Topsy, Pokegama, Hamaker
Forest Health Treatments

Environmental Assessment #OR014-98-01

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CHAPTER 1 - INTRODUCTION

Overview

This environmental assessment (EA) addresses forest health treatments on Bureau of Land Management (BLM) lands south of State Highway 66, excluding those lands within the Wild and Scenic Corridor of the Klamath River Canyon. Proposed treatments include thinnings, large tree and pine component enhancement, fuel reduction, and removal of excess tree mortality. The treatments are proposed for implementation by developing timber sales in the treatment areas over the next three to six years. Treatments proposed, to date, and their locations are shown in Table 1 and on Map 1. Areas may be deleted and additional areas added based upon further analysis. The acres shown are upper threshold levels for this EA analysis.

The purpose of this EA is to evaluate environmental impacts, to provide information about these proposed forest health treatments to the public, and to assist the decision maker in determining if an environmental impact statement needs to be prepared.

Table 1 - Proposed Timber Sale Treatments in Topsy/Pokegama/Hamaker Analysis Area.

Proposed Treatment Areas	FY	Location			Estimated Volume (MBF)		Estimated Activity Acres*	Estimated Actual Treatment Acres**
		Township	Range	Section	Total Vol.***	Volume Per/Acre		
Grenada East	98	40 S. 41 S.	7 E. 7 E.	27,33,35 3,5,9,10	3,500	3.2	1,400	1,100
Grenada West	99	40 S. 40 S. 41 S.	7 E. 6 E. 6 E.	7 23.35 1,2,11,13	2,500	2.5	1,200	1,000
Muddy Tom	99	40 S. 41 S. 40 S.	5 E. 5 E. 6 E.	23,25,35 1,3,11,15 31	3,000	1.6	2,300	1,800
Slim Chicken	00	40 S.	7 E.	19,21,29,31	2,000	1.3	1,800	1,500
Wild Gal/Dixie	01	40 S. 41 S.	5 E. 5 E.	31 5,7,8,17,18	1,500	2.5	700	600
Chase-Hamaker	02	40 S.	7 E.	9,11,15,22,23,27	1,500	2.5	600	500
TOTALS					14,000	2.2	8,000	6,500

* Estimated Activity Area Acres include numerous patches that will receive no treatment (no harvest), but are within the posted sale boundaries. (See KFRA FEIS, Appendix V, page V-8).

** Estimated Actual Treatment Acres is an estimate of the actual amount of acres within the activity area that will receive some type of treatment (harvest). Actual acres to be treated will likely be 10-30 percent less than the Estimated Activity Acres.

*** Total Volumes are estimated. Actual cruised volume may vary by approximately 20 percent.

Purpose and Need For Action

The Topsy/Pokegama Landscape Analysis (TPLA), prepared in July 1996, identified some management actions and restoration opportunities to improve forest health and ensure biological diversity in the analysis area. These restoration opportunities included the following:

Gradual restoration of the ponderosa pine component in some higher elevation forest stands where it has been reduced.
Reduction of white fir component in understories.
Reduction of fuel loads.
Reduction of disease and insect outbreaks caused by high tree densities.
Maintenance of late-successional habitat.
Reduction in road densities, where feasible, and reduction in erosion potential associated with roads.

The combination of potential treatments being considered to meet some of these recommendations include:

Density Management/Selective cutting of existing uneven-aged stands to maintain a multi-strata stand structure (primarily thinning from below).
Thinning of even-aged stands to improve tree vigor.
Interspersed patch cuts to reintroduce a pine component and to provide browse habitat and diversity for wildlife.
Regeneration harvest of appropriate stands, such as those in very poor health.
Salvage harvest.
Prescribed fire (underburning) to reduce fuel loads..

These timber sales and treatments would assist in meeting the annual timber sale commitment stated in the Klamath Falls Record of Decision and Resource Management Plan (KFRA ROD/RMP) signed June 2, 1995.

Many forest stands in the proposed project area (See Map 1) can be generally described as multi-aged, multiple canopy stands. Many stands proposed for treatment have a residual large tree overstory component of pines, Douglas-fir, and true firs, and a dense stagnated understory component. Past management practices, coupled with suppression of natural fire, have contributed to overstocking primarily of the understory, in many cases with shade-tolerant white fir (*Abies concolor).* This overstocking has contributed to a decline in forest health (stand resiliency) and an increased fire hazard in some forested areas. (<u>*Note*</u>: Forest health in this EA is defined as the resiliency of the forest ecosystems to sustain themselves in the process of natural disturbances such as insect outbreaks and wildfires. A more detailed discussion of forest health is in the TPLA, pages 17-35, and in the KFRA 1994 FEIS, pages 3-63 to 3-66.)

