.

Decommissioning parts of the of Roderick Mountain Road systems 6131, 6136, 6126, 6139, 6132, 6101, 6102, 6100, 6137, and parts of the Clark Mountain Road systems 902, and 904, both of which access inventoried roadless areas, would help reduce the risk of weed spread into the roadless areas by creating buffers from vehicular traffic, although currently many of those roads are inaccessible. Both areas are a high priority to preserve the integrity of alpine habitats, and currently have low populations of weeds; therefore, they could benefit by road decommissioning providing soil disturbance is minimal.

Roads scheduled to be converted to trails provide a limited amount of access for weed control work, but also need to have any existing weed populations treated prior to conversions, to prevent the transport of weeds along the trail into weed-free areas.

In the short term, precommercial thinning would reduce canopy cover in regenerating timber stands. Reduced canopy cover results in less competition to weeds from the overstory trees for light, moisture, and nutrients, and weeds may increase after thinning. However, the objective of precommercial thinning is to reduce stocking levels in young plantations thereby reducing competition between trees resulting in greater health, growth, and yield in the remaining trees. So in the long term, precommercial thinning allows the remaining stand to mature faster resulting in earlier, deep, mature canopy closure than in unthinned stands. By increasing the health and vigor of overstory trees, and reducing mortality, the future stands produced would persist and be more resistant to disturbance.

Creation of additional grizzly bear core habitat eliminates vehicle traffic. Since vehicles are efficient weed spreaders, closing roads would eliminate a major source of weed spread. But creation of core habitat also eliminates access to the road for weed management activities. Existing weed populations in core habitat may spread unchecked due to the inability to access the area for management actions such as spraying. Treatment of weeds on these roads prior to closure would help control weed spread.

In general, reducing disturbance levels in areas infested with noxious weeds would slow the rate of spread of weeds. However, without using integrated weed management controls, including herbicides, hand pulling, and biological control agents, noxious weeds would continue to spread and degrade habitat and watershed conditions even in areas without disturbance. Measures will be taken to reduce the risk of noxious weed introduction and spread in accordance with the Herbicide Weed Control EA and Decision Notice (USDA Forest Service 1997); these include:

1) Prior to activities including road and BMP work, accessible haul roads will be sprayed by the timber sale purchaser under special contract provision C(T)6.27 or by the District weed crew.

2) Timber sale contracts will contain Special Provision C6.351, which requires all off-road vehicles associated with harvest operations to be cleaned of all dirt and plant parts prior to entering the sale area; all equipment used in fuels reduction activities must also be clean prior to entering National Forest lands.

3) Treatment units 13, 13a, 15, 18, and 20 are proposed for winter harvest to protect soil and native vegetation.

4) Burning prescriptions will be prepared for fuel reduction activities; these prescriptions will determine the limits of weather conditions and fuel moistures to control fire intensity for protection of soil and native plants.

5) Reconditioning of existing roads needed for hauling will be held to the minimum necessary to protect and maintain the road surface and drainage structures, and provide for public safety; scarification of ditches and catch basins will be done only where necessary to provide for adequate function; blading of native road surfaces will only be done where necessary for haul or adequate drainage.

Cumulative Effects

Past Actions and Effects on Current Conditions*:* Past activities throughout the Yaak Valley have affected the spread of weeds, including building roads and subsequent paving of the Yaak Highway in the late 1970s and early 1980s. This has resulted in a substantial increase in vehicle travel into and through the valley. Paved access to the Yaak Valley increased land development as people built cabins and homes in the now accessible area. Changes in land use patterns from large holdings by few people to smaller holdings by many people, and easier vehicle access, have increased the potential for noxious weed infestations from vehicles, equipment, livestock, livestock feed, and planting of non-native plants. Paved roads also provide better and therefore more frequent, access for recreational use. These activities have contributed to weed spread, either directly by providing a source of weed seeds and other weed parts to the area, or indirectly by creating conditions conducive to weed infestation (i.e., soil disturbance, or by increasing the number of vectoring agents such as vehicles, people, and animals into the Yaak Valley).

Commercial timber harvesting on a large scale and the subsequent logging road building in the Yaak Valley started in the 1950s, peaked in the 1980s, and continues at a smaller scale today. Prior to the 1980s timber harvest methods were ground-based systems which often resulted in large amounts of soil disturbance. At that time, few invasive species were found in the Yaak Valley, so the risk of infestation was small. The biggest influence on noxious weed spread from timber harvest probably occurred in the 1970s with spotted knapweed. The seed source for knapweed was present, but the potential for spread was relatively unknown, as was the effects of soil disturbance on weed spread.

Other past activities that have negatively influenced weeds spread are wildfire and firefighting efforts, use of pack animals, wood gathering, and fuel reduction burning.

Contrasting Effects of Proposed Action with Past Actions: Prior to the mid-1990s there were few noxious weed prevention mitigations in place. Preventative measures to avoid weed spread have been adopted and implemented on the Forest, including integrated pest management

strategies authorized in the 1997 Kootenai NF Herbicide Weed Control Plan, and contractual provisions requiring washing of equipment to remove weed seeds and plant parts prior to entry onto NF land, contractor herbicide spraying of haul routes, and use of weed-free seed grass seed to re-vegetate disturbed ground. These weed control measures have been included with timber harvest, road building, and fire suppression activities to reduce the risk of weed spread. Equipment washing prior to entry onto NF lands was first required as mitigation for weed spread on the District in the Wood Rat EA (USDA Forest Service 1998b), as was seeding with weed-seed-free grass seed. The Spar Copter Timber Sale in 2001 was the first timber sale on the District to require contractor herbicide spraying of haul routes. Since then, treatment of haul routes infested with weeds has been a contract requirement on all major timber sales on the District. The FY 2004 Kootenai NF Monitoring and Evaluation Report states "The KNF has used herbicides to control noxious weeds with success. Spraying of roadsides, administrative sites, and gravel pits has visibly reduced weed populations in many areas and prevented weeds from spreading to un-infested areas." Washing of equipment, use of weed-free grass seed, and contractor herbicide spraying of haul routes would be required in the proposed Grizzly Project timber sales.

Effects of Ongoing and Reasonably Foreseeable Actions: Some future activities that have the potential to contribute to the spread of weeds are routine road maintenance, the Obermayer fuel reduction, along with the continued recreational activities by forest visitors, and private land development.

Combined Effects from Past, Proposed, Ongoing and Foreseeable Actions: The project activities, when considered with these past, foreseeable, and ongoing activities would increase the risk of weed spread due to associated soil disturbance; however, design features are included to minimize this risk.

Regulatory Consistency

The design features described in Chapter 2 would be applied to this project to help meet the goal for noxious weed management as stated in the Forest Plan, and in compliance with the Participating Agreement with the Lincoln County Weed District and the Federal Noxious Weed Act. Forest Service regional Supplement 2000-2001-1 requires that BMPs be used for many aspects of the operations required to accomplish the activities discussed above. Those practices would also help reduce the potential negative effects on the spread of noxious weeds from the activities. Herbicide application is authorized under the Kootenai NF Herbicide Weed Control Plan decision (USDA Forest Service 1997).

Recreation

Introduction

The Forest Plan goals include providing developed recreation facilities to meet demands; providing roadless areas for semi-primitive and primitive recreation opportunities; providing access for recreationists using transportation facilities including roads, bridges, and trails; and working with various groups and clubs to help maintain and construct recreation facilities and trails (Mason 2006).

Analysis Area

The area of analysis is the Grizzly project area. The recreational setting of the Grizzly project area is dominated by two inventoried roadless areas, Grizzly 667 and Roderick 684. The IRA

acreage in the project area totals 10,159 acres or approximately 23 percent of the project area. These settings provide a high probability of experiencing solitude, tranquility, challenge, and risk (refer to following section for analysis of IRAs).

The project area is a popular area for a variety of recreational activities including; hunting, hiking, firewood cutting, exploring, and other pursuits. The area provides a feeling of remoteness and includes hiking trails and one developed recreational facility, Whitetail Campground. Interpretation of the area is primarily self-discovery; however, there are several documents, guidebooks, and books available on the history of the area.

Regulatory Framework

Forest Plan goals include providing developed recreation facilities to meet demands, providing roadless areas for semi-primitive and primitive recreation opportunities, providing access for recreationists using transportation facilities including roads, bridges and trails, and working with various groups and clubs to help maintain and construct recreation facilities and trails.

Affected Environment

Historically, trails were used by trappers, miners, and Forest Service crews, mainly for fire detection and protection. The trails in this area were designed for foot and stock travel. Trails today are used by recreationists, hunters, horseback riders, outfitters, and by the Forest Service for fire protection and access. This area would continue into the foreseeable future to meet the needs of these users. Recreational use has increased in this area and is expected to continue to increase.

The area is popular during all seasons for recreational activities including hunting, fishing, huckleberry picking, firewood gathering, and other dispersed activities. The area is also used by snowmobilers and cross-country skiers; however, the majority of use is in summer and fall. The Yaak Highway is a popular drive from the Yaak Valley to Lake Koocanusa.

There are 38.8 miles of trails on the district trail inventory and maintenance schedule in the Grizzly project area (listed in Appendix B, Access Management). Other trails show on the historic trails map, but are not currently maintained. Most of the trailheads are marked with a sign and have parking for one to three vehicles. Some of the trailheads have a dispersed campsite. Typical trail use is hiking and foot travel, but there is some horse use and occasionally llama use. Many of the trails and closed roads provide opportunities for huckleberry picking in August and September.

Environmental Consequences

Alternative 1

Direct and Indirect Effects. Recreational use of the area would continue and is expected to slightly increase over the foreseeable future. Trails would be signed and maintained as budgets allow. Other recreation across the area would continue to be dispersed and occur in a variety of settings.

Alternatives 2 and 3

Direct and Indirect Effects. Impacts to recreational users would be minimal. There would be increased traffic on those roads where timber harvest would occur and in the areas where prescribed burns are conducted. Roads 902Y and 902Z (approximately 3.5 miles) would remain

open to the end of the proposed units after harvest activities are complete, providing access for firewood gathering, berry picking and other recreational activities. Decommissioning Road 6132, which is used as the trail in some sections, and spur roads would affect the Roderick Mountain Trail 189. Decommission work would include leaving a usable trail tread for foot and stock use along this section of roadway. The effects to recreational users would be short term and indirect. A variety of dispersed recreational settings and opportunities would continue to be available in the area. Designating these roads as open to motorized use would provide consistent information to the public related to opportunities for driving experiences on the District.

The trails described in this analysis predominantly lie within Grizzly Bear core habitat, which precludes motorized travel. These trails were designed for foot and stock travel and have not been used by motorized travel to any measurable degree. To remain consistent with Grizzly Bear standards and guidelines and to protect the trail resources from activities they were not designed for, legal restrictions for motorized use (with the exception of snowmobiles) would be implemented on the trails in this area. These restrictions would occur on Grizzly Peak Trail 182, Roderick Mountain Trail 189, Baldy Spring Trail 180, Sheepherder Trail 19, Independence Creek Trail 547, Baldy Mountain Trail 160, Buckhorn Ridge Trail 179 and Pleasant View/Independence Trail 193 (Appendix B). Motorized use has not been encouraged and has not occurred to any extent on any of these trails. These restrictions would dovetail with existing Grizzly Bear core standards for this area.

Harvest and burn units would create openings and provide forage for big game animals, which would benefit hunters and persons viewing wildlife. There may also be improvement to huckleberries in burned areas, which provide opportunity for berry pickers. Road restrictions to motorized use may impact some users, but these roads would still be open to foot, stock, and mountain bike users.

Cumulative Effects

Past Actions and their Effects on Current Conditions: Many of the past activities listed in Table 6 have had an effect on recreation. The roads built for timber sales have provided access to National Forest lands for recreationists. Many of the roads are now closed to motorized travel to meet grizzly bear standards, but may still allow access for foot, horse, mountain bike, and snowmobiles in the winter if not overgrown. Other roads have been decommissioned and may remain available for nonmotorized recreation, or may have revegetated and are impassable.

Timber harvest units have historically provided opportunities for hunting, wildlife viewing, firewood gathering, and other activities. Many of the harvest units in this area, from the 1970s and 1980s, are growing in and no longer provide the openings they once did. These areas still provide for recreational activities but in a different setting over time.

Contrasting Effects of Proposed Actions with Past Actions: No new roads would be constructed in any of the action alternatives, except for temporary roads. These roads would not be available to the public after harvest activities are completed, as they would be obliterated. Past actions typically constructed new roads that, even if closed, were available to the public for foot traffic. Past activities did not include decommissioning, therefore were available for use until vegetation grew in to a point that restricted access. Proposed decommissioning would retain a useable travel path, but over time, this path would become impassable due to vegetation growth.

Effects of Ongoing and Reasonably Foreseeable Actions: Maintenance of open roads and trails would continue to facilitate recreation access to National Forest lands. Recreational use is

expected to continue to increase over the next decade in the area. Development of private lands will contribute to increases in recreation activities in the area. Other effects that can be expected are the advances in technology in the recreation arena. Better equipment for camping, hiking, clothing, hunting, fishing, ATVs, and snowmobiles have resulted in changes in how people recreate.

Combined Effects from Past, Proposed, Ongoing and Foreseeable Actions: Overall, road management and associated actions are not anticipated to result in any major changes in the level of motorized access vs. non-motorized access available to recreation users. The opening of roads 902Y and 902Z would provide additional opportunities for access for firewood gathering, berry picking and driving for pleasure. Trails would continue to be maintained as time and funding allow. Recreational opportunities and settings would be similar after the activities. The project area and Forest have an abundance of recreation opportunities in a wide variety of settings available to meet the demands of recreationists for the foreseeable future.

Regulatory Consistency

The actions proposed are consistent with the Forest Plan goals, objectives, and standards for recreation resources in this area.

Inventoried Roadless Areas

Introduction

The Grizzly Vegetation and Transportation Management Project area has portions of two inventoried roadless areas (IRAs), the 29,659-acre Roderick Mountain IRA 684 and the 7,316-acre Grizzly Peak IRA 667 (Mason 2006a). The area between these two IRAs is considered by interested local groups as an important addition to the wilderness system, and advocates managing this area to minimize activities that would affect future consideration of this area as wilderness.

Analysis Area

The area of analysis includes IRAs within the Grizzly Project analysis area and surrounding IRAs that are partially within the project area (see Map M-7).

Analysis Methodology

The analysis will be conducted using the six criteria of the Roadless Area Inventory Protocol outlined in Forest Service Handbook (FSH) 1909.12: *natural integrity, apparent naturalness, remoteness, solitude, special features* and *manageability*.

- *Natural integrity* is defined as the extent to which long-term ecological processes are intact and operating. Impacts to natural integrity are measured by the presence and magnitude of human-induced change.
- *Apparent naturalness* is how the area looks to people using it. Naturalness is usually reduced by human activity such as burning, timber harvest, grazing, mining, and trail construction.
- The concept of *remoteness* is the sense of being secluded, inaccessible, or out of the way. This can be as result of topography, vegetative screening, distance from human impacts, difficulty of travel to reach the area, and the presence of roads.

- *Solitude* is a measure of the evidence or presence of other people, or their actions, during a person's use or stay in the roadless area. The lack of remoteness ties directly to a lack of solitude.
- *Special features* are those unique topographic, geologic, biological, ecological, cultural or scenic features of the area.
- The *manageability/boundaries characteristic* relates to the shape of the roadless area and whether manageable (easy to recognize) boundaries such as a forest boundary, roads, power lines, or a topographic feature such as a ridgetop or creek are available. This characteristic also deals with whether an area is large enough (greater than 5,000 acres) to be considered for wilderness.

Regulatory Framework

Forest Plan direction is to meet the laws and rules established for roadless areas and providing for semi-primitive and primitive recreation opportunities and wildlife values. Roadless area reviews have been ongoing. Roadless areas on the Kootenai National Forest (NF) have been defined using the Roadless Area Inventory Protocol outlined in Forest Service Handbook (FSH) 1909.12. Validation of all roadless areas has been completed on the Three Rivers Ranger District.

Current direction for roadless areas is provided in the Roadless Rule of January 12, 2001. No management activities prohibited under the 2001 Roadless Rule are being proposed in this project. Neither area has been recommended for wilderness designation in any previous wilderness bills or legislation.

Affected Environment

Roderick Mountain IRA

The Roderick Mountain IRA was validated on December 1, 1999, using the Roadless Area Inventory Protocol outlined in FSH 1909.12.

The natural integrity of the Roderick Mountain IRA is intact. Limited activities have occurred in the area (trail work, fire suppression, prescribed fire). Ecological processes have not been significantly manipulated by man except for the suppression of fires and the introduction of fires in the brush fields located in the winter range areas on south facing aspects (Forest Plan MAs 10 and 11).

The Roderick Mountain IRA has had several stand conversion burns completed inside the boundary using a helicopter-mounted torch, and several hand burns to maintain brush field components for big game winter range, grizzly bear habitat, and other plant and animal species. Several trails have also modified the apparent naturalness of the Roderick IRA. Remnants of the Roderick Mountain Lookout are still visible.

The Roderick Mountain IRA provides a good sense of remoteness even with the hiking trails. On Flatiron Mountain there is influence from the Southfork/Pipe Creek Road 68 due to noise and visibility of the road that takes away from the sense of remoteness when in this portion of the IRA.

The Roderick Mountain IRA has several other roadless areas (Grizzly, Zulu, Saddle) in proximity that add to the feeling of remoteness and solitude. From the top of Roderick Mountain, one can view the Cabinet Mountain Wilderness and the Canadian Rockies. The existing trails offer access

to recreationists; however, recreational use is low except during hunting season. This area also is in grizzly habitat, which can add to one's feeling of remoteness and solitude.

Special features of the Roderick IRA include the biological diversity—large brush fields and openings provide winter range for elk, moose, white-tailed and mule deer. Flattail Creek offers riparian areas with beavers, meadows, and ponds. This area is also occupied grizzly bear habitat and has all components necessary for grizzly bears. The Roderick Mountain IRA has views of the Yaak Valley to the north, including the Canadian Rockies. Views to the east include the Zulu IRA and Glacier National Park. Views to the south include Cabinet Mountain Wilderness and the Saddle Mountain IRA. There are many viewing points in the Roderick Mountain IRA including Roderick Mountain, Pleasant View, Sheepherder Mountain, and Flatiron Mountain.

The Roderick Mountain IRA is well proportioned with good definable boundaries. (The term *well proportioned* refers to the areas shape and size; blocky areas being better proportioned than long fingers or spokes of roadless areas.) The manageability/boundaries characteristic is very good.

Grizzly Peak Inventoried Roadless Area 667.

The Grizzly Peak IRA was validated on November 30, 1999, using the Roadless Area Inventory Protocol outlined in FSH 1909.12.

The natural integrity of the Grizzly Peak IRA is intact. Limited activities have occurred in the area (trail work, fire suppression, prescribed fire). Ecological processes have not been significantly manipulated by man except for the suppression of wildfires and the introduction of prescribed fires.

The apparent naturalness is very good in the Grizzly IRA. Human activities have included trail maintenance and suppression of wildfires; neither of these activities has reduced the apparent naturalness significantly.

The Grizzly IRA provides a good sense of remoteness; while not large in acreage, the shape and location to other IRAs help to provide a distance from human influences. The IRA is predominantly timbered with the exception of Grizzly Peak.

The Grizzly IRA has several other roadless areas (Roderick and Zulu) in proximity that add to the feeling of remoteness and solitude. From the top of Grizzly Peak, one can view the Cabinet Mountain Wilderness, Roderick Mountain IRA, and the Canadian Rockies. The existing trail offers access to recreationists; however, recreational use is low. This area also is in grizzly habitat, which can add to one's feeling of remoteness and solitude.

The Grizzly IRA special features include grizzly bear habitat and its scenic quality both from looking into the IRA as well as from the top of Grizzly Peak.

The Grizzly IRA is well proportioned with good definable boundaries. The IRA is small compared to other IRAs, but the manageability/boundaries characteristic is very good.

Environmental Consequences

Alternative 1

Direct and Indirect Effects. The IRAs would remain intact. No new roads, timber harvest, or other activities would occur within the IRAs. The natural integrity would not be altered by any activities. Natural ecological processes would continue within the IRA boundaries with the

exception of fire; unplanned ignitions would be suppressed. The apparent naturalness, feeling of remoteness and solitude would not change because of activities. The manageability of the area would not be changed.

Consistency with Regulatory Framework. This alternative is consistent with current regulations, guidelines, and rules for the management of IRAs.

Alternative 2

Direct and Indirect Effects. The Roderick and Grizzly IRAs would remain intact. No road construction or timber harvest would occur within the IRAs. There are 468 acres of prescribed burning proposed in the Grizzly IRA to return fire as a natural process and thereby improve habitat for wildlife. Design features that prohibit slashing of small trees would eliminate the potential of reducing the apparent naturalness that could result from the presence of stumps. Prescribed fires are preferred in the fall to emulate natural fire conditions and to gain the maximum benefit to the area. Fire would also be allowed to creep into and burn within the riparian areas between prescribed burn units G and H.

Harvest activities may be seen and heard from areas within the IRAs, especially the helicopter-logging units. This would affect the solitude and feeling of remoteness for users encountering this activity. The affects would be short term and would cease upon completion of the harvesting. The sights and sounds of the road decommissioning work would also be encountered from some areas of the IRA during this work, but again these would be short term and would not affect or change the values or acreages of the IRAs.

Units 57 and 57a lie just outside of the Roderick Mountain IRA. Apparent naturalness and natural integrity within the IRA would not be affected. The affects to the area outside the IRA in units 57 and 57a would be short term, until stumps begin to deteriorate and become less noticeable, and vegetation responds and occupies the areas affected. This activity disturbance would be limited to the area in units 57 and 57a, and would not be noticeable by the casual observer after a year or two, unless the visitor is hiking directly through the affected area. The overall values of this area in regards to wilderness characteristics would not be reduced or affect potential consideration in the future. Improving the aspen stand and its ability to regenerate would be a benefit to the overall ecosystem stability both within and outside the IRA.

Alternative 3

The effects of this alternative would be the same as Alternative 2 in regards to the IRAs. The area affected by Units 57 and 57a would remain unchanged, and future consideration for wilderness would not be precluded.

Cumulative Effects

Past Actions and their Effects on Current Conditions: Timber harvest, road building, watershed restoration, and wildfire suppression are a few of the activities that have occurred in the project area. All of these activities, with the exception of fire suppression, have occurred outside or adjacent to these IRAs and were implemented within the regulations and direction for roadless areas and IRAs that was relevant at the time of implementation. The Affected Environment description for inventoried roadless areas considers effects from past actions.

Contrasting Effects of Proposed Actions with Past Actions: The activities were designed to be located outside IRAs to ensure that roadless characteristics are maintained. IRAs would remain intact with this proposal.

Effects of Ongoing and Reasonably Foreseeable Actions: There are no reasonably foreseeable actions that would affect IRAs, with the exception of potential fire suppression. Fire suppression will continue to affect natural processes and associated changes in vegetation and habitat conditions (see the Forest Vegetation and Wildlife Habitat sections for more information).

Combined Effects from Past, Proposed, Ongoing, and Foreseeable Actions: Since roadless characteristics are maintained with this project, there would be no adverse cumulative effects to IRAs as a result of this project. With the exception of fire suppression, natural processes will continue to influence conditions in IRAs. The management of wildfire through fire suppression and development of fire plans for these areas is beyond the scope of this analysis. There are no irreversible or irretrievable activities planned that would affect the IRAs in this analysis. Short-term reductions would not preclude future consideration for wilderness designation in the area between the two IRAs.

Regulatory Consistency

All alternatives are consistent with current regulations, guidelines and rules for the management of Inventoried Roadless Areas.

American Indian Consultation

Introduction

Federal laws, regulations, and treaties direct the forest to consult with federally recognized tribes who may have concerns about federal actions that may affect religious practice, traditional cultural uses, and cultural resource sites and remains associated with American Indian ancestors. The analysis area lies within the aboriginal territory of the Kootenai Tribe. The Confederated Salish and Kootenai Tribes (CSKT) and the Kootenai Tribe of Idaho are the federally recognized tribes representing the modern members of the Kootenai Tribe. The specific laws, regulations, and treaties are further described under regulatory framework below (Hauge 2007).

Analysis Area

The analysis area for tribal consultation issues is the Grizzly subunit. Area maps of the Grizzly subunit were given to the identified tribes during both the NFMA and EIS phases of project planning.

Regulatory Framework

The Forest Service has a government-to-government responsibility to all federally recognized tribes. In addition, American Indian Tribes are afforded consideration under the National Historic Preservation Act (Section 2), NEPA, the Native American Graves Protection and Repatriation Act (NAGPRA), and the American Indian Religious Freedom Act (AIRFA) among other Executive orders and policy. Federal guidelines direct federal agencies to consult with modern American Indian tribal representatives and traditionalists who may have concerns regarding federal actions that may affect religious practices, and other traditional cultural uses, as well as cultural resource sites and remains associated with American Indian heritage. Any tribe whose aboriginal territory

falls within a project area is afforded the opportunity to voice concerns for issues governed by NHPA, NAGPRA, or AIRFA.

AIRFA protects the “inherent right of the freedom to believe, express, and exercise their traditional religions” (P.L. 95-442, 92 Stat. 1065; 7 U.S.C. 2269). The forest has identified the Confederated Salish and Kootenai Tribes and Kootenai Tribe of Idaho as having general concerns about the management of the project area. These concerns include, but are not limited to, access to sites, use and possession of sacred objects, and the freedom to practice sacred worship ceremonies.

The project area is located within lands encompassed by the Hellgate Treaty of 1855. The Hellgate Treaty was signed between the United States and the Flathead, Upper Pend d’Oreilles, and the Kootenai Tribes, and the Federal government has consultation responsibilities to insure that the Tribes’ reserved rights are protected. The treaty-reserved rights include the "right of taking fish at all usual and accustomed places, in common with citizens of the Territory, and of erecting temporary buildings for curing; together with the privilege of hunting, gathering roots and berries, and pasturing their horses and cattle upon open and unclaimed land". The District fits the description of “usual and accustomed places,” and lies within the aboriginal territory of the Kootenai and the Salish (Flathead). Ongoing consultation with the Confederated Salish and Kootenai Tribes ensures that their treaty rights are protected.

Analysis Methods

This analysis uses tribal consultation as a means of determining the effects of the proposed vegetation management and transportation projects. Consultations with the Kootenai Tribe of Idaho and the Confederated Salish and Kootenai Tribes in early planning phases helps the Forest Service meet their responsibilities.

Affected Environment

The Forest has identified the Confederated Salish and Kootenai Tribes and Kootenai Tribe of Idaho as having general concerns about the management of the project area. These concerns include, but are not limited to, access to sites, use and possession of sacred objects, and the freedom to practice sacred worship ceremonies.

Environmental Consequences

Alternative 1

Direct and Indirect Effects. Under this alternative, no actions are proposed, and any previously recorded or as yet undiscovered sites would remain undisturbed.

Alternatives 2 and 3

Direct and Indirect Effects. Ongoing consultation with the Confederated Salish and Kootenai Tribe and the Kootenai Tribe of Idaho has not indicated any direct or indirect effects from this project.

Cumulative Effects

Past Actions and Effect on Current Conditions*:* Before the NHPA of 1966 was implemented, project planning did not include consideration of impacts to historic properties. Any projects such as timber harvest, road building, and fire suppression activities that occurred prior to this,

had the potential to adversely impact historic properties, and many of these projects occurred in areas considered high probability for cultural resources and so probably damaged or destroyed cultural sites. While past actions may have affected cultural resources, no ongoing effects are known to be occurring currently from those past actions.

Contrasting Effects of Proposed Actions with Past Actions: Since the 1970s, cultural resource inventories have been conducted to locate cultural resources prior to project implementation. Known sites found during earlier inventories, and the refinement of the inventory process to locate properties during current inventories, allows impacts from projects to be avoided or mitigated. While natural deterioration of the resource is ongoing, the current condition and trend of the historic record is that historic properties are being protected from project impacts. Knowledge of the location and condition of historic properties also allows the potential for management action to abate or mitigate natural processes that could adversely affect the historic record. Since the 1980s, the Forest has worked with tribal liaisons from the Confederated Salish and Kootenai Tribe to protect areas of cultural value to the tribes.

Effects of Ongoing and Reasonable Foreseeable Actions: The ongoing and foreseeable activities listed in Table 9 were considered in this analysis. Fire suppression activities can impact cultural and other resources important to the tribes; however, Appendix 3 of the Northern Region Programmatic Agreement regarding Cultural Resources Management on National Forests in the State of Montana (USDA Forest Service 1995a) seeks to limit the potential of fire suppression activities to impact sites by setting out guidelines for protecting cultural resources during these activities. In addition, the Forest works with the tribal liaison of the Confederated Salish and Kootenai Tribes during wildfires to allow protection of resources important to the tribe.

Combined Effects from Past, Proposed, Ongoing and Foreseeable Actions*:* Cumulatively, when considering past, proposed, and ongoing and foreseeable actions, the Grizzly Project will not exacerbate effects to historic properties. The post-project condition and trend would continue the current condition and trend, which protects resources important to the tribes through ongoing consultation.

Regulatory Consistency

All alternatives are consistent with the laws and executive orders concerning Government-to-Government Consultation.

Cultural Resources

Introduction

Cultural resources include those historic properties reflecting past use of the area that have value for their relation to important events or people in our history, show a distinctive historical style, or which may provide information about our past (Hauge 2007a).

Analysis Area

The cumulative effects analysis area includes the entire Grizzly subunit/project area, which includes and surrounds the area of potential effect considered for field inventory of the current proposed project.

Regulatory Framework

The Forest Service and other federal agencies are required to protect and manage cultural sites in the United States under several statutes, most notably the National Historic Preservation Act (NHPA) of 1966. These requirements are carried forward in the Kootenai National Forest Plan (Forest Plan) standards (Forest Plan, Vol. 2, Appendix 19).

Historic properties are identified by a cultural resource inventory and are determined as either eligible or not eligible to the National Register depending on their ability to yield information about the past, or their relation to important events, persons, or historical styles. Sites that are determined as eligible are then managed to either protect them in-place or to mitigate adverse project effects. The State Historic Preservation Office (SHPO) reviews eligibility and management provisions. This process must take place prior to impacts on the ground unless the inventory results fall within the scope of a memorandum of understanding that streamlines the consultation process.

The location of cultural resource sites is exempt from public disclosure as described in Forest Service Handbook (FSH) 6209.13 11.2 and 11.22. This exemption protects sites from harm and retains confidentiality of sites culturally significant to American Indian Tribes.

Analysis Methods

Analysis methods used in this section consist of a review and synthesis of all pertinent literature, records, and documentation available on the history and prehistory of the project and surrounding areas. This information is from generalized sources and from several years of Forest Service heritage resource inventories conducted within and adjacent to the project area. Data is also gathered during field inventories of the proposed activities' areas of potential effect and adjacent areas of high site probability.

The measurement indicators for cultural resources are the beneficial or adverse effects to historic properties. Beneficial effects could include stabilizing a historic property such as controlling erosion through an archaeological site, restoring and maintaining a historic building, or reducing fuels concentrations around a historic property. Beneficial effects are designed and agreed upon through consultation conducted under Section 106 of the NHPA with the SHPO.

Adverse effects are impacts to the integrity of the property, destroying a portion or all of the property, and the information that it could yield. A direct adverse impact occurs during the activity itself, such as when a road is built through a historic property and the construction process destroys the site. An indirect adverse impact can occur as a side effect of the activity or after the activity is complete, such as runoff from a road that eventually erodes a historic property adjacent to it. In some cases where a beneficial action is possible, a no action determination that does not implement the beneficial action could be adverse when it allows greater degradation or deterioration of the historic property.

This planning process allows adverse impacts to be avoided altogether through project redesign, or mitigated through scientific investigation and/or removal of the site so that there are zero adverse impacts to historic properties. These avoidance or mitigation measures are agreed to in consultation conducted under Section 106 of the NHPA with the SHPO and allow the project to proceed with no adverse impact to eligible historic properties.

Affected Environment

People began occupying the northern Rocky Mountains following the retreat of the last continental glaciers. These people were hunter-gatherers whose subsistence patterns were highly attuned to the resources available in their natural environment. This subunit area provided opportunities for hunting, fishing, gathering, and camping and was probably important as a travel route to other favored localities.

Archaeological evidence in the Yaak Valley indicates human use extends back into the early Holocene. An early site in the Yaak River Valley has yielded artifacts ascribed to the Windust prehistoric phase believed to date back prior to 7,000 years. Another site in the vicinity shows evidence of occupation as far back as 3,000 years, with evidence that the native inhabitants practiced burning as a method of environmental control for at least the past 500 years (Zweifel 1995, p. 24). A Cascade style point found in the Yaak drainage gives evidence of hunting which may date to as much as 6,000 years ago. More recently, the Kootenai Indians have left their mark in the form of scarred trees, where the bark was peeled as part of traditional food gathering activities that continued into the early 1900s. Numerous other sites in Yaak River Valley have been recorded, but because most of these sites have not undergone scientific data recovery and did not yield diagnostic artifacts during preliminary recordation, the dates these sites were occupied has not yet been established. However, these sites, in addition to those that have yielded temporal evidence, indicate a long and continuous prehistoric use of the area.

The history of northwest Montana including the Grizzly Project area begins with a description of early exploration, mining, trapping, trading, logging, and railroads. Several factors influenced settlement including mining exploration, the 1906 Forest Homestead Act, the establishment of forest reserves, and the associated lumber industry.

Early Euro-American use of this area began in the late 1800s when prospectors passed through the Yaak Valley on their way to the gold fields near Wildhorse, British Columbia, in 1864 (Calvi 1993, p. 4). Although some of the historic sites within the analysis area may date to the late 1800s, most date from the early 1900s and into the 1950s. Mining activities continued in the Yaak Valley with prospecting activities radiating out from the Sylvanite Mining area from the late 1800s to the present day.

The area transportation system has changed and grown with the increasing needs since the early days. As elsewhere on the Northwest Frontier, the construction of the Great Northern Railroad had a critical impact on bringing people and supplies to nearby towns, and allowed the transportation of the timber, mineral, and other resources.

Old maps show trails that are no longer maintained by the Forest Service. Many of these trails were first used by American Indians and later developed into trails and roads by Euro-Americans. The Forest Service built, improved, and relocated strategic trails as part of the pre-World War II fire control effort, but many of them slipped into disuse as aircraft replaced pack strings and smoke jumpers replaced ground crews. These trails were used to access Forest Service administrative sites such as the lookouts on Grizzly Peak, Roderick Mountain, and other peaks, cache cabins, and work centers. Some of these trails were developed into wagon roads, and these wagon roads, such as Highway 508, were upgraded for automobiles. Roads were eventually connected to create access through the valley from all major surrounding towns.

Early Forest Service surveys identified within the Forest boundary, non-forested lands, which were made available for homesteading. Work was difficult to find; many homesteaders found

seasonal work with the Forest Service, mining, or trapping. Trap lines could extend for over 20 miles in the creeks in the areas, with line cabins used to extend the range.

The evidence of these past occupations of the project area can be diminished in value by any change in their historical, architectural, archaeological, or cultural character. Adverse impacts to cultural resource sites can result in their damage or complete destruction, the effects of which are irreversible. In cases of partial damage, the undisturbed portion of the site may still provide valuable information. The Forest Plan, in accordance with Section 106 of the NHPA, requires integration of cultural resource management into the overall multiple resource management effort to avoid adverse impacts. In addition, the Forest must work closely with the appropriate scientific community and Native American groups concerning this resource. Cultural resource inventories must be completed prior to road construction, timber harvest, and other ground-disturbing activities.

Environmental Consequences

Alternative 1

Direct and Indirect Effects. Under this alternative, no actions are proposed, and any previously recorded or as yet undiscovered sites would remain undisturbed.

Alternatives 2 and 3

Direct and Indirect Effects. There would be no adverse or beneficial effects to historic properties under any of the action alternatives. All proposed units including those in the proposed action would be inventoried prior to project implementation. A cultural resource inventory report would be completed and submitted to the Montana SHPO under the Northern Region Programmatic Agreement regarding Cultural Resources Management on National Forests in the State of Montana. The Confederated Salish and Kootenai Tribes would be included in these discussions where Native American sites are involved.

If additional sites are encountered in the course of additional inventory or project implementation, Forest specialists would consult with the SHPO, as required by law, to determine the significance of the discovery and the effects of the project upon them. The Confederated Salish and Kootenai Tribes would be included in these discussions where Native American sites are involved. Mitigation would be accomplished and may include avoidance of the sites, or scientific investigation.

Cumulative Effects

Past Actions and Effect on Current Conditions*:* Before the NHPA of 1966 was implemented, project planning did not include consideration of impacts to historic properties. Any projects such as timber harvest, road building, and fire suppression activities that occurred prior to this, had the potential to adversely impact historic properties, and many of these projects occurred in areas considered high probability for cultural resources and so probably damaged or destroyed cultural sites. Conversely, the remains of some of these activities that took place longer than 50 years ago may now be considered cultural resources, and so have been added to the historic record. While past actions may have affected cultural resources, no ongoing effects are known to be occurring currently from those past actions.

Contrasting Effects of Proposed Actions with Past Actions: Since the 1970s, cultural resource inventories have been conducted to locate cultural resources prior to project implementation. Known sites found during earlier inventories, and the refinement of the inventory process to

locate properties during current inventories, allows impacts from projects to be avoided or mitigated. While natural deterioration of the resource is ongoing, the current condition and trend of the historic record is that historic properties are being protected from project impacts. Knowledge of the location and condition of historic properties also allows the potential for management action to abate or mitigate natural processes, which can adversely affect the historic record.

As described in the direct and indirect effects section, there will be no adverse or beneficial effects to historic properties from any of the action alternatives. Ongoing efforts to locate and document historic properties allow their protection from proposed undertakings.

Effects of Ongoing and Reasonable Foreseeable Actions: The ongoing and foreseeable activities listed in Table 9 were considered in this analysis. Fire suppression activities can impact cultural resources; however, Appendix 3 of the Northern Region Programmatic Agreement regarding Cultural Resources Management on National Forests in the State of Montana seeks to limit the potential of fire suppression activities to impact sites by setting out guidelines for protecting cultural resources during these activities.

Combined Effects from Past, Proposed, Ongoing and Foreseeable Actions: Cumulatively, when considering past, proposed, and ongoing and foreseeable actions, the Grizzly Project will not exacerbate effects to historic properties. The post-project condition and trend would continue the current condition and trend, which protects historic properties through inventory and project design so no historic properties are impacted by project implementation.

Regulatory Consistency

The guidelines of the Forest Plan and that of other jurisdictions were recognized in the development of all alternatives. In addition, the laws and policies that govern cultural resource management on Federal lands are coordinated with the SHPO of Montana, who serves in an advisory capacity. The policies of the Forest Service and SHPOs are consistent. All alternatives would be consistent with the Forest Plan and applicable regulations and laws regarding historic properties.

Scenic Resources

Introduction

This section addresses the environmental effects of the proposed activities on the visual resource. The units of measure are whether the change in the viewing landscape meets inventoried visual quality objectives (VQOs) in the Forest Plan (Harlow 2006).