Proposed treatments would focus on improving forest health, maintaining habitat for native plant and animal species, enhancing the residual pine component in some areas, and protecting riparian and other areas by reducing the general fire hazard. The proposed treatments would also provide forest products that would help maintain stability of local and regional economies.

Conformance With Existing Plans

The proposed treatments are being planned under the following management direction:

Final Klamath Falls Resource Area Resource Management Plan and Final Environmental Impact Statement (RMP/FEIS, September 1994) and its Record of Decision (ROD, June 2, 1995).

Final Supplemental Environmental Impact Statement (FSEIS) on Management Habitat for Late-Successional and Old-Growth Forest Related Species Within the Range of Northern Spotted Owl (February 1994).

Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl. [April 1994. Also known as Northwest Forest Plan (NFP)].

Topsy/Pokegama Landscape Analysis (TPLA, July 1996).

Klamath Falls Resource Area Fire Management EA#-OR014-94-09 (June 10, 1994)

Klamath Falls Resource Area Integrated Weed Control Plan EA (July 21, 1993).

Range Reform FEIS (August 1995)

Standards For Rangeland Health And Guidelines For Livestock Grazing Management For Public Lands Administered By The Bureau Of Land Management In The State Of Oregon And Washington. (August 12, 1997).

Roaming Salvage EA, EA#-OR014-96 (May 1996)

Final Environmental Impact Statement, Vegetation Treatment On BLM Lands In Thirdteen Western States (1991).

Interior Columbia Basin Ecosystem Management Project / Eastside Draft Environmental Impact Statement / May 1997 (ICBEMP). We have reviewed the direction of the preferred alternative in ICBEMP and feel that the proposed action meets the intent/general direction of that alternative. The final decision for ICBEMP could amend direction in this EA; however, the NFP standards and guides take precedence over ICBEMP decisions.

CHAPTER 2 - AFFECTED ENVIRONMENT

Introduction

This chapter summarizes the physical, biological, and socioeconomic characteristics of the project areas. Because these characteristics are discussed in detail in the Klamath Falls Resource Area RMP/ROD and FEIS (pages 3-3 to 3-79), and also in the Topsy/Pokegama Landscape Analysis (pages 13 - 200), the following discussions are general with page references to those documents.

The proposed project area is within the boundaries defined in the Topsy/Pokegama Landscape Analysis and is located on BLM-administered lands (south of State Highway 66, starting approximately 2 miles west of Keno and extending to the Jackson/Klamath county lines; see Map 1). The Topsy/Pokegama Landscape Area encompasses approximately 171,400 acres.

Land ownership within the TPLA is as follows:

U. S. Timberlands (formerly Weyerhaeuser) (40%).
Pacific Power and Light (4%).
Bear Valley National Wildlife Refuge (2.5%).
Oregon Department of Forestry (2.4%).
California BLM-administered lands (2%).
Klamath National Forest (1%).
Other Private Lands (30%)
Klamath Falls BLM-administered lands (18%).

All treatments proposed in this environmental assessment would occur exclusively on BLM-administered lands within the Klamath Fall Resource Area.

Discussion of affected resources focuses primarily on those areas outside of the wild and scenic river corridor because no proposed treatments are planned within the corridor.

Land Allocations

Table 2 shows the approximate acres of land allocation in the Topsy-Pokegama-Hamaker Analysis Area, according to the Northwest Forest Plan. Proposed treatments would occur primarily on matrix lands with some potential restoration treatments within riparian reserves. In addition, some treatments could occur within the Late-Successional Reserves/ District Designated Reserves (LSR/DDR), contingent on completion of the LSR assessments and approval of proposed treatments by the Regional Ecosystem Office.

Of the 7,222 acres of riparian reserves acres reported in Table 2, approximately 3,500 acres have been verified in the field. Verification and classification of streams as perennial, intermittent, or ephemeral is ongoing and will occur prior to any ground-disturbing activity.

There are five Late Successional Reserves/District Designated Reserves in the analysis area (see Table 2). Each LSR/DDR is approximately 100 acres and has surrounding District Designated Reserve Buffers (DDRBs) ranging from 150 to 275 acres. General management objectives for DDRBs are to protect and enhance conditions of late-successional stands that serve as habitat for late-successional and old growth forest-related species. For additional detail on Late Successional Reserves/District Designated Reserve Buffers, reference pages 2-20 to 2-22 in the Klamath Falls Resource Area FEIS and pages 23-26 in the RMP/ROD.

Table 2 - Northwest Forest Plan Land Allocations of Topsy-Pokegama-Hamaker Analysis Area.