Analysis Area

The analysis area for scenic resources is the Grizzly project area (see vicinity map). This area includes the Yaak River, Burnt Creek, Cool Creek, Whitetail and Pheasant Creeks, Lucky Gulch, Shine Creek, and Little Creek viewpoints. These viewpoints were selected because of where forest users would concentrate and where management activities might be seen. As all of the proposed activities can be viewed from these points, this scale of analysis is considered appropriate.

Analysis Methods

Visual Quality Objectives

These objectives set measurable standards for the appearance of management activities. These standards are defined as:

- *Retention (R):* Management activities are not evident to the casual forest visitor.
- *Partial Retention (PR):* Management activities may be evident, but must remain visually subordinate to the characteristic (natural-appearing) landscape.
- *Modification (M):* Management activities may visually dominate the characteristic (natural appearing) landscape, but must, at the same time, utilize established form, line, color and texture and should appear as a natural occurrence when viewed in middleground or background.
- *Maximum Modification (MM):* Management activities may visually dominate the characteristic (natural-appearing) landscape, but they must look like natural occurrences when viewed as background.

The proposed action contains management activities (harvest, thinning, or burning) in the following management areas with associated Forest Plan VQOs:

MA 2: The VQO is retention.

MA 10, MA 11, MA 12, MA 14: "Maximum modification" for areas of low viewing significance, "modification" in areas of moderate viewing significance, and "partial retention" in areas of high viewing significance.

MA 15: The VQO is maximum modification.

Visual quality objectives are measured based upon areas of viewing significance. The Yaak Highway 508 (Montana State Road System), is a Sensitivity Level 1 travel route (high viewing significance) from the intersection with Burnt/Dutch Creek Road 472 to the community of Yaak. Specific viewing points along this route were used to measure effects of the proposed actions based upon the distance from these viewing points, and the amount of visual change.

Affected Environment

The areas affected can be viewed from specific viewpoints along either Yaak Highway 508, or Forest Road 472 (Burnt-Dutch road). The following describes the existing conditions as they relate to the scenic resource. These locations are then described in the Environmental Consequences section with the project-specific activities associated with each location.

Location 1: the intersection of roads 472 and 508. From this location, a view of the Burnt Creek drainage from Yaak Highway 508 to the east is available. This area would be considered heavily altered from activities on both private and public lands. The setting is pastoral with log buildings, pastures, the North Fork Yaak River, and the surrounding timbered lands visible. Evidence of past logging is visible; older clearcuts on the east and west sides of the drainage are visible, but have regenerated and are blending into the setting. The foreground views were inventoried as "retention" the middleground views were inventoried as "modification," and the background views as "maximum modification".

Location 2: Yaak Highway 508 at its intersection with the road entrance into the Red Top Campground. From this location, the foreground area was classified as "retention", the

middleground was classified as “modification”, and the background was classified as “maximum modification”.

Location 3: Yaak Highway 508 at its intersection with the road entrance into the Whitetail Campground. From this location, a majority of the foreground area was classified as “retention”, the middleground was classified as “modification”, and the background was classified as “maximum modification”.

Location 4: Yaak Highway 508 at its intersection with the road entrance into the Pete Creek Campground. From this location the foreground was classified as “retention”, middleground was classified “modification”, and the background was classified as “maximum modification”.

Location 5: Along Forest Road 472 from the intersection with Highway 508 to the intersection with Forest Road 68. From this location the foreground is classified as “partial retention”, middleground was classified “modification”, and the background was classified as “maximum modification”.

Environmental Consequences

Alternative 1

The No Action Alternative would have no direct, indirect, or cumulative effect on the current visual quality, and is consistent with the Forest Plan for scenery management.

Effects Common to Alternatives 2 and 3

Direct and Indirect Effects.

Pre-commercial Thinning: All of the action alternatives include thinning within previously harvested stands. This activity would have very little (if any) effect on the visual resource. The thinning would only reduce the number of conifer species and the stands would therefore retain components of hardwoods and shrubs.

Watershed Rehabilitation: The watershed rehabilitation planned for Grizzly project area would have no effect upon the overall visual quality of the area.

Ecosystem and Wildlife Burning: This treatment is proposed where fuel loads are light enough to underburn without mortality to overstory trees. The first season after underburning some tree trunks would be blackened and some needle mortality would be evident. However, in one to three years regrowth from shrubs, forbs, and grasses would hide any noticeable effects. This activity would meet all inventoried VQOs of partial retention, modification, and maximum modification, and there would be no long-term effect on the visual resource unless identified as otherwise.

Grapple Piling/Pile Burning: This activity would create ground disturbance that would reduce understory vegetation and accentuate bare soil color. Pile burning would leave scattered residual tree trunks blackened, scorch the soil, and result in some needle mortality. However, in one to three years, regrowth from shrubs, forbs, and grasses would hide any noticeable effects. This activity would meet all inventoried VQOs and there would be no long-term effect on the visual resource.

Hand Pile/Pile Burning: These areas are contiguous with private land and are intended to create a defensible space for property protection by hand-slashing trees less than 7 inches in diameter with chainsaws and hand-piling and burning downed fuels within 100 feet of private land. The hand-

slashing would only reduce the number of conifer species, and the areas would retain their components of larger merchantable conifers, hardwoods, and shrubs.

The first season after hand-piling and burning downed fuels, some tree trunks would be blackened and some needle mortality displayed. However, in one to three years regrowth from shrubs, forbs, and grasses would hide any noticeable effects. This activity would meet all inventoried VQOs and there would be no long-term effect on the visual resource.

Jackpot Burning: Burning of fuels concentrations from harvest operations within the units would leave residual tree trunks blackened, scorched soil, and some needle mortality. However, in one to three years regrowth from shrubs, forbs, and grasses would hide any noticeable effects. This activity would meet all inventoried VQOs and there would be no long-term effect on the visual resource.

Alternative 2

Direct and Indirect Effects. Timber harvest activities have the potential to change the visual characteristics of the area, depending on the distance from the viewpoint, and the type of changes. The effects are discussed based upon specific viewing points as described below.

Location 1: intersection of Roads 472 and 508. This viewing point is a view of the Burnt Creek drainage from Yaak Highway 508 to the east. The majority of this area has a VQO of modification, with unit 40 being in an area with a VQO of maximum modification.

Units 42 through 47 are proposed in this area. These units would meet the modification VQO by keeping unit shape and size equivalent to surrounding natural opening shapes and sizes. Also, leave trees are planned for units 42, 43, and 47, and should keep the harvesting visually subordinate to the surrounding landscape. Units 44, 45a, 46, and 47 are to be yarded by skyline, minimizing soil disturbance and color. Units 42 and 45 are to be yarded by tractor. Tractor yarding would create ground disturbance that would reduce understory vegetation and accentuate bare soil color. However the units would be revegetated within one to three years with natural grasses, forbs, shrubs, and trees from adjacent areas. Harvest unit 40 is in the maximum modification VQO. This unit would meet the modification VQO by keeping unit shape and size equivalent or smaller to surrounding natural opening shapes and sizes. The unit is to be tractor yarded.

Location 2: Yaak Highway 508 at its intersection with the road entrance into the Red Top Campground. The area affected by activities has a VQO of modification. Units 31 through 37 are proposed in the area classified as modification. These units should meet the modification VQO by keeping unit shape and size equivalent to surrounding natural opening shapes and sizes. Also, leave trees are planned for units 31, 34, and 37, and should keep the harvesting visually subordinate to the surrounding landscape. Units 33 and 34 are to be yarded by helicopter or skyline, minimizing soil disturbance and color. Units 31, 32, 36, and 37 are to be yarded by tractor. Tractor yarding would create ground disturbance that would reduce understory vegetation and accentuate bare soil color. However, the units would be revegetated within one to three years with natural grasses, forbs, shrubs and trees from adjacent areas.

Location 3: Yaak Highway 508 at its intersection with the road entrance into the Whitetail Campground. The area affected by activities has a VQO of modification. Units 1 through 4 and 10, and burn units B to F are proposed in this area, and would meet the modification VQO by keeping unit shape and size equivalent to surrounding natural opening shapes and sizes. Burn units B through F would leave some evidence of burning on tree trunks and where fuels are

concentrated. However, the units should be revegetated within one to three years with natural grasses, forbs, shrubs, and trees from adjacent areas. At the end of the three years, the units would meet the modification VQO.

Location 4: Yaak Highway 508 at its intersection with the road entrance into the Pete Creek Campground. The area affected by activities has a VQO of modification. Units 11, 12, 12a, 13, 13a, and 15 are proposed in this area. Unit shapes and management activities (tree removal and slashing) would borrow from natural forms, opening sizes, and reduce excessive slash accumulations to fit within the surrounding area. All units would meet the modification VQO.

Location 5: Along the 472 road from the intersection with Highway 508 to the intersection with Forest Road 68. The area affected by proposed activities has a VQO of partial retention or modification. Units 50, 55, 55 (a through g), and 60 and burn unit I are proposed within partial retention. These units would meet the partial retention VQO with designed unit location, leave tree density, and yarding requirements. To keep the harvesting visually subordinate to the surrounding characteristic (natural-appearing) landscape in units 50 and 60, leave trees (non-lodgepole type species and any advanced regeneration) in the first 100 feet near Forest Road 472 (where possible). Unit 50 is designed for skyline yarding that minimizes soil disturbance and color. Also, most of unit 50 is above the viewing level of a forest user in a motor vehicle thereby screening view of nearly all the unit except the portion nearest the road.

Units 55, 55 (a through g) are planned for cable yarding. Cable yarding would create ground disturbance that would reduce understory vegetation and accentuate bare soil color. However, the units would be revegetated within one to three years with natural grasses, forbs, shrubs, and trees from adjacent areas. To minimize the disturbance from cable yarding, design requirements are to locate skid trails and landings away from the view of Forest Road 472, and protect the existing advanced tree regeneration along Forest Road 472 from machine damage (where possible).

Unit I would leave some evidence of burning on tree trunks and where fuels are concentrated. However, the unit should be revegetated within one to three years with natural grasses, forbs, shrubs, and trees from adjacent areas. At the end of the three years, the unit should meet the partial retention VQO.

Harvest units 49, 57, and 57a are in the modification VQO. The unit shapes and sizes are equal to or less than natural surrounding openings. Leave trees are planned in units 57 and 57a and would keep the harvesting visually subordinate to the surrounding characteristic (natural-appearing) landscape. Unit 49 is above the Forest Road 472 and is not seen when driving by. All units would meet the modification VQO using the design criteria provided.

Alternative 3

Direct and Indirect Effects. The visual effects of the actions proposed in this alternative are the same as those described in Alternative 2, except that under Alternative 3 units 40, 57, 57a, and 60 would be dropped and unit 61 added. The visual quality in the dropped units would not change. In some units, actions were changed from grapple piling to underburning and to spot grapple piling. Underburning would leave some evidence of burning on tree trunks and where fuels are concentrated. Use of machinery to grapple pile spot locations would create ground disturbance that would reduce understory vegetation and accentuate bare soil color. However, the units should be revegetated within one to three years with natural grasses, forbs, shrubs, and trees from adjacent areas. At the end of the three years, the units should meet the VQOs. Unit 61 would meet

the modification VQO as understory vegetation would be retained, and soil disturbance would be revegetated within one to three years.

Cumulative Effects

Past Actions and Effects on Current Conditions*:* Past actions (previous timber sales) have a cumulative effect on the scenic resource in the short term. This is due to the unnaturally appearing geometric patterns and patch sizes remaining on the landscape. These effects would be evident until forest growth adds diversity in color and texture, blending the existing patterns into the adjoining landscape.

Contrasting Effects of Proposed Actions with Past Actions: The proposed actions entail primarily intermediate harvest, minor amount of regeneration harvest, and thinning activity, and include design features to minimize visual impacts when viewed by motorized users on the Yaak Highway 508.

Effects of Ongoing and Reasonable Foreseeable Actions*:* Other ongoing and foreseeable actions (such as the Obermayer Sale) would not contribute cumulatively to visual effects in the project area.

Combined Effects from Past, Proposed, Ongoing and Foreseeable Actions*:* Cumulatively, the Grizzly Project would have a short-term effect on the visual resource when combined with past actions. These effects would be consistent with Forest Plan standards for the scenic resource. Although irretrievable changes in the existing appearance of the landscape would occur under the action alternatives, these changes would become progressively less noticeable as vegetation recovers in harvested and burn areas, and along roads.

Regulatory Consistency

It is expected that all proposed treatments would meet Forest Plan VQOs under Alternatives 2 and 3.

Economics

Introduction

The management of the Kootenai National Forest has the potential to affect local economies. The human element is an important part of the ecosystem. Production of resources and recreational use on the Forest generate employment and income in the surrounding communities and counties and generate revenues that are returned to the federal treasury (Dickinson 2006). This section presents the economic effects of the project, including the project feasibility, financial efficiency, and impacts to jobs and income.

Analysis Area

The combination of small town and rural settings, along with people from a wide variety of backgrounds, provide a diverse social environment for the geographical region around the Three Rivers Ranger District. Local residents pursue a wide variety of lifestyles, but many share a common theme--an orientation to the outdoors and natural resources. This is reflected in both vocational and recreational pursuits including employment in the logging and milling operations, outfitter and guide businesses, hiking, hunting, fishing, camping, and many other recreational activities.

Timber management activities within the project area have the potential to impact the economic conditions of local communities and counties. To estimate the potential effect on jobs and income, a zone of influence (or impact area) was delineated. The zone of influence is comprised of Lincoln, Sanders, and Flathead counties in Montana and Boundary and Bonner counties in Idaho. These counties were selected based on a functioning economy, log flows and where the timber is likely to be processed.

Analysis Methodology

Project feasibility relies on the Region 1 Transaction Evidence Appraisal System. The most recent regression equation for the zone of interest was used to estimate the expected bid price (high bid resulting from the timber sale auction) for the timber project. The estimated bid price for the project was compared to the base rates (essential regeneration plus minimum return to the federal treasury) for the project. If the estimated bid price exceeds the base rates, the project is considered feasible.

Financial efficiency was measured by the present net value (PNV) and benefit cost ratios (B/C) of the alternatives. PNV is defined as the value of discounted benefits minus discounted costs. Similarly, a B/C ratio is the ratio of discounted benefits to discounted costs. A financial efficiency analysis is the PNV of federal revenues and costs. A positive PNV or B/C ratio greater than 1 indicates financial efficiency.

The economic impact effects were measured by estimating the direct jobs and labor income generated by the 1) processing of the timber volume from the project, and 2) dollars resulting from restoration activities of the project into the local economy affected by the treatments proposed. The direct timber employment and labor income benefit employees and their families and directly affect the local economy. Additional multiplier effects (ripple effects) are generated by the direct activities. The direct and multiplier effects are considered the total economic impacts to the local economy. The data used to estimate the direct effects from timber harvest was information provided by University of Montana's Bureau of Business and Economic Research. The economic effects tied to restoration activities and the multiplier effects (of both timber harvest and restoration activities) were estimated using a computer input-output model called IMPLAN Professional Version 3.0 (MIG 2004).

Regulatory Framework

The financial efficiency analysis is specific to the timber harvest and ecosystem management activities associated with the proposal as directed in Forest Service Manual 2400-Timber Management (FSM 2400) and guidance found in the Forest Service Handbook 2409.18 (FSH 2409.18).

Affected Environment

The Kootenai NF occupies approximately 75 percent of the land base in Lincoln County. Forest products have been an economic mainstay for over a century. However, over the last 10 to 15 years, the dependence on forest products has been greatly reduced.

Several years ago, the plywood mill at the Stimson Lumber Company site in Libby was dismantled and now is only producing finger-joint lumber. In addition, the Louisiana-Pacific, Inc. mill in Libby closed. Recently, Owens and Hurst Lumber Company closed their mill in Eureka. Because of this, a significant portion of the timber harvested on the Three Rivers Ranger District within the last few years has been hauled to mills in Moyie Springs and Bonners Ferry,

Idaho. There are also several small mills that generate lumber and specialty products such as house logs and cedar products that use timber harvested from the area. These mills rely, in part, on the supply of timber from National Forest land.

It is difficult to determine the economic benefit of timber harvest within the project area since statistics are not compiled separately for individual areas. However, a rough estimation can be made by examining the average share of total timber harvest on the Kootenai NF from the Three Rivers Ranger District over the last 7 years. From the period of 1998 to 2004, the Three Rivers Ranger District sold approximately 196,700 hundred cubic feet (CCF) or 100,420 million board feet (MMBF) of timber. During the same 7-year period, the Kootenai NF sold around 827,143 CCF (384,274 MMBF). The Three Rivers District's contribution was roughly 26 percent of the total.

Environmental Consequences

Financial Efficiency

Financial efficiency (PNV and B/C ratios) was calculated using an Excel spreadsheet. A 4 percent discount rate was used over a 5-year time period (2006-2013). For more information on the values, costs, or PNV calculation, see the project file. Table 48 displays the values used for this analysis, and the projected outcomes. These values are to be used for comparison purposes only.

The No Action Alternative has no costs or revenues associated with it. Of the action alternatives, Alternative 2 has a slightly higher PNV at $1,045,734. Alternative 3 has the highest benefit/cost ratio at 1.56. Both action alternatives incur costs in terms of the proposed reforestation and other restoration treatments. The No Action Alternative would not plant or take other restorative actions and, therefore, incur no costs.

When evaluating trade-offs, the use of financial efficiency measures is one tool used by the decisionmaker in making the decision. Many things cannot be quantified in this financial efficiency analysis, such as effects on wildlife, impacts on local communities, and restoration of watersheds and vegetation. The decisionmaker considers many factors in making the decision.

Table 48. Financial efficiency values between alternatives

Evaluation Item	Alternative 1	Alternative 2	Alternative 3
Volume harvested (CCF)	0	23,320	20,444
Estimated High Bid (Revenue)	$0	$125.04	$130.50
Discounted revenue	$0	$3,288,845	$2,885,363
Discounted cost	$0	-$2,243,110	-$1,845,726
Financial Present net value (PNV)	$0	$1,045,734	$1,039,637
Financial Benefit/cost ratio (B/C)	NA	1.47	1.56

Economic Impacts

Changes in timber production from the Forest have direct and indirect effects on local jobs and income. An input-output model, IMPLAN (Impact Analysis for Planning) was used to estimate effects on employment and labor income within a defined geographical area (called a functional economic area or zone of influence).

The IMPLAN modeling system allows the user to build regional economic models of one or more counties for a particular year. The regional model for this analysis used the 2001 IMPLAN data.

The economic impact area for this project is comprised of Lincoln, Sanders, and Flathead counties in Montana and Boundary and Bonner counties in Idaho. These counties were selected based on a functioning economy; log flows and where the timber is likely to be processed.

The direct, indirect and induced employment and labor income coefficients have been incorporated into a spreadsheet developed by Mike Niccolucci, regional economist for the Forest Service, Northern Region. Charles E. Keegan of the Bureau of Business and Economic Research at the University of Montana derived the direct employment and labor income response coefficients. The indirect and induced multiplier effects were estimated using the IMPLAN model for the economic impact area. The direct, indirect, and induced effects for reforestation and other restoration activities were derived solely using IMPLAN.

The analysis calculated the jobs and income associated with timber harvest, reforestation, and restoration activities. For calculating jobs and income associated with timber harvest, the timber production levels were proportionally broken out by product type for each alternative. For calculating jobs and income associated with reforestation and restoration activities, expenditures for these activities were developed for each alternative.

Table 49 displays the direct and total employment and labor income that may be attributed to each alternative. Since the expenditures are over a 6-year period, the total impact of jobs and income would be spread out over the life of the project. Most of the timber harvest and lumber processing jobs would occur over the first 2 years of the project. These are not new jobs or income, but rather jobs and income that can be attributed to this project. This table assumes that all resources would be retained within the zone of influence.

Table 49. Employment (full- and part-time jobs) and labor income (thousands of dollars)

Analysis Item[1]	Alternative 1	Alternative 2	Alternative 3
Direct Employment	0	105	88
Total Employment	0	224	188
Direct Labor Income	0	$3,277.8	$2,755.4
Total Labor Income	0	$5,904.4	$4,963.4

1 Definitions: Employment is the total full- and part-time wage, salaried, and self-employed jobs in region. Labor income includes the wages and salaries as well of benefits of workers who are paid by employers, and income to proprietors.

Cumulative Effects

Many factors influence and affect the local economies, including changes to industry technologies, economic growth, international trade, and the economic diversity and dependency of the counties. This project is not expected to add to any existing cumulative effect. However, the jobs and income associated with the action alternatives, especially Alternative 2, may bring the local economy some increased relative stability during the life of the project.

Regulatory Consistency

The action alternatives meet the requirements in the Forest Plan and related regulations and policy.

Required Disclosures

Potential Conflicts with Plans and Policies of Other Jurisdictions

Cultural Resources

The laws and policies that govern cultural resource protection on federal lands are coordinated with the SHPO of Montana, who serves in an advisory capacity. The policies for the Forest Service and SHPO are consistent. The Forest Service informs and consults with the Confederated Salish and Kootenai Tribes on proposed activities, site information, and potential impacts.

Wildlife

The Forest Service and the Montana Fish, Wildlife and Parks (MFWP) work together to manage wildlife, but the missions of the two agencies are different. The Forest Service manages the land and affects wildlife by adjusting cover, forage relationships, or through travel management. The State of Montana manages the animals, and they affect wildlife by adjusting hunting seasons, bag limits, and enforcing other rules that affect the populations of fish and wildlife.

The Forest Service works with the US Fish and Wildlife Service for the recovery of Threatened and Endangered Species. The Forest Service consults with the US Fish and Wildlife Service when Threatened and Endangered Species may be affected.

Water Quality

Section 313 of the Clean Water Act requires Federal Agencies to comply with all Federal, State, interstate and local requirements, administrative authority, and process and sanctions with respect to the control and abatement of water pollution. Executive Order 12088 also requires the Forest Service to meet the requirements of the Act.

All action alternatives would comply with the Clean Water Act and Montana State Water Quality Standards. These alternatives would incorporate reasonable Soil and Water Conservation Practices, avoid channel degradation, and comply with the forest plan.

Air Quality

The prescribed burning of harvest units under all action alternatives has the greatest potential to affect local air quality. This activity is conducted in accordance with the State of Montana air quality guidelines administered by the Montana/Idaho State Airshed Group, made up of industry, State and Federal agencies, and local Health Department representatives.

Potential conflicts occasionally exist between national forest concerns for meeting land management goals and the commitments of the state agencies for clean air. Other sources of potential conflict exist between private landowners within Montana, State land management agencies, and other adjoining national forests competing for the limited number of suitable burning days. When such conflicts are identified, the Forest Service does not burn.

Adverse Environmental Effects That Cannot Be Avoided

Implementation of any alternatives would inevitably result in some adverse environmental effects. The severity of the effects can be minimized by adhering to the design features of the alternatives such as the Best Management Practices. If management activities occur, however,

some effects cannot be avoided. Even the No Action Alternative has effects. See the individual resource analysis discussions for more details on effects.

Cultural Resources

There is no assurance that every cultural resource site would be located in advance of all planned management activities. Some ground-disturbing activity may affect an undiscovered historic or prehistoric site. Sites discovered in this manner would be immediately protected from further disturbance.

Scenic Resources

The introduction of timber harvest units would add a variety of line, form, color, and texture to the landscape. Recreation visitors may see a modified forest in the near foreground, middle ground, and background where harvest is implemented.

Air Quality

Temporary seasonal effects on air quality are unavoidable under any of the action alternatives. Prescribed fire is an integral part of ecosystem management, fuel treatment, and site preparation for reforestation. These activities would be scheduled when air dispersion is good.

Relationship Between Short-Term Use And Long-Term Productivity

Short-term uses are those uses that generally occur annually. Long-term productivity refers to the ability of the land to produce a continuous supply of a resource.

Water Quality

The duration of the effects of timber management on the water resource is highly variable and dependent on land and vegetation types. Stream channel conditions may be altered because of short-term direct and indirect effects of implementation of best management practices and decommissioning. However, these will provide long-term benefits of sediment reduction.

Wildlife

Key habitat requirements for wildlife species include feeding habitat or foraging areas interspersed with nesting or denning habitat and thermal and hiding cover. As the feeding habitats experience successional changes and reforestation, they would again provide cover. The appropriate scheduling of timber harvest can provide and sustain a mosaic of cover and feeding habitat.

Vegetation

Managed stands produce a higher volume of wood fiber through time than unmanaged stands. Regeneration of desired fast-growing species, planting of genetically improved trees, stocking control to reduce competition and improve growth of individual trees, and intermediate treatments to maintain the health and vigor of stands are silvicultural means of maintaining the long-term yield of forest stands.

In the short term, harvesting stands that are high risk of mortality captures economic value that would otherwise be lost. Timely reforestation puts the land back into a productive growing condition.

Depending on the level of timber harvesting and the site preparation method that follows, reductions in organic matter could reduce long-term site productivity. Silvicultural prescriptions include measures designed to maintain varying levels of organic matter. Reforestation of harvest areas could change plant succession, stand development, and species composition.

Air Quality

The temporary impacts of smoke from prescribed debris burning and road dust from vehicles associated with proposed activities would have minor, short-term effects on visual quality and recreation use. The short-term impacts are traded for by minimizing the risks from wildfire and long-term, increased site productivity. The short-term impact of prescribed burning is required to decrease the risk from wildfire on these sites. Wildfires generally provide significantly more air pollution. Silvicultural treatments and prescribed burning would increase long-term site productivity.

Irreversible and Irretrievable Commitments of Resources

An irreversible commitment of resources refers to the loss of production or use of a non-renewable resource due to a land use decision that, once executed, cannot be changed. An irretrievable commitment of resources applies to losses of production or use of renewable resources for a time.

Soil Productivity

Best management practices would be used to avoid soil productivity losses from timber harvesting and associated temporary road/skid trail construction. Temporary roads would constitute an irretrievable commitment of resources even though they would be recontoured. The soil mixing and disturbance that would be associated with temporary construction would lower soil productivity. While plant and tree growth on these sites would occur over the short term, full productivity recovery could take decades to hundreds of years.

Air Quality

The impact of prescribed burning and road dust would have temporary seasonal impacts on the air quality in all alternatives except Alternative 1, No Action.

Scenic Resources

Irretrievable changes in the existing appearance of the landscape would occur under the action alternatives. These changes would become progressively less noticeable as vegetation recovered in harvested areas and along roads.

Wildlife

The loss or modification of habitat for certain wildlife species is an irreversible commitment of resources. As vegetation recovers, this habitat would recover. However, the timeframe for this to occur may be as long as several decades for mature and old growth-related species.

Cultural Resources

Any activity that would disturb a cultural resource is an irreversible commitment.

Specifically Required Disclosures

Effects of Alternatives on Social Groups

Executive Order 12898 ordered federal agencies to identify and address the issue of environmental justice (i.e., adverse human health and environmental effects of agency programs that disproportionately impact minority and low income populations). Based on experience with similar projects on the Three Rivers Ranger District none of the alternatives would substantially affect minority or low-income individuals, Native American Indians, women, or civil rights. The implementation of this project is expected to provide job opportunities in communities such as Troy, Montana. Small or minority-owned business would have the opportunity to compete for some of the work, including timber sales, non-commercial thinning, and fuels reduction projects.

Effects on Floodplains and Wetlands

Floodplain areas constitute all of the wetlands in the project area and are protected as RHCAs. Wetlands may occur in the form of seeps, springs, and small bogs; however, the exact locations of all these have not been identified prior to unit layout. These seeps, springs, and small bogs are not evident through aerial photography and are probably less than one-quarter acre in size. These areas would be protected by adhering to the Montana Stream Management Zone regulations, Kootenai NF Riparian Area Guidelines as amended by INFS (USDA Forest Service 1995), Best Management Practices and Section 404 of the Clean Water Act (33 CFR 323). See the Water Resources section of this chapter for more specifics.

Effects of Alternatives on Threatened and Endangered Species

Threatened and endangered wildlife, fish, and plant species may be affected by the proposed activities in the project area. A biological assessment will be prepared and submitted to the US Fish and Wildlife Service for concurrence according to the Endangered Species Act to insure protection of these species.

Energy Requirements and Conservation Potential of Alternatives

The energy required to implement the alternatives in terms of petroleum products would be insignificant when viewed in light of the production costs and effects of the national and worldwide petroleum reserves.

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

The alternatives presented comply with federal regulations for prime lands. The definition of prime forestland does not apply to lands within the national forests. Lands administered by the Forest Service in the project area do not include prime farm lands or range lands. In all alternatives, Federal lands would be managed with the appropriate consideration to the effects on adjacent lands.

Chapter 4 - List of Preparers; Recipients of DEIS

List of Preparers

Name	Position	Years experience	Contributions
TEAMS Planning Personnel			
Bruce Higgins	IDT leader	20	Process management, documentation coordination/preparation
Rob Schantz	Silviculturist	25	Vegetation and old growth analysis, specialist report documentation
Betsy Hamann	Wildlife Biologist	21	Wildlife and old growth analysis, specialist report documentation
Tiffany Vanosdall	Fisheries Biologist	7	Fisheries analysis, specialist report documentation
Rachel Young	Fuels Specialist	17	Fire, Fuels and Air Quality analysis, specialist report documentation
Vince Archer	Soils Scientist	8	Soils survey and analysis, specialist report documentation
Eric Moser	Hydrologist	18	Hydrology analysis, specialist report documentation
Bill Overland	Hydrologist	5	Hydrology analysis, specialist report documentation
Donna Dixon	GIS Analyst	15	GIS data development, maintenance, provided analysis support, prepared maps for documentation and analysis
Judy York	Writer/Editor	16	Documentation editing and review
Three Rivers District Personnel			
Mike Arvidson	Botanist	23	PTES plants specialist report analysis and documentation
Dick Harlow	Visuals Specialist	15	Visual resource analysis and specialist report documentation
Mark Mason	Recreation Specialist	23	Recreation and inventoried roadless area analysis and specialist report documentation
Glen Gill	Wildlife Biologist	3	Grizzly bear analysis, analysis review
Eric Dickinson	Logging Systems, Economics	23	Identification of logging systems, proposed action identification, economics analysis and documentation
Kathy Mohar	Environmental Coordinator	15	Process management, public involvement, project liaison, analysis review
Pat Cooley	Timber Management Staff	30	Project liaison, analysis review
Russ Gautreaux	Silviculturist	26	Vegetation analysis review
Kris Newgard	Hydrologist/Soils Specialist	20	Analysis review, BMP and watershed rehabilitation proposal identification
James Benedict	Silviculturist	28	Vegetation diagnosis, proposed treatment identification, analysis review
Shelly Anderson	GIS Specialist	16	GIS data preparation, coordination, grizzly bear analysis support, database management
Kristen Hauge	Archeologist	15	Heritage resource analysis and specialist report documentation, Tribal consultation
Connie Hommel	Timber Sale Administrator	23	Proposed action identification, sale operations input, design features identification
Jennifer Nelson	Weeds Specialist	2	Invasive plants analysis and specialist report documentation
Amee Rief	Fisheries Biologist	10	Fisheries analysis review, fish habitat proposal improvement identification
Chad Pickering	Fuels Planner	3	Fuels proposed action identification, analysis review, project coordination
Timory Peel	Transportation Planner	2	Roads and travel analysis

List of Recipients

The following is a list of recipients to whom this Draft EIS or notice of availability has been sent. Additional copies of this Draft EIS are available upon request from the Three Rivers Ranger District in Troy, Montana.

LOCAL GOVERNMENT AND ELECTED OFFICIALS
Lincoln County Commissioners Office
John Konzen

FEDERAL AGENCIES
US Army-Engr. Northwest Division
US Coast Guard
USDA Forest Service
USDA Office of Civil Rights
USDA-National Agriculture Library
USDA-Natural Resources Conservation Service
USEPA Region 8, Montana Office
USEPA, Office of Federal Activities
USDI – Office of Environmental Policy
USDI Fish and Wildlife Service
Advisory Council on Historic Preservation
Northwest Power Planning Council

ORGANIZATIONS
Alliance for the Wild Rockies
American Wildlands
Montana Wilderness Association
Wild West Institute
The Lands Council
The Wilderness Society
Yaak Valley Forest Council

STATE AGENCIES
Montana Department of Environmental Quality
Montana Department of Fish, Wildlife and Parks
Montana Department of Natural Resources and Conservation

NATIVE AMERICAN TRIBES AND ORGANIZATIONS
Confederated Salish and Kootenai Tribe
Kootenai Tribe of Idaho
Tribal Chair
Environmental Department
Kootenai - Salish Tribal Liaison

INDIVIDUALS
Bass, Rick
Blecher, Mel
Campbell, Mary
Canepa, Sarah
Fuqua, Pam
Hancock, John and Lynn
Glenn, Hayden
Janssen, Sue
Lawson, Brian
Ledbetter, Bob
Loney, John and Mary
Maxwell, Elise
McAfee, Bill And Judy
O'Day, Jeremy
Sedler, Liz
Stehlik, Linda
Wade, H. Lee
Wilson, William
Williams, Noel

Appendix A: Grizzly Project Scoping Comment Disposition

The comments received from the public were reviewed by the District Ranger and Interdisciplinary Team (IDT) to identify significant issues, determine the range of alternatives, and ensure that the environmental analysis will be responsive to public concerns. The following table identifies the commenter, general subject of the comment, the specific comments, and how each comment will be addressed in the environmental analysis. Agency Response/Comment disposition identifies how each comment will be addressed in the analysis, either through the incorporation of Forest Plan standards and guidelines, development of alternative actions, or outside the scope of the analysis (unable to address in this site-specific project). The issue category identifies key issues used in the development of alternatives, and other issues that would be resolved through design criteria, analysis of effects, or current policy, regulation or law.

Summary of Grizzly Disposition of Comments
Proposed Action Scoping, July, 2006

Commenter	Subject	Comment	Agency Response /Comment Disposition	Issue Category
Hayden Glenn	Grizzly Bear habitat Spring use	No activity should occur in the Grizzly IRA in the spring, this area is a known grizzly trysting place in the spring.	All activities will follow the Terms and Conditions identified in the Biological Opinion, which incorporate timing restrictions from April 1 - June 15. No proposed activities would occur during this period.	Other
Hayden Glenn	Public notification	This project should be well coordinated with the folks living in the subdivision just north of the Burnt Dutch road on the east side of the Yaak River.	All adjacent landowners were notified during scoping of the proposed action. Adjacent landowners will be apprised of activities prior to beginning operations. Additional notification will be conducted through personal contacts, notices in local establishments, and mailings.	Other
Hayden Glenn	Cooperative project	This project should be well coordinated with the Yaak Valley Forest council, and the possibility of a cooperative project should be explored.	The Yaak Valley Forest Council was notified of this project, participated in a public field trip to discuss the project, and continue to be involved with the project. Implementation of the project under Stewardship authorities will be considered at the appropriate time.	Other

Summary of Grizzly Disposition of Comments Proposed Action Scoping, July, 2006				
Commenter	**Subject**	**Comment**	**Agency Response /Comment Disposition**	**Issue Category**
Hayden Glenn	Local use	Don't mess with the hucks in the Whitetail drainage! The local folks will be after your scalp if you do!	The prescribed burns proposed (Units B, C, D, E and F) would enhance berry production over time, as the shrubs quickly respond after fire, reinvigorating growth of older decadent plants.	Other
Hayden Glenn	Soils Units 108-116	If I remember right, the area encompassing Units 108 through 116 have some steep, unstable erodable slopes. This shouldn't be a problem, but needs to be taken into consideration when entering the area.	Specific design features to minimize soils impacts are incorporated into the proposed action. Thank you for the specific information. These units are identified for precommercial thinning, which would be accomplished with hand cutting methods. Access to these units will be through walking in from existing open roads. No roads would be opened for access to these units.	Other
Kootenai Tribe of Idaho	Public notification	While we appreciate the opportunity to comment, the information provided doesn't include enough specifics related to project activities nor make a clear case for direct linkage of the project to the Healthy Forest Restoration Act, Watershed Rehabilitation actions, and improvements to Grizzly Bear Habitat (other than it will bring the District closer to meeting road density guidelines by 2009). We do realize more details will be available in the DEIS and are confident that it will more clearly outline the project activities, specific desired outcomes and intent.	This project is not being implemented under the Healthy Forest Restoration Act authorities, but is moving towards more resilient forest conditions. The Draft Environmental Impact Statement (DEIS) will provide further detail than what was included in the scoping notice.	Other
Kootenai Tribe of Idaho	Public notification	The Tribe wishes to be included in the project-specific mailing and will provide further comment at that time	All respondents will be retained on the project-specific mailing list.	Other

Summary of Grizzly Disposition of Comments Proposed Action Scoping, July, 2006				
Commenter	**Subject**	**Comment**	**Agency Response /Comment Disposition**	**Issue Category**
Sarah Canepa - Yaak Valley Forest Council	Grizzly Bear habitat Spring use. Disturbance period between activities	We would like to reiterate our concerns expressed in previous scoping letters about grizzly bears and the preservation of wilderness characteristics in the area. Grizzly Peak and Roderick have long served as a stronghold for the Yaak grizzly bears and therefore we ask that the management guidelines for grizzly bears are held to the highest standards and are given special consideration due to the high concentration of bears in this area. The timing of activities taking place in the Burnt Dutch drainage will be of great importance, such that a corridor for bears is provided at all times. Ideally we would hope to see a year minimum between activities that might impede animal movement across the drainage with no planned activities in the spring. We feel confident that your specialists are taking these issues into consideration and are only reiterating the importance we place on such issues as concerned citizens.	Terms and Conditions in the Biological Opinion will be met. Specific design criteria have been established to reduce disturbance and displacement. Alternative actions will further address this issue.	Key
Sarah Canepa - Yaak Valley Forest Council	Grizzly Bear habitat Unit 40 and road access, adjacent to Inventoried Roadless Area	We have specific concerns about unit 40, which is located at the end of an overgrown, kelly-humped road only moderately infested with weeds. Due to the grizzly activity witnessed near this unit this spring and the evidence of use by grizzly bears in previous years, we wonder whether this 17-acre unit warrants the level of disturbance that will be required to extract this timber. Its close proximity to the IRA makes it an area of high bear use and apparent lack of management for a number of years has made it a desirable place for grizzly bears. We ask that you might reconsider the need and purpose of unit 40 in this light.	This will be considered in an alternative to address concerns regarding impacts to Grizzly Bear habitat, potential for invasive plants increases, and impacts to Inventoried Roadless Area.	Key
Sarah Canepa - Yaak Valley Forest Council	Roadless Areas - wilderness designation	Our organization is working to draft legislation that will allow for wilderness designation for both Grizzly IRA and Roderick IRA, therefore we are concerned about any activities that will take away from the wilderness qualities of both areas and how they affect each other. We discourage the team from management actions that will impact the viewshed of Grizzly IRA as appreciated from Roderick as well as activities that will deter from the wilderness qualities of Roderick.	This will be considered in an alternative to address concerns regarding potential impacts to Inventoried Roadless Areas and visual resources will be discussed in the EIS.	Key