Land Allocation	Acres	Percent
Administrative Withdrawals		
Klamath River ACEC	1620	5.4
Habitat for Threatened & Endangered Species	92	0.3
TPCC & Non-Forest	7,675	25.0
Roads	968	3.1
Late-Successional Reserves/District Designated Reserves (LSR/DDR)	677	2.1
Riparian Reserves	7,222	24.0
Matrix		
General Forest Management Area (GFMA)	11,033	36.0
District Designated Reserve Buffer (DDRB)	718	2.3
Visual Resource Class II (VRM 2)	553	1.8
Totals	30,176	100.0

Source: (BLM/Microstorms Data)

Water and Lentic/Lotic Riparian-Wetland Resources

Water

The three primary streams in the analysis area outside the Klamath River Canyon are Long Prairie Creek, Edge Creek, and Hayden Creek. These streams, which are minor tributaries to the Klamath River and lie west of the Klamath River Canyon, encompass approximately 75 square miles. The three watersheds (all ownerships) are estimated to have approximately 10 miles of perennial streams, 111 miles of intermittent streams, and 117 miles of ephemeral streams. BLM land ownership comprises only 15, 3, and 10 percent of the watersheds for these streams, respectively. There are no major streams east of the Klamath River Canyon; however, there are some intermittent and ephemeral streams. Only 60 acres, which is less than 10 percent of the 820 acres of lentic riparian-wetland areas in the analysis area, are believed to occur on BLM-administered lands.

Approximately 11 to 24 percent of the BLM-administered lands (between 3,500 and 7,222 acres) in the analysis area have riparian reserves, according to the RMP/ROD allocations and the TPLA estimations, respectively (see Table 2). Allocations for riparian reserves were based, in part, on assumptions in the ROD/RMP about the miles of each type of stream (fish bearing, perennial nonfish-bearing, intermittent and ephemeral) and the acres of wetlands. Field work since 1996 indicates that both these acreage estimates of riparian reserve may be overestimated due to fewer miles being classified as intermittent than expected in the TPLA area.

According to the TPLA, the high number of roads adjacent to existing streams is likely contributing to an increase in sediments delivered to streams, to interruption of subsurface flow to streams, and to riparian habitat modification. Past activities (including dam building and subsequent breaching, road building, livestock grazing and timber harvesting) have increased sediment loads to streams and reduced stability of some stream banks. In some areas of the TPLA, there is little to no in-channel coarse woody debris.

The TPLA reports a possible decrease in base flows as a result of higher than historical forest canopy densities, especially on BLM-administered land. However, increased harvest activity on land owned by U.S. Timberlands may have recently abated any such decrease in base flow. There is a moderate to high probability that peak flows have increased, primarily due to the road network. The timing of peak flows may also be altered, in that the duration of high flows is probably shorter and, in south-facing portions of the analysis area, earlier in the year due to more rapid snow melt from openings in the forest canopy on non-BLM lands.

Sections of the upper Klamath River and its tributaries are currently not meeting water quality standards for temperature and dissolved oxygen. Macroinvertebrate populations throughout the TPLA area are dominated by

species tolerant to fine sediment, higher temperatures and organic enrichment. Preliminary indications suggest that the pH and bacteria may, at times, be elevated above standards in some areas within the TPLA.

Additional information about current conditions of water and lentic riparian-wetland area-related resources in the analysis area is available in the TPLA: hydrology (pages 75-89); stream channels (pages 93-99); lentic riparian-wetland areas (101-110), and water quality (pages 111-124).

Lotic Riparian Resources

Lotic riparian areas are a category of riparian-wetland areas associated with running water habitat such as rivers, streams, and springs. Riparian resources associated with perennial and intermittent streams in the project area will be included within designated riparian reserves. Riparian reserves will be established following guidelines in Appendix A-2: Project Design Features for Water Resources.

As discussed above, the estimated amount of riparian reserves varies between 3,500 and 7,222 acres. Field work has determined that these acreages may be too high. The actual amount may be below 3,000 acres.

For a description of lotic riparian resources in the analysis area, see the Topsy/Pokegama Landscape Analysis: lotic riparian-wetland areas (pages 101-110), channel condition (pages 93-100), and hydrology (pages 75-89).

Roads

The BLM-administered lands in the analysis area have an average of approximately 3.9 miles of road per square mile, excluding seasonal and semi-permanent road closures. A cooperative agreement (dated February 1991 and referenced in this environmental assessment as the Pokegama road closure) among BLM, Pacific Power and Light (PP&L), Weyerhaeuser (now U.S Timberlands), and Oregon Department of Fish and Wildlife (ODFW) closes an area west of the Klamath River Canyon to motorized vehicle traffic from November 20 through March 30. During this time, the average miles of road closed per square mile is approximately 2.3 miles/square mile (see Appendix D.2). Objectives of the Pokegama road closure are to reduce road damage and soil erosion and to protect wildlife habitat during critical periods. This agreement, which encompasses all ownerships in the closure area, remains in effect.