Summary of Grizzly Disposition of Comments Proposed Action Scoping, July, 2006				
Commenter	**Subject**	**Comment**	**Agency Response /Comment Disposition**	**Issue Category**
Sarah Canepa - Yaak Valley Forest Council	Access Management Road 472? Unit 60	Furthermore we would like express our desire to see the portion of the Burnt Dutch road between the Grizzly Peak trailhead and the Sheepherder trailhead closed to motorized use and available for hikers and horseback riders. The closure of this road now, will show foresight in avoiding the human wildlife conflicts that could increase with the development and subdividing that is currently taking place on private land near the Burnt Dutch Junction. We do not wish to see haul traffic traversing the Burnt Dutch road between the Grizzly Trailhead and Sheepherder Trailhead locations and would like to reiterate again that we feel the highest and best use of this old road is as a secure corridor for bears, and to a hiking and horseback section To better accomplish a successful closure of this road and to provide a wildlife corridor for animals seeking to cross the drainage, we would ask that the district reconsider unit 60, the only unit being proposed on this portion of the road.	Closure of this road segment will be considered during the upcoming Forest review of the travel route system. Public comment on the Forest Plan Revision identified high public values to loop roads. The proposed action was specifically designed so as not to change existing public access. Other actions are proposed to meet Grizzly bear standards. Not harvesting unit 60 will be included in an alternative.	Key
Sarah Canepa - Yaak Valley Forest Council	Road decommissioning	We support the decommissioning of roads on the North facing slope of Roderick and the abandoning of roads that will occur there. We feel that the restoration of these watersheds and the decommissioning of these roads with minimal disturbance will serve to enhance the area and the habitat it provides for wildlife.	Comment is noted. Supportive of proposed action.	Other
Sarah Canepa - Yaak Valley Forest Council	Grizzly Bear habitat	While the Grizzly IRA is a consistent producer of huckleberries, this particular area has shown a marked decline in berry production and we would like to see underburning in more areas to help enhance the eventual berry production for grizzly bears.	Additional areas proposed for mechanical fuels reduction will be identified and included in an alternative.	Key
Sarah Canepa - Yaak Valley Forest Council	Roadless Areas - wilderness designation Units 57, 57a	We also have concerns about the need and purpose for units 57&57a and their proximity to the roadless area. Especially because they are currently the only sales being proposed on the Roderick side of the drainage, which might be better left for bears and other wildlife. By reducing ground disturbing activities in this area, apart from a prescribed burning, the project can enhance the solitude that this area provides for wildlife and wilderness advocates who are seeking wilderness designation in this area.	This proposal will be included in an alternative for analysis.	Key

Summary of Grizzly Disposition of Comments Proposed Action Scoping, July, 2006				
Commenter	**Subject**	**Comment**	**Agency Response /Comment Disposition**	**Issue Category**
Sarah Canepa - Yaak Valley Forest Council	Aspen restoration	However, we do support the team's desire to restoring aspen stands and if it can be done effectively through mechanical thinning of encroaching conifers, we might suggest that this technique be utilized in an area that is more easily accessible and less impactful to wildlife in the area. In our excursions into the field we were most supportive of the proposed treatment along road 8021, an accessible road where there are aspen stands adjacent to the road and unit 37. We might suggest that the team evaluate this area for its potential in improving an aspen stand. Additionally the sales proposed along the Clark Mountain road provide abundant opportunities to restore aspen stands through treatment that is currently being proposed for other reasons. Aspens are widespread through out the drainage on both sides and it would be preferable to us that the Roderick side of the drainage remain as wild as possible. It also might be interesting to compare and contrast aspen regeneration attempts with one area protected by an enclosure fence and an adjacent area unprotected.	Other units in this drainage have an aspen component, which would be protected during harvest operations. The proposed harvesting would promote aspen where they currently exist. Aspen browsing damage is beyond the scope of this analysis. Several studies have shown that in areas with high ungulate populations, or cattle, browsing can have a detrimental impact on aspen regeneration. The primary concern in units 57, 57a is the age of the overstory aspen, and the encroaching conifer competition, not browsing.	Key
Sarah Canepa - Yaak Valley Forest Council	Invasive plants Road 8021	The severe weed infestation of road 8021 is an example of a major concern that we have throughout the proposed project. Many of the proposed units show no weed infestation or only a very minor infestation on the edges of the units or in abandoned road beds. Yet the roads leading to these units are heavily infested with hawkweed, daisies and spotted knapweed that would likely lead to the infestation of all disturbed ground. We encourage the team to take a proactive approach that reaches beyond BMP standards to address these seed sources prior to ground disturbing activities. By preventing infestation in future timber sales we hope that the district will save money on future treatments and restore native vegetation in disturbed areas much quicker. We would like to see roadways effectively treated a year or two years consecutively prior to harvest to reduce the spread of weed into harvest units.	Specific design criteria are proposed, as well as a risk assessment/priority strategy to proactively treat weed infestations and reduce future infestations as a result of the proposed activities.	Other

Summary of Grizzly Disposition of Comments Proposed Action Scoping, July, 2006				
Commenter	**Subject**	**Comment**	**Agency Response /Comment Disposition**	**Issue Category**
Sarah Canepa - Yaak Valley Forest Council	Soil erosion Units 49, 50	We are concerned about the results of the Dutch Oven salvage sale that took place in 2004-2005 adjacent to clearcuts that are being proposed in units 49&50. While we like the corridors of regeneration, ground cover and aspen that were left behind, we were disturbed by the skid trails running down the slope that appear to expose an excessive amount of mineral soil. We recognize the team's desire to capture some of the remaining value of the lodgepole that is overmature and unraveling in this area but have concerns as to the manner in which the timber will be extracted. Units 49&50 display a healthy regeneration underneath the mature lodgepole and we would like to see this regeneration retained during harvest. We would also encourage the team to draw unit boundaries that might leave buffer zones in the steeper parts of the unit, where the change in slope is not favorable to skyline use. With leave islands in place, fire danger can still be reduced and these islands of vegetation will serve to slow down erosion into Burnt Creek. These units also demonstrate a significant aspen component that could meet the goals of the team to restore aspen if it is retained.	Specific design features are incorporated to identify and exclude areas that are too steep for ground-based equipment. Skyline harvesting is less impactive on advanced regeneration, and would be used on steeper slopes. Retention of existing regeneration is desired. Where aspen is present, it will be retained and protected from damage to the extent practical.	Key
Sarah Canepa - Yaak Valley Forest Council	Soil erosion	A number of these units are recommending grapple piling for post logging fuels treatment. The use of post-harvest excavators concerns us due to the ground cover it removes to prepare a seed bed for weed infestation. We would rather see underburning used to treat fuels or other methods of dealing with fuels accumulation. In previous projects that we have commented on, we have found ourselves quite pleased with the results post harvesting, but after grapple piling we have been disturbed by the end result. In consideration of soil disturbance, vegetative cover and weed infestation we are eager to explore less impactful options for fuels treatments.	Alternative fuels treatments will be considered in an alternative.	Key
Sarah Canepa - Yaak Valley Forest Council	Retention of live trees	A number of the units currently being proposed for salvage sales also demonstrate significant stands of healthy trees. It has been described to us that these sales are intended only to remove the dead and dying trees but will retain a significant component of the mixed forest type post harvest. We encourage the team to leave a significant overstory component to these units and to maintain the healthy understory that many of them also demonstrate.	Salvage treatments are designed to remove only dead and dying trees, retaining all healthy trees, both in the overstory and understory. Residual tree protection measures would be incorporated into the contract.	Other

Summary of Grizzly Disposition of Comments Proposed Action Scoping, July, 2006				
Commenter	**Subject**	**Comment**	**Agency Response /Comment Disposition**	**Issue Category**
William Wilson	Wildlife habitat	Treatment activities should be scheduled to avoid concurrent activity throughout the project area. Doing so will minimize interfering with wildlife activity - denning, nesting, feeding, travel.	Timing restrictions would be incorporated to meet Grizzly Bear objectives.	Other
William Wilson	Roadless Area Units 57, 57a Units 46, 47	Unit 57 and Unit 57a should be removed from the treatment plan. To disturb this large area adjacent to the Roderick roadless area seems unnecessary, excessive and contradicts one of the goals - avoid fragmenting large patches of seral species trees. There appears to be a large amount of larch in these units and removing them to "promote" aspen growth seems wrong. What blow-down has occurred should be left to a natural or prescribed course of fire/regeneration is these areas. Aspen growth can be "promoted" in other units - 46-47 for example.	This may be considered in an alternative to address concerns regarding potential impacts to Inventoried Roadless Areas	Key
William Wilson	Retention of live trees Units 45a, 48, 49 and 50	Units 45a, 48, 49, and 50 should be salvage logged instead of clear cut. Much regeneration has occurred in these units already and to clear cut the area would destroy seedling and young desired tree species already in place. If the goal is to remove dead/dying/damaged lodge pole pine then salvage logging should meet this goal and leave the landscape in these units much less disturbed.	The units described are primarily lodgepole pine, and these stands are deteriorating rapidly. Removal of dead and dying is the objective of the treatment, which would result in a clearcut condition due to the species composition. Retaining as much of the regeneration is desired, however harvest operations will damage some of these trees.	Other
William Wilson	Fragmentation Units 40, 41, 60	Unit 40, Unit 41 and Unit 60 should be removed from the treatment plan. To disturb the landscape around these isolated units by clear cutting them is unnecessary. Again it would fragment large patches of seral species trees. The areas should be left to a natural or prescribed course of fire/regeneration to restore them.	Units 40 and 60 will be dropped from an alternative to address the concerns. Unit 41 is a deteriorating lodgepole stand adjacent to a large patch of young forest. Treating unit 41 would improve the patch size of young forest.	Key

Summary of Grizzly Disposition of Comments Proposed Action Scoping, July, 2006				
Commenter	**Subject**	**Comment**	**Agency Response /Comment Disposition**	**Issue Category**
William Wilson	Access management/habitat management Road 472	The travel management plan should consider gating Road 472 (Burnt Dutch Rd.) for seasonal closure. This would promote and protect a habitat corridor from the Roderick roadless area to the Grizzly roadless area. There should never be consideration of a motorized vehicle or snowmobile loop from 17-Mile to Yaak.	Closure of this road segment will be considered during the upcoming Forest review of the travel route system. Public comment on the Forest Plan Revision identified high public values to loop roads. The proposed action was specifically designed so as not to change existing public access. Other actions are proposed to meet Grizzly bear standards.	Other
William Wilson	Soil erosion	I appreciate the effort to include mitigation strategies to lessen the impact of treatment on the soil. After viewing the results of the Dutch Oven Salvage project completed last Fall (2005), decompacting skid trails and landing sites, and scattering slash seem good. I hope they occur. They did not in the Dutch Oven project.	Comment noted. Supportive of proposed action	Other
William Wilson	Access management/habitat management	I also appreciate the effort to reduce road densities to improve wildlife habitat. Thank you for those efforts.	Comment noted Supportive of proposed action	Other
William Wilson	Prescribed burning	I support prescribed burning to reduce fuel loads and promote regeneration.	Comment noted. Supportive of proposed action	Other
U.S. Environmental Protection Agency	Analysis procedures	At this early stage in project planning we are transmitting EPA's EIS preparation guidance and scoping comments for your consideration. EPA's intent is to promote full public disclosure of all foreseeable direct, indirect, and cumulative environmental impacts and mitigation, and consistency with environmental and public involvement requirements of State and Federal laws, Executive Orders and policies. We hope this will lead to an improved decision-making process for selecting among alternatives. The twin goals of the National Environmental Policy Act (NEPA) to consider environment effects and inform the public can only be met with clear disclosure of effects of proposed actions on the environment. Our experience has shown that when environmental concerns are thoroughly evaluated, the EIS is a more meaningful document that will lead to better decisions.	Your preparation guidance will be used during the analysis and documentation process.	Other

Summary of Grizzly Disposition of Comments Proposed Action Scoping, July, 2006				
Commenter	**Subject**	**Comment**	**Agency Response /Comment Disposition**	**Issue Category**
U.S. Environmental Protection Agency	Project design	We very much support proposed reduction in watershed damage by decommissioning and abandoning roads and implementing BMPs, since roads are often major anthropogenic source of sediment that affects hydrology, water quality and fisheries in streams on public lands. We also encourage project planning and design that minimizes new road construction; siting of roads away from streams and riparian areas to reduce road impacts upon streams; and maximizes improvements in conditions of existing roads and removal and restoration of roads that are not needed for management or access or which cannot be properly maintained with agency budgets (see recommendations to reduce impacts from roads in our more detailed comments enclosed).	The proposed action brought forward all possible road improvements and access management practices identified in the project level Travel Analysis Process. Site-specific surveys related to sediment production were conducted to identify watershed improvement projects.	Other
U.S. Environmental Protection Agency	Project design	In regard to vegetation management we encourage use of timber harvest methods that minimize ground disturbance and erosion potential (e.g., skyline, helicopter, and logging during winter on snow or frozen ground). We generally favoring understory thinning from below, slashing and prescribed fire for fuels reduction, with retention of large, healthy, fire resistant trees, and adequate snags and woody debris to maintain wildlife habitat and soil productivity.	The project was designed with these considerations. Silviculture diagnosis identified where intermediate treatments could occur to meet management objectives. Retention of large trees, snags and coarse woody debris are incorporated in the project design criteria.	Other
WildWest Institute, The Lands Council, Alliance for the Wild Rockies	Notification of DEIS	Please keep each group on the list to receive the Draft EIS.	Groups will be retained on the mailing list.	Other

Appendix B: Access and Road Management Plan

Road No.	Location	Action	Timing	Reason
Harvest Activity Related Access Management Actions (Committed) No watershed protection measures identified				
595	Jct. 593 Jct.= Junction	Remove berm behind gate, retain existing gate and maintain closure to public. Reinstall berm at end of post harvest activities if needed after monitoring.	During harvest activities	Habitat security, resource protection, Old Growth protection
902	Current barrier on south end of road past Jct. 902Y	Remove barrier, install gate. Closed to public, lock gate on weekends and evenings	Prior to harvest activities	Harvest access, Habitat security
902Y	Jct. 902	Remove berm at 902 junction. Install double earthen berm at end of unit 47 prior to activities. Intermittent Stored Service beyond berm	During and post harvest activities	Harvest and Public Access
902Z	Jct. 902	Remove gate, clear road of brush to end of unit 44. Install double earthen berm at end of unit 44. Intermittent Stored Service beyond berm	Prior to harvest activities	Harvest and Public Access
902B, 14121, 903	Jct. 902	Install double earthen berm Intermittent Stored Service	Prior to harvest or road reconstruction for units 34, 57, 57a	Offset core habitat loss from harvest activities
6715B	West of last stream crossing (MP 1.71) MP=Milepost	Install double earthen berm Intermittent Stored Service	Prior to harvest or road reconstruction for units 34, 57, 57a	Offset core habitat loss from harvest activities
6840, 6840B	Jct. 6840 and 6840B	Install double earthen berm Intermittent Stored Service	Prior to harvest or road reconstruction in Units 1-4	Offset core habitat loss from harvest activities
6084, 6084A, 6084C	Jct. 593	Closed to public, lock gate on weekends and evenings	During harvest activities for units 15, 17, 18 and 20	Elk habitat security, resource protection, Old Growth protection
8021	Jct. 472	Closed to public, lock gate on weekends and evenings	During harvest activities	Habitat security
8021C	Jct. 8021	Clear road of brush, install double earthen barrier at junction at end of harvest activities Intermittent Stored Service	During harvest activities	Harvest access, Habitat security

Road No.	Watershed	Location	Action	Timing	Reason
Harvest Related Watershed Protection BMPs (Committed)					
472	Burnt Tribs	MP 0-11.19	Replace culverts at MP 2.24 and MP 2.32.	Prior to completion of harvest contracts	Watershed Protection
593	Cool	MP 0-12.02	Replace undersized culvert at MP 6.6.	Prior to completion of harvest contracts	Watershed Protection
595	Cool		Replace fish barrier culvert	Prior to completion of harvest contracts	Watershed Protection
902	Little, Pheasant, Burnt Tribs	MP 0-2.71	Add ditch relief and road surface drainage structures, replace culvert, particularly between MP 1.26 and MP 3.41	Prior to harvest activities on this road	Watershed Protection.
902Y	Burnt Tribs	MP 0-3.0	Apply Best Management Practices (BMPs)	Prior to completion of harvest contracts	Watershed Protection
902Z	Burnt Tribs	MP 0-2.89	Apply Best Management Practices (BMPs) - buttress slope	Prior to completion of harvest contracts	Watershed Protection
6084	Lang	MP 0-5.02	Apply Best Management Practices (BMPs)	Prior to completion of harvest contracts	Watershed Protection
6084A	Lang	MP 0-2.17	Apply Best Management Practices (BMPs)	Prior to harvest activities on this road	Watershed Protection
6084C	Lang	MP 0-1.65	Apply Best Management Practices (BMPs) - prevent sediment delivery from operations in Unit 18 via ditch or road surface.	Prior to harvest activities on this road	Watershed Protection
8021	Yaak Tribs, Little, Lucky Gulch	MP 0-3.79	Apply Best Management Practices (BMPs) – Add ditch relief and road surface drainage structures to prevent sediment delivery to stream channels.	Prior to harvest activities on this road	Watershed Protection
8021B	Lucky Gulch	MP 0-0.53	Apply Best Management Practices (BMPs) - protect drainages that are running across road.	Prior to harvest activities on this road	Watershed Protection
Watershed Protection BMPs (When Funding Available)					
435Y	Yaak Trib 21		Remove undersized culvert	Post-decision	Watershed Protection
593	Gus		Replace undersized culvert on lower main Gus Creek	Post-decision	Watershed Protection
902	Little		Add culverts, buttress slopes, armor ditches	Post-decision	Watershed Protection
902	Pheasant		Normal BMPs	Post-decision	Watershed Protection

Road No.#	Watershed	Location	Action	Timing	Reason
Grizzly Bear Habitat and Watershed Rehabilitation Management Actions - Intermittent Stored Service (ISS) (Committed)					
902B	Pheasant	Jct. 902	Install double earthen berm Intermittent Stored Service - remove or armor crossings, stabilize slopes, cross drain	Prior to Harvest Activities	Core and TMRD - Watershed Protection
903	Pheasant	Jct. 902	Install double earthen berm Intermittent Stored Service - remove or armor crossings, stabilize slopes, cross drain	Prior to Harvest Activities	Core and TMRD, Watershed Protection

Road No.	Watershed	Location	Action	Timing	Reason
Intermittent Stored Service - Active Watershed Rehabilitation (When Funding Becomes Available)					
902T	Little	Jct. 902-both ends of road 902T	Install double earthen berm	Post-Decision	Core and TMRD
2374	Cool	Jct. 2355, MP 0-2.65 MP 2.7-3.4	Install double earthen berm remove or armor crossings, stabilize slopes, cross drain Recontour/waterbar	Post-Decision	Core and TMRD Watershed Protection
6100	Burnt	Jct. 6132, MP 0-3.63	Install double earthen berm recontour/waterbar, remove or armor crossings	One Year post-activities in Burnt Creek Watershed	Core and TMRD - Watershed Protection

Road No.	Watershed	Location	Action	Timing	Reason
Decommission - Active Watershed Rehabilitation (When Funding Becomes Available)					
472Z	Burnt	MP 0-0.84	Decommission (active) recontour/waterbar	Post-Decision	Watershed Rehabilitation
902A	Gus	MP 0.42-1.45	Decommission (active) recontour/waterbar	Post-Decision	Watershed Rehabilitation
902D	Pheasant	MP 0-1.35	Decommission (active) recontour/waterbar	Post-Decision	Watershed Rehabilitation
902U	Little	MP 0-0.53	Decommission (active) recontour/waterbar	Post-Decision	Watershed Rehabilitation
902V	Little	MP 0-1.10	Decommission (active) recontour/waterbar	Post-Decision	Watershed Rehabilitation
2374C	Cool	MP 0-0.53	Decommission (active) - recontour/waterbar	Post-Decision	Watershed Rehabilitation
5951	Cool	MP 0-0.76	Decommission (active) -	Post-Decision	Watershed