The TPLA identifies areas with high impacts from roads and recommends that road closures, obliteration, and/or stabilization be implemented in these areas. The TPLA also recommends that Transportation Management Objectives be established for roads to reduce the number of open roads and total road densities and to determine appropriate surface and maintenance for roads. The KFRA ID Team is working on a Transportation Management Plan for the analysis area concurrently with this environmental assessment to meet this objective. As each treatment or timber sale is developed in the analysis area, roads within the boundaries of the treatment area are identified to remain open, be closed permanently or seasonally, or be obliterated.

Table 3 shows road densities in the three watersheds analyzed in the TPLA and their location in relation to streams.

Table 3 - Road Density by Watershed (all ownerships)

Watershed	Drainage Density (miles of stream per square mile)	Road Density (miles of road per square mile)	Number of Stream Crossings (per mile of road)	Miles of Road within 100 feet of streams
Long Prairie Creek	3.5	3.7	2.2	31.15
Hayden Creek	3.0	3.6	2.4	21.38
Edge Creek	1.7	2.5	0.6	0.69

Soil Resources

Soil issues and concerns for the affected environment were addressed in detail in the Topsy-Pokegama Landscape Analysis (pages 34-45). That discussion should be consulted for a complete understanding of the soil issues and concerns in the affected environment. The following narrative summarizes the major soil issues and concerns discussed in the landscape analysis.

Ground disturbance is common throughout the affected environment as a result of repeated timber harvest entry and, to a lesser extent, other land uses in the past (livestock grazing and human settlements). The landscape is checkerboarded with both private forestlands owned and managed now by U.S. Timberlands (formerly Weyerhaeuser Corporation) and public forestlands managed by the BLM-Klamath Falls Resource Area. Because of Euro-American settlement history, logging history, gentler topography, and extensive private ownership in the affected environment, the landscape has been more intensively managed and disturbed than forests north of Highway 66. Skid road occurrence is common, and skid road density is high in many areas as a result of repeated logging entries in the past. Soils in many areas are still recovering from past disturbance. More open forested landscape typifies the affected environment, as compared to more closed forested landscape north of Highway 66. The open forested landscape is a result of not only natural conditions and natural disturbance (a xeric landscape with lower annual precipitation, higher summer temperatures, and greater fire frequency under a presettlement natural fire regime), but also a relatively intensive human-induced disturbance history.

Because of the affected environment's mild topography and low number of streams, soil erosion is less of a concern than other types of soil disturbance. The high density of roads in the affected area contributes to transport of soil particles during periods of rain and snowmelt into stream courses and wetland areas; however, in general the mild topography and small number of streams reduce the potential for serious soil erosion. Large-scale erosion through the action of landslides and debris flows does occur periodically in the steep Klamath River Canyon, but the likelihood of these kinds of events is very low in the gentle topography that characterizes the majority of the affected environment outside the river canyon.

The two soil disturbance issues of greatest concern in the affected environment are (1) reduction (through displacement and/or compaction) of surface and subsurface organic matter reserves (humus), and (2) compaction. Reduction of surface and subsurface organic matter reserves and soil compaction have occurred throughout the affected environment to varying degree as a result of repeated timber harvest entry and use of certain logging methods in the past (soil displacement and scarification). Some areas have extensive skid roads that were created in past entries. This past construction and the repeated use of ground-based logging equipment (tractors, skidders, and bulldozers) has, in some places, displaced or compacted soils, contributing to the reduction of soil organic matter reserves.

Under a natural fire regime, frequent low-severity fires would have reduced surface and subsurface organic reserves as well to some extent, but repeated ground-based logging disturbance reduces the soil organic layer and also displaces and compacts soils. Important forest ecosystem functions such as nutrient storage and cycling, nitrogen fixation, symbiosis between mycorrhizal fungal communities and trees, and site productivity are associated with organic reserves in the soil. The amount of organic reserves in the soil is an important determinant and therefore measure of soil health. The concern with any future timber sale entries is worsening existing disturbed soil

conditions. Use of ground-based logging systems employing equipment that cannot be limited to existing or designated skid trail systems to reduce the areal extent of disturbance (such as use of a mechanical harvester or shear) is a concern.

Although numerous soil series occur in the affected environment, the three primary ones are Pinehurst, Greystoke, Pokegama, and Woodcock. Soil compaction varies with soil types and series. Compaction susceptibility of forest soils in the affected environment is rated as moderate to high, and surface erosion and nutrient loss susceptibility is rated as moderate. See Tables A-1, A-2, and A-3 in the appendix to the landscape analysis for a listing of disturbance susceptibility ratings for each soil series in the affected environment.

Upland Vegetation

Past management practices (including timber harvesting, road building, fire suppression, and livestock grazing) modified the vegetative species composition and stand structure in the proposed treatment area. The changes in forest composition, function, and structure in present stands are described in detail in the TPLA (pages 17-34 and 185-200).

Some composition changes noted in the TPLA include a decrease in ponderosa pine composition with a corresponding increase in white fir. The changes in composition are more extensive in the white fir (*Abies concolor)* plant associations and only moderate in the drier Douglas-fir (*Pseudotsuga menziesii)* and Ponderosa Pine (*Pinus ponderosa)* plant associations. Although there has been a gradual shift in species composition, ponderosa pine is still the dominant overstory tree (49%), as well as the understory tree species (45.6%). Douglas-fir and white fir comprise approximately 30 percent and 13 percent, respectively, of the dominant overstory tree species and 33 percent and 14 percent, respectively, of the understory. In the understory, the TPLA states that the white fir component has increased from a historical (Lieberg 1899) range of 0 to 10 percent, to 13 to 14 percent presently.

Other species in the analysis area include: Sugar pine (*Pinus lambertiana),* Shasta red fir (*Abies manifica var. shastensis)*, incense cedar (*Calocedrus decurrens),* western juniper (*Juniperus occidentalis),* Oregon white oak (*Quercus garryana)*, lodgepole pine (*Pinus contorta),* and Oregon black oak (*Quercus kelloggii)*. These species comprise less than 10 percent of the area.

Plant communities in the EA analysis area are generally within those plant associations described by Hopkins (1979a) for the Klamath Ranger District, Winema National Forest or by Azet and McCrimmon (1990) for the Sourthern Oregon Cascade Mountain Province. For a complete list of these plant associations, along with a detailed description of other plant communities within the EA analysis area, reference pages 55-59 in the TPLA.

Assessment of 15% Standard and Guide

Table 4 lists the forest structural classes on commerical forest lands in BLM-administered lands in the Topys/Pokegama/Hamaker Analysis Area.

Table 4 - Existing Stand Structures on Commerical Forest Lands on BLM-KFRA Administered Lands in the Topsy-Pokegama-Hamaker Analysis Area			
Stand Structure	**Age Class (Years)**	**Acres**	**Percent**
Stand Initiation	0-10	2,481	11.3
Stem Exclusion	20-40	2,905	13.3
Late-Stem Exclusion	50-90	10,041	45.8
Understory Re-initiation	100-190	4,621	21.1
Old Growth	200+	1,866	8.5
Totals		**21,914**	100.0
Other Federal Lands in the TPLA			
Bear Valley USFWS Refuge		4,200	
BLM-administered lands in California		3,262	
USFS - California		1,830	
Totals		**9,262**	

The TPLA (page 193) estimated approximately 7 percent of the stands in the landscape analysis area were 200 years of age or older, and 22 percent were between 100 to 190 years of age. The TPLA included BLM and USFS lands in California (pages 194-195), but not the USFWS Bear Valley National Wildlife Refuge lands. In addition, the TPLA included both commerical and non-commerical forest lands in the analysis (pages 194-195). Recent guidance from the Regional Ecosystem Office (Feb. 3, 1998) indicates that the 15 percent standard and guide applies only to commerical forest lands. The revised percentages shown in Table 4 above indicate approximately 8.5 percent of the forested stands are 200+ years old, and 21 percent are 100-190 years of age in the analysis and proposed treatment area. This does not include lands in the USFWS Bear Valley National Wildlife Refuge (4,200 acres), much of which exceeds 80 years of age.

Of significant note, the uneven-aged silivicultural prescriptions adopted in the Klamath Falls Resource Area RMP are designed to maintain the structural and functional late-successional characteristics in those stands proposed for treatment. As a result, the proposed treatments are expected to have little to no reduction of late-successional habitat within the TPLA or the EA analysis area. Timber harvest treatments would be designed to primarily reduce stand densities (particularly of the understory trees) and reserve most of the larger, older trees. Regional Ecosystem Office guidance, to date (Feb. 3, 1998), requests that agencies, at a minimum, implement the 15 percent standard and guide on the lands they manage within the watershed until further guidance is adopted. Proposed treatments will meet this criteria.