Road No.	Watershed	Location	Action	Timing	Reason
Decommission - Active Watershed Rehabilitation (When Funding Becomes Available)					
			recontour/waterbar		Rehabilitation
5953	Cool	MP 0-1.31	Decommission (active) - recontour/waterbar	Post-Decision	Watershed Rehabilitation
6084B	Lang	MP 0-1.58	Decommission (active) - recontour/waterbar	Post-Decision	Watershed Rehabilitation
6100	Burnt	MP 3.63-6.01	Decommission (active) - recontour/waterbar	One Year post-activities in Burnt Creek Watershed	Watershed Rehabilitation
6101	Burnt	MP 0-0.69	Decommission (active) - recontour/waterbar	One Year post-activities in Burnt Creek Watershed	Watershed Rehabilitation
6102	Burnt	MP 0-1.21	Decommission (active) - recontour/waterbar	One Year post-activities in Burnt Creek Watershed	Watershed Rehabilitation
6102A	Burnt	MP 0-0.49	Decommission (active) - recontour/waterbar	One Year post-activities in Burnt Creek Watershed	Watershed Rehabilitation
6108	Burnt	MP 3.17-5.57	Decommission (active) - recontour/waterbar	One Year post-activities in Burnt Creek Watershed	Watershed Rehabilitation
6126	Burnt	MP 0-1.40	Decommission (active) - recontour/waterbar	One Year post-activities in Burnt Creek Watershed	Watershed Rehabilitation
6131	Burnt	MP 0-2.70	Decommission (active) - recontour/waterbar	One Year post-activities in Burnt Creek Watershed	Watershed Rehabilitation
6131A	Burnt	MP 0-0.4	Decommission (active) - recontour/waterbar	One Year post-activities in Burnt Creek Watershed	Watershed Rehabilitation
6132C	Burnt	MP 0-0.89	Decommission (active) - recontour/waterbar	One Year post-activities in Burnt Creek Watershed	Watershed Rehabilitation
6132D	Burnt	MP 0.10-0.40	Decommission (active) - recontour/waterbar	One Year post-activities in Burnt Creek Watershed	Watershed Rehabilitation
6132	Burnt	MPs 1.34-3.48 and 4.13-4.27	Decommission, convert to trail (trail #189) - recontour/waterbar	One Year post-activities in Burnt Creek Watershed	Watershed Restoration
6132	Burnt	MP 3.48-4.13	Decommission (active) - recontour/waterbar	One Year post-activities in Burnt Creek Watershed	Watershed Rehabilitation
6132D	Burnt	MP 0-0.1	Decommission, convert to trail (trail #189) - recontour/waterbar	One Year post-activities in Burnt Creek Watershed	Watershed Rehabilitation
6136	Burnt	MP 0-2.20	Decommission (active) - recontour/waterbar	One Year post-activities in Burnt Creek Watershed	Watershed Rehabilitation
6139	Burnt	MP 0-1.14	Decommission (active) - recontour/waterbar	One Year post-activities in Burnt Creek Watershed	Watershed Rehabilitation
16135	Yaak Trib	MP 0-0.98	Decommission (active) - recontour/waterbar	Post-Decision	Watershed Rehabilitation

Road No.	Watershed	Location	Action	Timing	Reason
Decommissioning - Passive (Abandon)					
902K	Pheasant	MP 0-1.4	decommission (passive)	Post-decision	Unneeded
903C	Yaak Trib	MP 0-0.6	decommission (passive)	Post-decision	Unneeded
904A	Yaak Trib	MP 0-0.1	decommission (passive)	Post-decision	Unneeded
904B	Yaak Trib	MP 0-0.5	decommission (passive)	Post-decision	Unneeded
6100A	Burnt	MP 0-0.9	decommission (passive)	Post-decision	Unneeded
6100B	Burnt	MP 0-1.2	decommission (passive)	Post-decision	Unneeded
6100C	Burnt	MP 0-0.6	decommission (passive)	Post-decision	Unneeded
6126	Burnt	MP 1.4-1.9	decommission (passive)	Post-decision	Unneeded
6126A	Burnt	MP 0-0.2	decommission (passive)	Post-decision	Unneeded
6131A	Burnt	MP 0.4-0.9	decommission (passive)	Post-decision	Unneeded
6131B	Burnt	MP 0-0.4	decommission (passive)	Post-decision	Unneeded
6131C	Burnt	MP 0-0.3	decommission (passive)	Post-decision	Unneeded
6132	Burnt	MP 4.3-5.6	decommission (passive)	Post-decision	Unneeded
6132A	Burnt	MP 0-0.7	decommission (passive)	Post-decision	Unneeded
6132B	Burnt	MP 0-1.3	decommission (passive)	Post-decision	Unneeded
6132D	Burnt	MP 0.4-0.7	decommission (passive)	Post-decision	Unneeded
6132E	Burnt	MP 0-0.2	decommission (passive)	Post-decision	Unneeded
6132H	Burnt	MP 0-0.2	decommission (passive)	Post-decision	Unneeded
6136	Burnt	MP 2.2-2.7	decommission (passive)	Post-decision	Unneeded
6136A	Burnt	MP 0-0.4	decommission (passive)	Post-decision	Unneeded
6136B	Burnt	MP 0-0.6	decommission (passive)	Post-decision	Unneeded
6136C	Burnt	MP 0-0.9	decommission (passive)	Post-decision	Unneeded
6136D	Burnt	MP 0-0.4	decommission (passive)	Post-decision	Unneeded
6137	Burnt	MP 0-0.4	decommission (passive)	Post-decision	Unneeded
11902	Pheasant	MP 0-0.8	decommission (passive)	Post-decision	Unneeded
11902A	Pheasant	MP 0-0.5	decommission (passive)	Post-decision	Unneeded
11904	Pheasant	MP 0-0.2	decommission (passive)	Post-decision	Unneeded
14124	Pheasant	MP 0-0.2	decommission (passive)	Post-decision	Unneeded
14127	Pheasant	MP 0-0.3	decommission (passive)	Post-decision	Unneeded
16130	Burnt	MP 0-0.2	decommission (passive)	Post-decision	Unneeded
16131	Burnt	MP 0-0.2	decommission (passive)	Post-decision	Unneeded
16132	Burnt	MP 0-0.2	decommission (passive)	Post-decision	Unneeded

Road Access Actions - Motorized Use Designation				
Road No.	**Location**	**Action**	**Timing**	**Reason**
68	MP 32.84-36.00	Designate open for highway vehicle motorized use	Upon decision	Motorized use designation
338	MP 0-2.57	Designate open for highway vehicle motorized use	Upon decision	Motorized use designation
435	MP 30.51-31.98	Designate open for highway vehicle motorized use	Upon decision	Motorized use designation
524	MP 0-0.60	Designate open for highway vehicle motorized use	Upon decision	Motorized use designation
591	MP 0-2.53	Designate open for highway vehicle motorized use	Upon decision	Motorized use designation
595	MP 6.2-6.39	Designate open for highway vehicle motorized use	Upon decision	Motorized use designation
745	MP 0-4.20	Designate open for highway vehicle motorized use	Upon decision	Motorized use designation
902	MP 10.99-15.77	Designate open for highway vehicle motorized use	Upon decision	Motorized use designation
2355	MP 0-0.13	Designate open for highway vehicle motorized use	Upon decision	Motorized use designation
5932	MP 0-5.26	Designate open for highway vehicle motorized use	Upon decision	Motorized use designation
5954	MP 0-5.07	Designate open for highway vehicle motorized use	Upon decision	Motorized use designation
5955	MP 0-0.55	Designate open for highway vehicle motorized use	Upon decision	Motorized use designation
6100	MP 0-0.11	Designate open for highway vehicle motorized use	Upon decision	Motorized use designation
6132	MP 0-1.34	Designate open for highway vehicle motorized use	Upon decision	Motorized use designation
6723	MP 0-0.65	Designate open for highway vehicle motorized use	Upon decision	Motorized use designation
6812	MP 0-0.81	Designate open for highway vehicle motorized use	Upon decision	Motorized use designation
6814	MP 0-0.87	Designate open for highway vehicle motorized use	Upon decision	Motorized use designation
6815	MP 0-0.95	Designate open for highway vehicle motorized use	Upon decision	Motorized use designation
14140	MP 0-0.55	Designate open for highway vehicle motorized use	Upon decision	Motorized use designation
6815A	MP 0-0.25	Designate open for highway vehicle motorized use	Upon decision	Motorized use designation
472	MP 0-11.19	Designate open for highway vehicle motorized use	Upon decision	Motorized use designation
593	MP 0-12.02	Designate open for highway vehicle motorized use	Upon decision	Motorized use designation
902	MP 0-2.71	Designate open for highway vehicle motorized use	Upon decision	Motorized use designation

Trail Access Actions Motorized Use Designation				
Trail No. Name	**Location**	**Action**	**Timing**	**Reason**
19 Sheepherder	10.33 miles	Designate Non-motorized use, Foot and Stock use	Upon decision	Motorized use designation
160 Baldy Mtn. Lookout	3.88 miles	Designate Non-motorized use, Foot and Stock use	Upon decision	Motorized use designation
179 Baldy Buckhorn	1.07 miles	Designate Non-motorized use, Foot and Stock use	Upon decision	Motorized use designation
180 Baldy Spring	0.65 miles	Designate Non-motorized use, Foot and Stock use	Upon decision	Motorized use designation
182 Grizzly	7.82 miles	Designate Non-motorized use, Foot and Stock use	Upon decision	Motorized use designation
189 Roderick Mtn.	3.47 miles	Designate Non-motorized use, Foot and Stock use	Upon decision	Motorized use designation
193 Pleasant View / Independence	6.36 miles	Designate Non-motorized use, Foot and Stock use	Upon decision	Motorized use designation
547 Independence Ck.	5.22 miles	Designate Non-motorized use, Foot and Stock use	Upon decision	Motorized use designation

Appendix C: Alternative-Specific Unit Treatments

Alternative 2 Specific Unit Treatments

Unit	MA	Acres	Alternative 2 Actions	Logging System	Slashing	fuels
01	11	17	clearcut w/reserves	Tractor	slashing	underburn
02	11	16	clearcut w/reserves	Tractor	slashing	underburn
03	11	20	clearcut w/reserves	Tractor	slashing	spot grapple
04	11	20	seedtree w/reserves	Tractor	slashing	grapple
10	12	9	clearcut w/reserves	Tractor	slashing	grapple
11	12	17	seedtree w/reserves	Tractor	slashing	grapple
12	12	7	seedtree w/reserves	Tractor	slashing	grapple
12a	12	19	seedtree w/reserves	Tractor	slashing	grapple
13	12	39	clearcut w/reserves	Tractor/Winter	slashing	underburn
13a	12	24	clearcut w/reserves	Tractor/Winter	slashing	underburn
15	12	33	thinning	Tractor/Winter		underburn
17	11	163	thinning	Tractor		grapple
18	12	28	clearcut w/reserves	Tractor/Winter	slashing	underburn
20	12	34	thinning	Tractor/Winter		underburn
31	14	5	thinning	Skyline		grapple
32	14	40	clearcut w/reserves	Tractor	slashing	grapple
33	14	20	clearcut w/reserves	Skyline	slashing	grapple
34	14	98	thinning	Helicopter		lop and scatter
36	14	13	seedtree w/reserves	Skyline	slashing	grapple
36a	14	8	seedtree w/reserves	Tractor	slashing	grapple
37	11	64	thinning	Tractor		grapple
40	11	17	seedtree w/reserves	Tractor	slashing	grapple
42	11	36	thinning	Tractor		grapple
43	11	63	thinning	Tractor		grapple
44	11	18	seedtree w/reserves	Skyline	slashing	lop and scatter/jackpot
45	11	10	clearcut w/reserves	Tractor	slashing	grapple
45a	11	20	clearcut w/reserves	Skyline	slashing	lop and scatter/jackpot
46	11	15	clearcut w/reserves	Skyline	slashing	grapple
47	11	13	thinning	Skyline		lop and scatter
49	11	40	clearcut w/reserves	Tractor	slashing	grapple
50	11	86	clearcut w/reserves	Skyline/Helicopter	slashing	grapple
55 (all)	14	170	salvage	Skyline		lop and scatter
57	14	69	release	Helicopter		lop and scatter
57a	14	15	release	Helicopter		lop and scatter
60	14	40	seedtree w/reserves	Tractor	slashing	grapple
100	11	15	precommercial thin			lop and scatter
101	11	24	precommercial thin			lop and scatter
102	11	16	precommercial thin			lop and scatter
103	12	37	precommercial thin			lop and scatter
104	12	36	precommercial thin			lop and scatter
105	12	6	precommercial thin			lop and scatter
106	12	4	precommercial thin			lop and scatter
107	12	22	precommercial thin			lop and scatter
108	12	64	precommercial thin			lop and scatter
109	12	23	precommercial thin			lop and scatter

Unit	MA	Acres	Alternative 2 Actions	Logging System	Slashing	fuels
110	15	36	precommercial thin			lop and scatter
111	12	27	precommercial thin			lop and scatter
112	21	11	precommercial thin			lop and scatter
113	12	44	precommercial thin			lop and scatter
114	12	31	precommercial thin			lop and scatter
115	12	26	precommercial thin			lop and scatter
116	12	27	precommercial thin			lop and scatter
117	11	1	precommercial thin			lop and scatter
118	14	2	precommercial thin			lop and scatter
119	14	9	precommercial thin			lop and scatter
120	11	30	precommercial thin			lop and scatter
121	11	24	precommercial thin			lop and scatter
Burn B	11	49	ecosystem burn		slashing	
Burn C	11	27	ecosystem burn		slashing	
Burn D	11	60	ecosystem burn		slashing	
Burn E	11	62	ecosystem burn		slashing	
Burn F	11	52	ecosystem burn		slashing	
Burn G	2	104	wildlife burn			
Burn G	11	129	wildlife burn			
Burn H	2	186	wildlife burn			
Burn I	10	49	wildlife burn			

Alternative 3 Specific Unit Treatments

Unit	MA	Acres	Alternative 3 Actions	Logging System	Slashing	Fuels treatment
01	11	17	clearcut w/reserves	Tractor	slashing	underburn
02	11	16	clearcut w/reserves	Tractor	slashing	underburn
03	11	20	clearcut w/reserves	Tractor	slashing	spot grapple
04	11	20	seedtree w/reserves	Tractor	slashing	grapple
10	12	9	clearcut w/reserves	Tractor	slashing	grapple
11	12	17	seedtree w/reserves	Tractor	slashing	grapple
12	12	7	seedtree w/reserves	Tractor	slashing	grapple
12a	12	19	seedtree w/reserves	Tractor	slashing	grapple
13	12	39	clearcut w/reserves	Tractor/Winter	slashing	underburn
13a	12	24	clearcut w/reserves	Tractor/Winter	slashing	underburn
15	12	33	thinning	Tractor/Winter		underburn
17	11	107	thinning	Tractor		underburn
17a	11	56	thinning	Tractor		grapple
18	12	28	clearcut w/reserves	Tractor/Winter	slashing	underburn
20	12	34	thinning	Tractor/Winter		underburn
31	14	5	thinning	Skyline		lop and scatter
32	14	40	clearcut w/reserves	Tractor	slashing	grapple
33	14	20	clearcut w/reserves	Skyline	slashing	grapple
34	14	98	thinning	Helicopter		lop and scatter
36	14	13	seedtree w/reserves	Skyline	slashing	underburn
36a	14	8	seedtree w/reserves	Tractor	slashing	underburn
37	11	64	thinning	Tractor	slashing	underburn
42	11	36	thinning	Tractor		lop and scatter
43	11	63	thinning	Tractor		lop and scatter

Unit	MA	Acres	Alternative 3 Actions	Logging System	Slashing	Fuels treatment
44	11	18	seedtree w/reserves	Skyline	slashing	lop and scatter/jackpot
45	11	10	clearcut w/reserves	Tractor	slashing	underburn
45a	11	20	clearcut w/reserves	Skyline	slashing	lop and scatter/jackpot
46	11	15	clearcut w/reserves	Skyline	slashing	grapple
47	11	13	thinning	Skyline		lop and scatter
49	11	20	clearcut w/reserves	Skyline	slashing	lop and scatter
50	11	20	clearcut w/reserves	Skyline	slashing	lop and scatter
50a	11	19	clearcut w/reserves	Helicopter	slashing	lop and scatter
55 (all)	14	171	salvage	Skyline		lop and scatter
61	11	25	defensible space	Tractor	slashing	grapple/handpile
100	11	15	precommercial thin			lop and scatter
101	11	24	precommercial thin			lop and scatter
102	11	16	precommercial thin			lop and scatter
103	12	37	precommercial thin			lop and scatter
104	12	36	precommercial thin			lop and scatter
105	12	6	precommercial thin			lop and scatter
106	12	4	precommercial thin			lop and scatter
107	12	22	precommercial thin			lop and scatter
108	12	64	precommercial thin			lop and scatter
109	12	23	precommercial thin			lop and scatter
110	15	36	precommercial thin			lop and scatter
111	12	27	precommercial thin			lop and scatter
112	21	11	precommercial thin			lop and scatter
113	12	44	precommercial thin			lop and scatter
114	12	31	precommercial thin			lop and scatter
115	12	26	precommercial thin			lop and scatter
116	12	27	precommercial thin			lop and scatter
117	11	1	precommercial thin			lop and scatter
118	14	2	precommercial thin			lop and scatter
119	14	9	precommercial thin			lop and scatter
120	11	30	precommercial thin			lop and scatter
121	11	24	precommercial thin			lop and scatter
Burn B	11	49	ecosystem burn		slashing	
Burn C	11	27	ecosystem burn		slashing	
Burn D	11	60	ecosystem burn		slashing	
Burn E	11	62	ecosystem burn		slashing	
Burn F	11	52	ecosystem burn		slashing	
Burn G	2	104	wildlife burn			
Burn G	11	129	wildlife burn			
Burn H	2	186	wildlife burn			
Burn I	10	49	wildlife burn			

Appendix D: Best Management Practices

Introduction

Federal agency compliance with pollution control is addressed through Section 313 of the Clean Water Act, Executive Order 12580 (January 23, 1987), National Nonpoint Source Policy (December 12, 1984), USDA Nonpoint Source Water Quality Policy (December 5, 1986) and the Environmental Protection Agency in their guidance "Nonpoint Source Controls and Water Quality Standards" (August 19, 1987). In order to comply with State and local non-point pollution controls the Forest Service will apply Best Management Practices (BMPs) to all possible non-point sources that may result from management activities proposed in this DEIS. These BMPs are the Soil and Water Conservation Practices described in the Forest Service Handbook (FSH) 2509.22.

BMPs are the primary mechanism for achievement of water quality standards (EPA 1987). This appendix describes the Forest Service's BMP process in detail, and lists the key Soil and Water Conservation Practices that have been selected to be used in the action alternatives analyzed in this DEIS. BMPs include, but are not limited to, structural, and non-structural controls, operations, and maintenance procedures. BMPs can be applied before, during, or after pollution-producing activities to reduce or eliminate the introduction of pollutants into the receiving watershed (40 CFR 130.2, EPA Water Quality Standards Regulation). BMPs are usually applied as a system of practices rather than a single practice. They are selected on the basis of site-specific conditions that reflect natural background conditions and political, social, economic, and technical feasibility.

The Forest Plan states that soil and water conservation practices, as outlined in the Soil and Water Conservation Practices Handbook (FSH 2509.22, May 1988), will be incorporated into all land use project plans as a principal mechanism for controlling non-point pollution sources, meeting soil and water quality goals, and protecting beneficial uses. Activities found not to comply with the soil and water conservation practices or State standards will be brought into compliance, modified, or stopped (USDA Forest Service, 1987a, pp. 11-23). Montana State Water Quality Standards require the use of reasonable land, soil, and water conservation practices (analogous to BMPs) as the controlling mechanism for non-point pollution. The use of BMPs is also required in the Memorandum of Understanding between the Forest Service and the State of Montana as part of the agency's responsibility as the designated water quality management agency on National Forest System lands.