Noxious Weeds

On BLM-administered lands in the TPLA, five species of noxious weeds were found:

- Yellow starthistle (*Centaurea solstitialis)*
- Diffus knapweed (*Centaurea diffusa)*
- St. Johnswort (*Hypericum perforatum)*
- White top (*Cardaria draba)*
- Tansy ragwort *(Senecio jacobaea)*

These weed populations have primarily been associated with disturbed areas including springs, roadsides, construction sites (power houses), landings, and skid trails. For more detail on noxious weeds in the analysis area, reference pages 52- 53 of the TPLA and pages 73-74 of the Klamath Falls Resource Area's RMP.

Wildlife - Terrestrial

For a list of common species in the proposed project area, reference the Klamath Falls Resource Areas's Draft RMP/ROD, Appendix 3C. A description of their habitats is in the TPLA (pages 61-75) and the Klamath Falls Resource Area FEIS (pages 3-37 to 3-41).

Ungulates

The project area contains critical winter and transitional range (spring and fall) for Columbian black-tailed deer (*Odocoileus hemionus columbianas*). This area also supports a small population of year-round residents. Approximately 2,500 deer are estimated to use this area as winter range, which is a lower population than trends projected by ODFW in the 1960s-80s. Population goals are set at 3,200 animals by ODFW for the Keno unit that includes this analysis area. Roosevelt elk (*Cervus elaphus*) use this area year-round. Elk populations continue to expand in the area since first noted 20 years ago. Results of the multi-agency Pokegama habitat project including the road closure, effected in 1991, have been positive.

Upland Birds

Wild turkeys (*Meleagris gallopavo*) are found throughout the analysis area and are year-round residents. California quail (*Callipepla californicus*), mountain quail (*Oreortyx pictus*), and blue grouse (*Dendragapus obscurus*) are also found in the proposed project area.

Raptors

Several raptor species that do not have special status migrate through, and nest within, the proposed project area. They include:

- Red-tail hawk (*Buteo jamaicensis*)
- Cooper's hawk (*Accipiter cooperii*)
- Sharp-shinned hawk (*Accipiter striatus*)
- American kestrel (*Falco sparverius*)
- Great horned owl (*Bubo virginianus*)
- Long-eared owl (*Asio otus*)
- Northern pygmy owl (*Glaucidium gnoma*)
- Western screech owl (*Otus kennicottii*)

The peregrine (*Falco peregrinus*) and prairie falcon (*Falco mexicanus*) also have been documented within the Wild and Scenic Corridor of the Klamath River Canyon.

Woodpeckers

Several species of woodpeckers have been documented in the proposed project area, including:

- White-headed (*Picoides albolarvtus*)
- Pileated (*Dryocopus pileatus*)
- Hairy (*Picoides villosus*)
- Downy (*Picoides pubescens*)
- Red-breasted sapsucker (*Sphyrapicus ruber*)
- Northern flicker (*Colaptes auratus*)

Furbearers

Neither the American marten (*Martes americana*) or fisher (*Martes pennanti*) have been documented within the analysis area, and current habitat conditions do not favor their presence.

Wildlife - Aquatic

Long Prairie Creek and Rock Creek are the only tributary streams in the TPLA occupied by native fish (Speckled dace). Fish are not known to occupy either Hayden Creek or Edge Creek or any other intermittent tributaries within the TPLA, due to the lack of continuous connectivity and low relative water quantity that limits the ability of these streams to provide habitat for a diverse fish assemblage. Non-native fish have been introduced into some man-made ponds in the analysis area. This includes a self-propagating black crappie population in the spring-fed heli-pond adjacent to Long Prairie Creek. Other introduced species may include bass, crappie, and sunfish but populations have not been confirmed.

Amphibian species known to occur are those generally associated with intermittent and ephemeral water sources. These include Pacific chorus frog, the long-toed salamander, and the Western toad. Riparian-dependent vertebrates in the area include the Klamath garter snake, common garter snake, mountain kingsnake, and Western Pond Turtle. Although numerous fish, amphibian species, and aquatic mollusks are known to occur in the Klamath River, no harvest treatments are planned within either the Klamath River Canyon Wild and Scenic Corridor or ACEC.

A complete description of special status aquatic species and their habitat requirements is in the TPLA (pages 127-134).

Special Status Species

As described below, there are four special status species plants either documented or reported in the analysis area, two Federally listed Threatened animal species, and some species of concern. Reference the Land Allocations section for a discussion about late-successional reserves relative to habitat for special status species.

Plants

Documented populations of the following special status plant species have been found in the analysis area:

Bellinger's meadowfoam (*Limnanthes floccosa spp. bellingeriana*)
Pygmy monkey flower (*Mimulus pygmaeus)*
Red root yampah (*Perideridia erythorrhiza)*

Green's mariposa lily (*Calochortus greenei)* has also been reported in the TPLA area.