BMP Implementation Process

In cooperation with the State, the Forest Service's primary strategy for the control of non-point sources of pollution is based on the implementation of preventive practices (i.e., BMPs). The BMPs have been designed and selected to protect the identified beneficial uses of the watershed.

The Forest Service non-point source management system consists of the following steps:

1) <u>BMP Selection and Design</u> - Water quality goals are identified in the Forest Plan. These goals meet or exceed applicable legal requirements including State water quality regulations, the Clean Water Act, and the National Forest Management Act. Environmental assessments for projects are tiered to Forest Plans using the National Environmental Policy Act process. The appropriate BMPs are selected for each project by an interdisciplinary team. In each new location, there is flexibility to design different BMPs depending on local conditions and values and downstream beneficial uses of water. The BMP selection and design are dictated by the proposed activity,

water quality objectives, soils, topography, geology, vegetation, and climate. Environmental impacts and water quality protection options are evaluated, and alternative mixes of practices are considered. A final collection of practices are selected that not only protect water quality but meet other resource needs. These final selected practices constitute the BMPs for the project.

2) BMP Application - The BMPs are translated into contract provisions, special use permit requirements, project plan specifications, and so forth. This ensures that the operator or person responsible for applying the BMPs actually is required to do so. Site-specific BMP prescriptions are taken from plan-to-ground by a combination of project layout and resource specialists (hydrology, fisheries, soils, etc.). This is when final adjustments to fit BMP prescriptions to the site are made.

3) BMP Monitoring - When the resource activity begins (e.g., timber harvest or road building), timber sale administrators, engineering representatives, resource specialists, and others ensure the BMPs are implemented according to plan. BMP implementation monitoring is done before, during, and after resource activity implementation. This monitoring answers the question: Did we do what we said we were going to do? Once BMPs have been implemented, further monitoring is done to evaluate if the BMPs are effective in meeting management objectives and protecting beneficial uses. If monitoring indicates that water quality standards are not being met or beneficial uses are not being protected, corrective action will consider the following:

> Is the BMP technically sound? Is it really best or is there a better practice that is technically sound and feasible to implement?
>
> Was the BMP applied entirely as designated? Was it only partially implemented? Were personnel, equipment, funds, or training lacking which resulted in inadequate or incomplete implementation?
>
> Do the parameters and criteria that constitute water quality standards adequately reflect human-induced changes to water quality and beneficial uses?

4) Feedback - Feedback on the results of BMP evaluation is both short- and long-term in nature. Where corrective action is needed, immediate response will be undertaken. This action may include: modification of the BMP, modification of the activity, ceasing the activity, or possibly modification of the State water quality standard. Cumulative effects over the long-term may also lead to the need for possible corrective actions.

KNF BMP SELECTION AND DESIGN FORM (KNF-BMP-1) (Revised 11/06 for D-4)

Site-specific Best Management Practices. Description of the soil and water conservation practices from the Forest Service Soil and Water Conservation Handbook (FSH 2509.22) will be applied in all alternatives. The location where the practices will be applied is specified in the table below. For a more detailed description of a specific BMP, refer to the Soil and Water Conservation Handbook.

Abbreviations used in this table:

SPS = Special Project Specification
TSC = Timber Sale Contract
TSA = Timber Sale Administrator
SMZ = Streamside Management Zone
IDT = Interdisciplinary Team
SWCP = Soil and Water Conservation Practice
KNF = Kootenai National Forest
PSF = Pre-sale Forester
ER = Engineering Representative
COR = Contracting Officer's Representative
SAM = Sale Area Map
RHCA = Riparian Habitat Conservation Area

SWCP	SWCP Objective	Applicable Units/Roads	Considerations For Best Management Practices	Recommended Best Management Practices By IDT/TSA	Person(S) Responsible	Contract Provisions
14.01	TIMBER SALE PLANNING - To incorporate soil and water resource considerations into Timber Sale Planning	All Units	IDT evaluates watershed characteristics and estimated response to proposed activities. EIS identifies design criteria to protect soil and water resources. Timber sale contracts will include provisions to meet water quality, soils, and other resources as directed by the Decision.	1. Unit design, design features, and effects analysis was done by IDT. 2. TSC will be prepared by PSF that will include management constraints and Design Criteria from EIS. 3. Default RHCAs are required. No modifications are proposed. 4. Use exiting skid trails in units with previous harvest.	IDT; PSF	N/A
14.02	TIMBER HARVEST UNIT DESIGN - To insure that timber harvest unit design will secure favorable conditions of water flow, maintain water quality and soil productivity, and reduce soil erosion and sedimentation.	All Units	Proposed activities were evaluated to estimate the potential watershed response. Prescriptions will be designed to assure an acceptable level of protection for soil and water resources. Management will protect soil/water values by avoiding sensitive areas, adjusting unit boundaries, adding specific BMPs to meet specific SWCPs, implementing the KNF Riparian Area Guidelines, applying mitigation, and applying implementation/effectiveness monitoring.	1. Cumulative effects analysis and unit design were performed by IDT. 2. The prescriptions and unit design are consistent with direction outlined in the considerations for Best Management Practices.	IDT	N/A
14.03	USE OF SALE AREA MAPS (SAMs) FOR DESIGNATING SOIL AND WATER PROTECTION NEEDS - To delineate the location of protected areas and available water sources and insure their recognition, proper consideration, and protection on the ground.	All Units	The IDT will identify water courses to be protected, unit boundaries, and other features required by other means such as "C" provisions. Ground verification and preparation of SAMs to be included in TSC will be done by PSF. TSA reviews areas of concern with purchaser before operations.	1. Water courses are identified and protected using default RHCA widths. No harvest or slash disposal activities will occur within designated RHCAs. 2. No equipment will be allowed in RHCAs except for designated temporary road or skid trail construction.	IDT; PSF; TSA	B(T)1.1 B(T)6.5 C(T)6.50#
14.04	LIMITING THE OPERATION PERIOD OF TIMBER SALE ACTIVITIES - To minimize soil erosion, sedimentation, and a loss in soil productivity by insuring that the purchaser conducts his/her operations in a timely manner.	Units 13, 13a, 15, 18, 20 will be harvested on frozen ground to protect soils. Units 3 and 40 will be harvested on dry ground.	If limited operating periods are identified and recommended during the analysis by the IDT, the PSF will prepare a contract that includes provision C(T)6.316 and/or C(T)6.4#. Activities include harvesting and mechanical slash treatment.	1. Units located on soils sensitive to disturbance have been identified. 2. Activities in these units will occur during dry, frozen, or snow-covered conditions.	IDT; PSF; TSA	B(T)6.31 B(T)6.311 B(T)6.6 C(T)6.6 C(T)6.316# C(T)6.4#

SWCP	SWCP Objective	Applicable Units/Roads	Considerations For Best Management Practices	Recommended Best Management Practices By IDT/TSA	Person(S) Responsible	Contract Provisions
14.05	PROTECTION OF UNSTABLE AREAS - To protect unstable areas and avoid triggering mass movements of the soil mantle and resultant erosion and sedimentation.	All Units	If the NEPA analysis concluded that soils/geology in the area were unstable, BMPs would be designed to prevent irreversible soil and water damage. Landslide-prone areas are protected as RHCAs. TSA will inform Hydrologist and PSF if it appears logging operations may cause a mass failure.	No unstable zones were found within proposed units.	Hydrologist; PSF; TSA	C(T)6.4#
14.06	RIPARIAN AREA DESIGNATION - To minimize the adverse effects on riparian areas with prescriptions that manage nearby logging and related land disturbance activities.	All Units	All streams and wetlands in the decision area will comply with the Forest Plan and the State SMZ law. These features and appropriate boundaries will be included on the sale area map and marked on the ground. This information will be included in the timber sale contract.	1. Default RHCA widths are required.	IDT; PSF; TSA	B(T)1.1 B(T)6.5, C(T)6.4# C(T)6.41# C(T)6.50#
14.07	DETERMINING TRACTOR-LOGGABLE GROUND - To protect water quality from degradation caused by tractor logging ground disturbance.	All Units	IDT identifies tractor ground (in conjunction with personnel from timber operations) during transportation and timber sale planning process. Slopes in tractor units should generally be less than 40%. PSF will prepare a TSC that includes provisions stating areas and conditions under which tractors can operate.	1. Tractor units were identified during the planning process. 2. Those areas found not to be appropriate for tractor logging were designated as cable or helicopter. 3. See 14.04 for seasonal restrictions.	IDT; PSF	N/A
14.08	TRACTOR SKIDDING DESIGN - To minimize erosion and sedimentation and protect soil productivity by designing skidding patterns to best fit the terrain.	All Units	PSF proposes feasible harvest plan for each unit that meets Forest Plan standards and guidelines and minimizes adverse impacts to soil resources. PSF reviews difficult or complex situations with TSA during planning. TSA approves all skidding operations after consideration of which design will yield the least impact to the soil resource. IDT documents in layout notes. TSA adheres to plan on the ground or reviews with PSF if additional problems are encountered.	Areas of concern and proposed plan of operations are documented in the layout notes by the PSA and Hydrologist. Skid trails will be spaced a minimum of 75 -100 feet apart except where converging at landings. Skid trails will be placed on slopes less than 35%, with only minor pitches of 40% where not able to avoid.	IDT; TSA; Hydrologist	B(T)6.422 C(T)6.4#
14.09	SUSPENDED LOG YARDING IN TIMBER HARVESTING - To protect the soil from excessive disturbance and accelerated erosion and maintain the integrity of the riparian areas and other sensitive areas.	All Skyline Units	If cable logging occurs through riparian areas, full suspension will be required. These areas will be identified by the IDT and requirements enforced by the SA.	No skyline corridors through riparian areas are planned.	IDT; PSF; TSA	B(T)6.42 C(T)6.4# C(T)6.50#

SWCP	SWCP Objective	Applicable Units/Roads	Considerations For Best Management Practices	Recommended Best Management Practices By IDT/TSA	Person(S) Responsible	Contract Provisions
14.10	LOG LANDING LOCATION AND DESIGN - To locate in such a way as to avoid soil erosion and water quality degradation.	All Units	TSA must agree to landing locations proposed by the purchaser. Approved landing locations will meet the criteria of: minimal size, least excavation needed, no side-cast material into sensitive areas, and have proper drainage.	TSA will not permit side cast of material into RHCAs or generally on slopes greater than 50%.	TSA	B(T)6.422 C(T)6.422
14.11	LOG LANDING EROSION PREVENTION AND CONTROL- To reduce erosion and subsequent sedimentation from log landing through the use of mitigating measures.	All Units	PSA and ER will consult on designing road BMP work so as to install cross drainage in appropriate location in vicinity of unit so as to prevent sedimentation in streams. TSA assess what is necessary to prevent erosion and takes necessary action to prevent protect soil and water resources during operations including temporary construction of drainage structures.	Landings will be scarified, seeded and fertilized upon completion harvest activities.	PSF; TSA	CT6.6 BT6.64 BT6.6
14.12	EROSION PREVENTION AND CONTROL MEASURES DURING THE TIMBER SALE OPERATION - To ensure that the purchaser's operations shall be conducted reasonably to minimize soil erosion.	All Units	PSF sets purchaser's responsibility to prevent soil/water resource damage in TSC. TSA ensures that erosion control is kept current and prevents operation when excessive impacts are possible. TSA shuts down operations when unacceptable resource damage is occurring.	Designated units have seasonal restrictions (see 14.04).	PSF; TSA	B(T)6.6 B(T)6.64 C(T)6.6 C(T)6.601# C(T)6.633# B(T)6.661
14.14	REVEGETATION OF AREAS DISTURBED BY HARVEST ACTIVITIES - To establish a vegetative cover on disturbed areas to prevent erosion and sedimentation.	All Units	IDT establishes vegetation and fertilizer mix to be used in the project area with outlines on the extent to which it should be used. PSF puts in contract. TSA is responsible for seeing that revegetation work required by purchaser is done correctly and in a timely manner.	On roadways and landings seed and fertilize disturbed areas with KNF approved seed and fertilizer mix for roads. On temporary roads and skid trails within units seed and fertilize only where specified or where natural vegetation and slash do not appear adequate for erosion control. In these cases use KNF approved mix for skid trails.	IDT; PSF; TSA	C(T)6.01# C(T)6.633#

SWCP	SWCP Objective	Applicable Units/Roads	Considerations For Best Management Practices	Recommended Best Management Practices By IDT/TSA	Person(S) Responsible	Contract Provisions
14.15	EROSION CONTROL ON SKID TRAILS - To protect water quality by minimizing erosion and sedimentation derived from skid trails.	All Units	IDT will identify areas where special concerns need to be addressed, such as harvesting in fire salvage situations. Erosion control measures may be recommended by the IDT, but site-specifically adjusted by the TSA. TSA will ensure erosion control is kept current and installed before winter. Maintenance of erosion control structures by the purchaser may be necessary and requested by the TSA.	IDT recommends that slash be pulled across trails and lightly tamped into the ground so as to trap runoff in lieu of waterbars. Use waterbars where slash is unavailable or inadequate.	IDT; PSF; TSA	C(T)6.6 B(T)6.6 B(T)6.64 B(T)6.65 B(T)6.66
14.17	STREAM CHANNEL PROTECTION (IMPLEMENTATION AND ENFORCEMENT) - Protect natural stream flows; provide unobstructed passage of flows; reduce sediment input; and restore flow if diverted by timber sale activity.	All Units	IDT has identified the location of channels in the decision area. PSF will prepare a SAM locating the channels needing protection. Layout crew marks boundaries and trees according to HB-731 and FP guidelines. TSA will review any proposed stream channel crossings by skid trails or temporary roads with hydrologist. TSA will see that TSC items are carried out on the ground.	1. Default RHCA widths apply. 2. No equipment is allowed within RHCAs except for designated skid trails or temporary road crossings.	IDT; PSF; TSA	B(T)1.1 B(T)6.5 B(T)6.6 C(T)6.50# C(T)6.6
14.18	EROSION CONTROL STRUCTURE MAINTENANCE - To insure that constructed erosion control structures are stabilized and working effectively.	All Units	TSA ensures contract compliance.		TSA	B(T)6.67
14.19	ACCEPTANCE OF TIMBER SALE EROSION CONTROL MEASURES BEFORE SALE CLOSURE - To assure the adequacy of required erosion control work on timber sales.	All Units	TSA reviews erosion control work in each harvest unit for implementation and effectiveness. Erosion control measures are not considered acceptable if they do not meet standards or do not protect soil/water values. TSA documents acceptance of erosion control features in daily diary. TSA informs IDT where problems with effective implementation are encountered.		TSA	B(T)6.36
14.20	SLASH TREATMENT IN SENSITIVE AREAS - To protect water quality by protecting sensitive tributary areas from degradation that would result from using mechanized equipment for slash disposal.	All Units	All activities will comply with the KNF Forest Plan and State SMZ law. Mechanical fuels treatments should not be prescribed for areas with slopes greater than 45%. TSA will not permit piling operations if high soil moistures will result in rutting. Prescribed burning ignition will not occur within RHCAs.	Mechanical piling is limited to units with slopes less than 45%. No piling or equipment is permitted within RHCAs.	IDT; TSA	B(T)6.5 C(T)6.50# B(T)6.7 C(T)6.7 C(T)6.71 C(T)6.753

SWCP	SWCP Objective	Applicable Units/Roads	Considerations For Best Management Practices	Recommended Best Management Practices By IDT/TSA	Person(S) Responsible	Contract Provisions
14.22	MODIFICATION OF THE TSC - To modify the TSC if new circumstances or conditions indicate the timber sale will cause irreversible damage to soil, water, or watershed values.	All Units	If TSC is not adequate to protect soil/water resources, the TSA and Contracting Officer are responsible for recommending modification of the TSC. IDT will be consulted on problem and proposed remedy.		TSA; Contracting Officer; IDT	B(T)8.3
15.01	GENERAL GUIDELINES FOR TRANSPORTATION PLANNING - To introduce soil and water resource considerations into transportation planning.	All Roads	Complete or update roads analysis. The IDT evaluates watershed characteristics and response of soil and water resources to proposed transportation alternatives and activities. IDT identifies priority road-related work. Engineering works with specialists on BMP design for sites of special concern and implements BMP work according to Decision.	IDT completed project specific roads analysis, identifying specific BMP needs, decommissioning work, and priorities specified in the design features of the alternatives.	IDT; ER	N/A
15.02	GENERAL GUIDELINES FOR THE LOCATION AND DESIGN OF ROADS AND TRAILS - To locate and design roads and trails with minimal soil and water impact while considering all design criteria.	All New Temporary Roads	The IDT has insured that the location and design of roads and trails are based on multiple resource objectives. Mitigation measures have been designed to protect the soil and water resources identified in the NEPA process. Design and contract will be prepared by the ER that meets the soil and water resource protection requirements.	No new permanent roads are planned for this project. For new temporary roads: 1. Design temporary roads so as to minimize total ground disturbance considering skidding and landing needs, using existing templates where possible. 2. Avoid unstable or wet soils during location. 3. Avoid slopes over 50%. 4. Minimize stream crossings and minimize length of road within 300 feet of stream courses. Bring existing roads used for log haul up to BMP standards.	IDT; ER	N/A
15.03	ROAD AND TRAIL EROSION CONTROL PLAN - To prevent, limit, and mitigate erosion, sedimentation, and resulting water quality degradation during construction by timely implementation of erosion control practices.	All Roads	ER prepares contract that has adequate provisions for erosion control. ER will see that erosion control measures are completed in a timely manner. ER/SA documents compliance in daily diary.	1. Seed and fertilize disturbed areas on reconstructed roads. 2. Install adequate cross drainage. 3. Maintain adequate erosion control on temporary roads.	ER; SA	B(T)6.31 B(T)6.6 B(T)6.312
15.04	TIMING OF CONSTRUCTION ACTIVITIES - To minimize erosion by conducting operations during minimal runoff periods.	All Roads	IDT identifies any timing restrictions. PSA puts appropriate timing into TSC. ER/SA only permits construction within allowed periods and when ground conditions are such that water quality impacts are minimized.	No special timing restrictions have been identified for proposed road work.	IDT; ER; SA	B(T)6.31 B(T)6.312 B(T)6.6 SPS 204

SWCP	SWCP Objective	Applicable Units/Roads	Considerations For Best Management Practices	Recommended Best Management Practices By IDT/TSA	Person(S) Responsible	Contract Provisions
15.06	MITIGATION OF SURFACE EROSION AND STABILIZATION OF SLOPES - To minimize soil erosion from road cutslopes, fill slopes, and travel ways.	All Roads	Stabilization techniques are included in contract provisions by ER. Seed and fertilize cut and fill slopes. Buttress slopes that will slump and plug ditch or culvert. Compliance is assured by ER.		ER	SPS 203, 204, 206A 210, 412 619, 625, 626 630 B(T)5.3, B(T)6.31 B(T)6.6, B(T)6.62 B(T)6.66 B(T)6.312 C(T)6.6, C(T)6.601
15.07	CONTROL OF PERMANENT ROAD DRAINAGE - To minimize the erosive effects of concentrated water and degradation of water quality by proper design and construction of road drainage systems and drainage control structures.	All Permanent Roads	Hydrologist identifies road segments of special concern. ER includes appropriate BMPs in road package.	Specific BMPs have been identified, BMP work on Roads 902, 6084C, 8021 and 8021B must be completed prior to haul.	Hydrologist; ER	B(T)5.3 C(T)5.31 B(T)6.311 B(T)6.6 C(T)6.6
15.09	TIMELY EROSION CONTROL MEASURES ON INCOMPLETE ROADS AND STREAM CROSSING PROJECTS - To minimize erosion of and sedimentation from disturbed ground on incomplete projects.	All Roads	Protective measures will be kept current on all areas of disturbed, erosion-prone areas. TSA/ER ensure contract compliance.		ER; TSA	B(T)6.31 B(T)6.6 B(T)5.23 B(T)6.66 C(T)6.6
15.10	CONTROL OF ROAD CONSTRUCTION, EXCAVATION, AND SIDE-CAST MATERIAL - To reduce sedimentation from unconsolidated excavated and side-cast material caused by road construction, reconstruction, or maintenance.	All Roads	Protective measures will be kept current on all areas of disturbed, erosion-prone areas. TSA/ER ensure contract compliance.		ER; TSA	BT5.3 CT5.31 SPS 203 SPS 204
15.11	SERVICING AND REFUELING EQUIPMENT - To prevent contamination of waters from accidental spills of fuels, lubricants, bitumens, and other harmful materials.	All Units and Roads	ER/TSA will designate the location, size, and uses of service refueling areas. Fueling should not occur within RHCAs. ER/TSA will ensure contract compliance. SA/ER will follow KNF Hazardous Substance Spill Plan in case of accidents.		ER; TSA	BT6.222 BT6.34 B(T)6.341

SWCP	SWCP Objective	Applicable Units/Roads	Considerations For Best Management Practices	Recommended Best Management Practices By IDT/TSA	Person(S) Responsible	Contract Provisions
15.12	CONTROL OF CONSTRUCTION IN RIPARIAN AREAS - To minimize the adverse effects on riparian areas from roads.	All Roads	Construction of proposed new and temporary roads will comply with Forest Plan and Montana SMZ Law. All construction will be performed so as to minimize impact to water quality and the riparian area. ER/SA will pay particular attention to activities in riparian areas.	Road width will be kept minimal at crossings. Excess material will not be sidecast in riparian area. Cross drainage will be provided on approaches so that surface runoff is diverted before crossing. Culverts will be installed during periods of low flow and according to specifications. Erosion control measures will be implemented.	ER; TSA	B(T)6.5 B(T)6.62 C(T)6.50 SPS 206 SPS 206A
15.13	CONTROLLING IN-CHANNEL EXCAVATION - To minimize stream channel disturbances and related sediment production.	All Roads	See 15.13.		ER; TSA	B(T)6.5 SPS 204 SPS 206 206A
15.14	DIVERSION OF FLOWS AROUND CONSTRUCTION SITES - To minimize downstream sedimentation by insuring all stream diversions are carefully planned.	All Roads	Live stream crossings require a State 124 permit. The ER will acquire permit and comply with conditions. The ER will review 124 permit with the hydrologist.		ER; Hydrologist	BT6.5 BT6.31 CT6.50 CT6.52 CT6.6
15.15	STREAM CROSSINGS ON TEMPORARY ROADS - To keep temporary roads from unduly damaging streams, disturbing channels, or obstructing fish passage.	Temporary Roads	The SA will ensure compliance during installation.		Hydrologist; PSF; TSA	
15.16	BRIDGE AND CULVERT INSTALLATION - To minimize sedimentation and turbidity resulting from excavation for in-channel structures.	All Roads	The hydrologist and ER will cooperate on design and mitigations. The ER will ensure the design criteria are put into the TSC and apply for State 124 Permit.		Hydrologist; ER	CT6.5
15.17	REGULATION OF BORROW PITS, GRAVEL SOURCES, AND QUARRIES - To minimize sediment production from borrow pits, gravel sources, and quarries and limit channel disturbance in those gravel sources suitable for development in floodplains.		ER will consult hydrologist if there are water quality concerns. ER ensures contract compliance		ER	BT6.5 CT6.50

SWCP	SWCP Objective	Applicable Units/Roads	Considerations For Best Management Practices	Recommended Best Management Practices By IDT/TSA	Person(S) Responsible	Contract Provisions
15.18	DISPOSAL OF RIGHT-OF-WAY AND ROADSIDE DEBRIS - To insure that debris generated during road construction is kept out of streams and prevent slash and debris from subsequently obstructing channels.	All Roads	Proposed road construction will adhere to the Forest Plan guidelines and Montana SMZ law.	The TSC requires that debris and slash generated during road construction will not be side cast into streams.	ER	Std Spec 201 SPS 201
15.19	STREAM BANK PROTECTION – To minimize sediment production from stream banks and structural abutments in natural waterways.	All Roads	Take precautions to minimize or eliminate disturbance to stream banks. Maintain instream structures. Protective measures will be kept current on all areas of disturbed soils. TSA and ER ensure contract compliance.		ER;TSA	Std Spec 619
15.20	WATER SOURCE DEVELOPMENT CONSISTENT WITH WATER QUALITY PROTECTION - To supply water for road construction and maintenance and fire protection while maintaining water quality.	All Roads and Units			ER; FMO	Std Spec 207
15.21	MAINTENANCE OF ROADS - To maintain all roads in a manner that provides for soil and water protection by minimizing rutting, failures, side-cast, and blockage of drainage facilities.	All Roads	Road maintenance associated with a timber sale is the responsibility of purchaser. The ER/SA will ensure that the purchaser maintains roads according to the appropriate maintenance level.		ER; SA	BT5.12 BT5.3 BT6.6 CT6.6 CT5.9 CT5.42 BT6.31
15.22	ROAD SURFACE TREATMENT TO PREVENT LOSS OF MATERIALS - To minimize the erosion of road surface materials and, consequently, reduce the likelihood of sediment production.	All Roads	Protective measures will be kept current on all areas of disturbed, erosion-prone areas. ER ensures contract compliance.	1. Maintenance of road surface should include proper blading and/or dust abatement. 2. Use crushed gravel where necessary.	ER	BT5.3 CT5.31 CT5.314
15.23	TRAFFIC CONTROL DURING WET PERIODS - To reduce the potential for road surface disturbance during wet weather and reduce sedimentation.	All Roads	Road restrictions and traffic control measures will be implemented on all roads when damage would occur during spring breakup. The decision to restrict a road is made by the ER. Hauling restrictions would be controlled by the TSA.		ER; TSA	BT6.6 CT6.6 CT5.316 CT5.41

SWCP	SWCP Objective	Applicable Units/Roads	Considerations For Best Management Practices	Recommended Best Management Practices By IDT/TSA	Person(S) Responsible	Contract Provisions
15.24	SNOW REMOVAL CONTROLS - To minimize the impact of snow melt on road surfaces and embankments and reduce the probability of sediment production resulting from snow removal operations.	All Winter Haul Roads	Snow removal will be kept current on all roads associated with winter logging operations. The TSA ensures compliance with contract provisions.	TSC requires opening sections of berm to allow water to leave road surface.	TSA	CT5.316 Std Spec 203.09
15.25	OBLITERATION OF TEMPORARY ROADS - To reduce sediment generated from temporary roads by obliterating them at the completion of their intended use.	All Temporary Roads	Temporary roads will be fully recontoured, and slash will be pulled back onto the disturbed surface. To the extent possible, the top soil should be placed back on top as the road is recontoured. The TSA will ensure contract compliance.		TSA	BT6.63 CT6.6 CT6.632 CT6.633
18.03	PROTECTION OF SOIL AND WATER FROM PRESCRIBED BURNING EFFECTS - To maintain soil productivity, minimize erosion, and prevent ash, sediment, nutrients, and debris from entering surface water.	All Units	Broadcast burning adjacent to riparian areas will adhere to Forest Plan and Montana SMZ law. Prescribed burn plans identify the conditions necessary to prevent soil damage and meet site preparation objectives. The IDT will monitor results.	No ignition will occur within the RHCAs.	Fuels Specialist; IDT	N/A

Appendix E: Monitoring Plan

RESOURCE	OBJECTIVE	TIMING	METHODOLOGY	RESPONSIBLE
Watershed	Monitor implementation and effectiveness of Best Management Practices (BMPs) in harvest units.	During and post timber sale activities.	Review a representative sample of units and complete BMP timber sale inspection reports.	Sale Administrator/IDT/District Staff
Watershed	Monitor implementation and effectiveness of BMPs on road work.	During and post timber sale activities.	Inspect road work in critical areas for compliance with BMPs and complete inspection reports.	Engineering Representative/IDT/District Staff
Watershed/ Fisheries	Monitor implementation of Riparian Habitat Conservation Areas (RHCAs)	Prior to advertisement of timber sales and after harvest.	Monitor application of RHCAs during layout. Monitor protection of RHCAs post harvest.	Sale Prep Forester /Hydrologist/Fisheries Biologist
Soils	Monitor detrimental soil disturbance specifically on Units 1, 2, 3, 11, 12, 12a, 18, 20.	Post harvest, post rehabilitation.	Utilize regional protocols	Hydrologist
Soils/Wildlife	Monitor implementation of large woody debris retention, especially in wet habitat sites.	Post harvest and post fuel reduction activities.	Measure tons per acre of down woody debris using transects within a sample of units	Fire and Fuels Specialist/ Hydrologist/Wildlife Biologist
Fire	Wildfire management and pre-suppression through fuels management (both in harvest and other areas).	Ongoing	Monitor fuels levels and treatment needs and effects. Evaluate both long and short-term effects of completed or ongoing treatments. Monitor areas of risk with potential suppression problems.	Fire/Fuels Specialist
Silviculture /Fire/Soils	Determine whether Silv. Rx objectives were accomplished. Assess site preparation and tree planting needs. Review status of CWD on site. Verify or modify next treatment	Post harvest and prior to any site preparation or fuels treatment	Review selected treatment areas. Evaluate silvicultural objectives in light of accomplishments and, if necessary, modify the original prescription. Check for fuels treatment needs (e.g. excavator piling, no treatment, or different timing of Rx burn) and planting needs (e.g. excavator scalp, moving of slash, or different stock type needed)	Project Fuels Management Specialist/Project Silviculturist
Silviculture/ Noxious Weeds	Determine status of regeneration harvest units. Note presence or absence of noxious weeds	First, third and, if necessary, 5th year, following initial planting.	Monitor stocking and status of regeneration (planted or natural regeneration) using walk-through and standard plot exams that follow R1 procedures. Determine status of non-native plants using monitoring survey form	District Reforestation Specialist
Wildlife	Verify maintenance and retention of cavity habitat	Pre- and Post-harvest	Representative sample of units taken to determine retention of cavity habitat.	Wildlife Biologist
Noxious Weeds	Noxious weed infestations	Pre-harvest and following timber sale activities	See Design Features for details.	District Weeds Specialist
Wildlife	Determine effectiveness of burning to increase browse	1- 3 year after burning	Walk-through survey to determine the species of browse and to what extent burning has stimulated browse.	Wildlife Biologist
Wildlife	Ongoing status of closure devices - Gates-EB-Signing	1-2 times a year	Adopt-A-Road - Access Management - Law Enforcement	Access Management

Appendix F: Past Management Activities - Cumulative Effects

Sale name	Activity	Pre-80s	1980s	1990s	2000-present
ANTLER PC	Stand Clearcut		153		
	Understory Burn		153		
BEETLEMANIA PC	Stand Clearcut		40		
BLISTSED LUNG SSTS	Excavator Piling (Grapple)				6
	Sanitation (Salvage)			6	
BURNT CREEK WILDLIFE	Stand Clearcut		15		
BURNT SHEEP BURN	High Severity Wildfire			188	
	Mixed Severity Wildfire			106	
BURNT-SHEEPHERDER	Dozer Piling	41			
	Liberation Cutting	154			
	Precommercial Thinning	55			
	Stand Clearcut	41			
CHERVO POST	Dozer Piling		2		
	Stand Clearcut		2		
CLARK CEDAR #1	Sanitation (Salvage)		1		
CLARK CEDAR #2	Sanitation (Salvage)		16		
CLARK MTN BLOWDOWN	Sanitation (Salvage)	67			
	Stand Clearcut	22			
CLAY BEAVER	Fireline Construction				18
	Seed Tree Seed Cut with Reserves				2
	Understory Burn				2
COLD BEAR	Dozer Piling		241		
	Fireline Construction		102		
	Sanitation (Salvage)		15		
	Shelterwood Seed Cut with Reserves		149		
	Stand Clearcut		138		
COOL CABLE	Dozer Piling		66		
	Shelterwood Seed Cut with Reserves		66		
COOL CREEK - 12	Mixed Severity Wildfire				7
COOL LANG CREEKS	Dozer Piling	250			
COOL LANG CREEKS	Stand Clearcut	250			
COOL MEADOW PC	Sanitation (Salvage)		32		
COOL ONE STR	Seed Tree Final Cut with Reserves			76	
COOL OTIS	Clearcut with Reserves			96	188
	Excavator Piling (Grapple)			192	175
	Fireline Construction			148	
	Precommercial Thinning			85	
	Sanitation (Salvage)			158	
	Understory Burn			29	40
COOL SALVAGE	Dozer Piling		94		

Sale name	Activity	Pre-80s	1980s	1990s	2000-present
	Seed Tree Seed Cut		76		
	Seed Tree Seed Cut with Reserves		24		
	Understory Burn		7		
DOEPOLE P/P - 316	Shelterwood Seed Cut			6	
DOORNAIL SALVAGE	Clearcut with Reserves			15	
	Dozer Piling			15	
DOWN AND OUT SALVAGE	Sanitation (Salvage)			6	
DOWN DUTCH SALVAGE	Sanitation (Salvage)			6	
DUTCH OVEN BLOWDOWN SALVAGE	Clearcut with Reserves				57
	Excavator Piling (Grapple)				77
	Sanitation (Salvage)				39
FLAMING WHITETAIL SSTS	Fireline Construction			20	
	Understory Burn				28
GRIZZLY CEDAR	Sanitation (Salvage)		1		
GRIZZLY CEDAR #2	Sanitation (Salvage)		5		
GRIZZLY CREEK LP	Shelterwood Seed Cut with Reserves		23		
	Stand Clearcut		5		
GRIZZLY FINISH	Dozer Piling		69		
	Stand Clearcut		88		
GRIZZLY NORTH - 88	Mixed Severity Wildfire				27
GRIZZLY POINT PULP	Sanitation (Salvage)	121			
GRIZZLY RIDGE	Dozer Piling	288			
	Stand Clearcut	288			
GRIZZLY VIEW SLVG	Dozer Piling		92		
	Sanitation (Salvage)		164		
	Shelterwood Seed Cut with Reserves		57		
	Stand Clearcut		22		
GRIZZLY WEST - 74	Mixed Severity Wildfire				24
GUS CREEK	Clearcut with Reserves		1		
	Dozer Piling		171		
	Fireline Construction		22		
	Seed Tree Seed Cut with Reserves		9		
	Shelterwood Seed Cut		67		
	Shelterwood Seed Cut with Reserves		44		
	Stand Clearcut		101		
	Understory Burn		7		
GUS CREEK (ORIG)	Dozer Piling	42			
	Stand Clearcut	42			
HENSLEY LP	Dozer Piling	71			
	Shelterwood Seed Cut	71			
HODGEPODGE	Shelterwood Final Cut		17		

Sale name	Activity	Pre-80s	1980s	1990s	2000-present
INDEPENDENCE BURN 4	Understory Burn			125	
	Wildlife Burn			125	
KELSEY FIRE SALVAGE	Clearcut with Reserves				77
	Excavator Piling (Grapple)				77
LANG BUTTE SLVG	Dozer Piling		37		
	Seed Tree Seed Cut with Reserves		37		
LANG CREEK - 52	Mixed Severity Wildfire				9
LITTLE SHINE CREEK	Liberation Cutting	222			
	Stand Clearcut	51			
LONG MEADOW LP	Sanitation (Salvage)		14		
LUCKY LITTLE P. C.	Dozer Piling		110		
	Fireline Construction		386		
	Shelterwood Seed Cut with Reserves		50		
	Stand Clearcut		284		
LUCKY POINT - 10	High Severity Wildfire				126
	Low Severity Wildfire				53
	Mixed Severity Wildfire				258
MILO AND OTIS SSTS	Shelterwood Seed Cut with Reserves			33	
MORE DOE SALVAGE SSTS	Clearcut with Reserves			6	
OBERMAYER LP	Dozer Piling		31		
	Shelterwood Seed Cut with Reserves		31		
	Stand Clearcut		19		
OTIS CREEK	Dozer Piling		233		
	Sanitation (Salvage)		5		
	Seed Tree Seed Cut		70		
	Shelterwood Seed Cut		264		
	Shelterwood Seed Cut with Reserves				
	Stand Clearcut		49		
	Understory Burn		14		
OTIS CREEK STR	Seed Tree Final Cut with Reserves			70	
	Shelterwood Final Cut with Reserves			130	
OTIS REHAB	Dozer Piling		27		
	Stand Clearcut		171		
PETE CREEK FUELS SALVAGE	Fireline Construction			142	
	Sanitation (Salvage)			114	
	Understory Burn			114	
PETE SAKES SALV SSTS	Sanitation (Salvage)			6	
PHEASANT STR SSTS	Shelterwood Final Cut with Reserves			68	
REWHITE SALV SSTS	Sanitation (Salvage)			2	
ROCKY BENCH	Dozer Piling		31		

Sale name	Activity	Pre-80s	1980s	1990s	2000-present
	Fireline Construction		114		
	Sanitation (Salvage)		9		
	Seed Tree Seed Cut		63		
	Seed Tree Seed Cut with Reserves		27		
	Understory Burn		56		
RODERICK BUTTE	Clearcut with Reserves		61		
	Dozer Piling		152		
	Sanitation (Salvage)		124		
	Shelterwood Seed Cut with Reserves		50		
	Stand Clearcut		26		
RODERICK BUTTE BURN	High Severity Wildfire			4	
RODERICK BUTTE SALVAGE	Dozer Piling				20
	Sanitation (Salvage)			20	
RODERICK FUELS	Understory Burn				307
RODERICK SOUTH - 14	High Severity Wildfire				137
	Mixed Severity Wildfire				116
RUST IN HELL SSTS	Sanitation (Salvage)			3	
SHEEPHERDER - 67	High Severity Wildfire				27
	Low Severity Wildfire				29
	Mixed Severity Wildfire				35
SODBUSTER	Sanitation (Salvage)		16		
	Wildlife Burn		16		
SOUTH BURNT	Liberation Cutting				
SOUTH SPREAD	Clearcut with Reserves			32	
	Excavator Piling (Grapple)			32	
	Fireline Construction			56	
	High Severity Wildfire			11	
SPINE TINGLER SALV	Sanitation (Salvage)			6	
TICKS ME OFF SAL	Sanitation (Salvage)			9	
UPPER OTIS CREEK	Sanitation (Salvage)	113			
	Stand Clearcut	45			
WEST PETE	Dozer Piling		71		
	Sanitation (Salvage)		22		
	Seed Tree Seed Cut with Reserves		17		
	Shelterwood Seed Cut		48		
WEST YAAK FUELS	Understory Burn				82
WHITECAMP	Dozer Piling		5		
	Sanitation (Salvage)		5		
WHITEFACE SLVG	Dozer Piling		28		
	Seed Tree Seed Cut with Reserves		96		
	Understory Burn		125		
WHITETAIL BURN 1	Understory Burn		62		
WHITETAIL BURN 2	Understory Burn		52		

Sale name	Activity	Pre-80s	1980s	1990s	2000-present
WHITETAIL BURN FUELS 1	Wildlife Burn			91	
YAAK LP RESALE	Dozer Piling		37		
	Shelterwood Seed Cut with Reserves		37		
No Sale Name attributed	Dozer Piling				
	Group Selection Cut				
	High Severity Wildfire		163	15	
	Liberation Cutting				
	Low Severity Wildfire		68		
	Precommercial Thinning		426	153	291
	Precommercial Thinning - Strip	44			
	Sanitation (Salvage)		111		
	Seed Tree Seed Cut with Reserves		20		
	Shelterwood Preparatory Cut		40		
	Stand Clearcut	3388			
	Thinning	17			
	Understory Burn		55		

Appendix G: References

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Map Appendix