The range of these four species within the analysis area is not well known. Additional surveys are being planned for unsurveyed BLM-administered land within the analysis area. Bellinger's meadowfoam and Pygmy monkeyflower were found in vernally (seasonally) moist-wet meadows within ponderosa pine/oak woodlands. Red root yampah has been reported in seasonally wet grasslands adjacent to streams on private lands. Green mariposa lily is reported to occur in clay soils in chaparral areas and dry thickets and on rocky slopes.

Reference the TPLA (pages 47-51) and the Klamath Falls Resource Area FEIS (pages 3-42 to 3-47) for additional detail about Special Status Plant Species.

Animals

Two Federal Threatened animal species are within the analysis area: bald eagle (*Haliaeetus leucocephalus*) and the northern spotted owl (*Strix occidentalis caurina*).

Bald Eagles

There are seven known bald eagle breeding territories on BLM-administered land in the project area. No active nest sites are currently in any of the proposed timber sale units, although one former bald eagle nest site and one historic golden eagle nest are within proposed units. Also, there is evidence of winter/spring use in the southeastern portion of the EA analysis area for roosting bald eagles.

The analysis area is within the Klamath Basin Recovery Zone under the Pacific Bald Eagle Recovery plan, and the Klamath River is identified as a "key area" for which target recovery territory goals have been set. Within the project area, recovery has exceeded goals due partly to establishment of the Bear Valley National Wildlife Refuge in the late 1970s and the increased habitat protection effort by Weyerhaeuser (now U.S. Timberlands) and Pacific Power and Light.

Northern Spotted Owl

Five historic northern spotted owl nest sites, in addition to some potential areas, occupying both public and private lands are within the proposed project area. Four of the historic sites maintained pairs and were considered active at the end of the 1997 field season. All four active sites are within 0.25 mile of proposed timber sale units. The fifth historic site is entirely on private land on the most western edge of the project area; the last known occupancy of this site was in 1992. Also, according to documented banding and recapture efforts, the project area functions as dispersal habitat between areas in northern California and the Southern Cascades.

Other Species of Concern

Three northern goshawk (*Accipiter gentilis*) nest sites are in the proposed project area. As of 1997, two of the sites successfully nested and an adult was seen near the third, but nesting status remains unknown. Surveys conducted between 1994 and 1996 for three of the proposed sales (Grenada, Muddy Tom, and Slim Chicken) did not find any nest sites, although several individual sightings occurred.

The Townsend's big-eared bat (*Plecotus townsendii*) and six other bat species (see TPLA, page 67) have been documented in the proposed project area, mostly in caves and buildings. It is also well documented that bats roost in large snags and green trees.

Also, there is potential for occurrence of four protection buffer species in the analysis area:

- Great gray owl (*Strix nebulosa)*
- White-headed woodpecker (*Picoides albolarvatus)*
- Flammulated owl (*Otus flammeolus)*
- Pygmy nuthatch (*Sitta pygmaea)*

Two years of surveys (1996-97) in the analysis area did not locate any great gray owls. Although no systematic surveys have been done for the flammulated owl, this owl is documented in the analysis area. Random sightings are documented for the white-headed woodpecker. Suitable habitat for the white-headed woodpecker and the pygmy nuthatch may exist but, to date, no surveys have been completed.

Survey and Manage Species

Mollusks

Surveys for mollusk species listed under survey and manage strategy 2 are required for FY-99 sales and beyond. Surveys under current protocol standards began in spring of 1998 to identify any sites in the timber sale planning area. However, management recommendations have not yet been released for use by field units. Based on information in aquatic and terrestrial survey protocols (version 1.9) for mollusk species, two aquatic species and seven terrestrial species could occur in the TPLA.

Vertebrates

The Klamath Falls Resource Area is not within the ranges of known species of any vertebrate survey and manage species.

Nonvascular Cryptogams

Some preliminary (cursory) surveys for survey and manage species, as identified in Table C3 of the NFP, have been conducted for nonvascular cryptogams (bryophytes, lichens, and fungi) within the proposed treatment areas. In addition, the five District Designated Reserves in the analysis area were surveyed in 1997 for survey and manage species as part of the required Late-Successional Reserve assessment process.

Surveys are required for FY-99 sales and beyond for nonvascular cryptogam species listed under survey and manage strategy 2. Surveys to current protocol standards began in spring of 1998 to identify sites within the timber sale planning area. Based on previous resource area surveys and information concerning habitat requirements and range distribution in Survey Protocols for Component 2 Lichens (version 2.0) and Management Recommendations for Survey and Manage Fungi (version 2.0), there is no potential habitat on our resource area for any component (strategy) 2 lichens or fungi. However, based on information in Survey Protocols for Survey and Manage Component 2 Bryophytes (version 2.0), there may be potential habitat within TPLA for a component 2 liverwort. Surveys for this liverwort will be conducted prior to ground-disturbing activities.

Vascular Plants

Botanical surveys done in 1996 included survey and manage vascular plants as a focus of the survey in the proposed treatment area. A survey of the District Designated Reserves in 1997 recorded all vascular plants; no survey and manage vascular plants were found in that survey.

Cattle Grazing/Wild Horses

Cattle

Three active BLM cattle grazing allotments are in the analysis area. These are listed below, along with the maximum number of livestock grazed via the BLM leases and season of use:

Dixie (Allotment #0107) - (91 head from 5/1 to 9/15)
Chicken Hills (Allotment#0141) - (20 head from 5/15 to 9/15)
Ward pasture of Edge Creek (Allotment#0102) - (59 head from 5/1 to 7/15)

In 1993, Weyerhaeuser (now U.S. Timberlands) cancelled all of their grazing leases in the analysis area, reducing overall grazing use by 80 percent. Their stated reason for the cancellations was to protect riparian and wetland areas on their lands. This cancellation caused the full revoking of three BLM grazing leases - Chase Mountain (0101), Dry Lake E(0140), and the North and Edge Creek pastures of Edge Creek, since these grazing leases were linked to the Weyerhaeuser lands as recognized base property. These pastures are still in non-use.

For a complete description of the grazing allotments, including historic and current use levels, allotment boundaries, and current range conditions, reference the TPLA (pages 135-154). Additional information is in the Klamath Falls Resource Area FEIS, RMP/ROD, and Rangeland Program Summary.

Wild Horses

The Pokegama wild horse Herd Management Area (HMA) is within the portion of the analysis area located west and north of the Klamath River Canyon. According to the TPLA, the number of wild horses in 1995 (estimated at 50-75) was causing periodic overutilization of localized riparian/meadows along unenclosed portions of Long Prairie Creek and near Wild Gal Spring. As a result, the TPLA recommended reducing the herd size to meet the Wild Horse Act (1971) objective of a "thriving natural ecological balance between the wild horse population, wildlife, livestock, and the vegetation, and to protect the range from deterioration associated with overpopulation." The Appropriate Management Level (AML) for the Pokegama HMA (30 to 50 head) was analyzed and determined in the RMP and affirmed in EA #OR-010-95-10 and the TPLA. In 1996, 20 head were trapped and removed from the herd area. Recent (1997) horse census counts indicate a current herd size of 30-35 head, which is well within the appropriate management level.

For additional detail about the Pokegama HMA, reference the TPLA (pages 155-168) and the Klamath Falls Resource Area RMP/ROD and FEIS.

Cultural Resources

Most proposed treatment areas have been surveyed for cultural resources using BLM Class III survey methods (see Table 5). The unsurveyed proposed treatment areas will be surveyed prior to any ground-disturbing activity. Site descriptions of identified sites have been forwarded to the Oregon State Historic Preservation Office (SHPO) for recording. Sites requiring protection will be buffered, and the stands will not be treated within the buffer. Most of the cultural resources are concentrated in the Klamath River Canyon. The analysis area also contains portions of the Applegate Trail, the Topsy Road, and the Linkvill-Yreka Road.

Table 5 - Summary of Cultural Resource Surveys Within Proposed Activity Areas.

Sale Name	Number of Cultural Sites	Cultural Survey Status
Grenada East	8	All BLM-administered land surveyed and cleared.
Grenada West	6	Sale area surveyed and cleared.
Muddy Tom	10	Sale area surveyed and cleared.
Slim Chicken	2	Survey needed in T. 40 S., R. 7 E, Sections 19, 21, and 29.
Wild Gal	16	All BLM-administered land surveyed and cleared.
Chase-Hamaker	0	Survey needed in T. 40 S., R. 7 E., Sections 11, 15, 22, and 23.

The analysis area has prehistoric and historic cultural resources. The area is within a larger territory ceded to the United States in 1864 by The Klamath Tribes. Along with the Klamath and Modoc, Shasta and Takelma peoples likely utilized this area as well. The Klamath River Canyon, although not considered within the analysis area, bisects the Topsy/Pokegama/Hamaker area. The Klamath River Canyon is extremely rich in archaeological and historical resources and presumably served as one corridor for entry into the analysis area by both prehistoric and historic inhabitants. To date, archaeological and ethnographic research has demonstrated a significant and apparently year-round use of the Klamath River Canyon by prehistoric groups. Upland use, which corresponds more closely with our area of analysis, was apparently associated with seasonal rounds conducted for subsistence needs.

Early historical use of the area centered on trapping and lumber industries. This area helped support a large mill at Klamathon (in California), which burned in 1903. Initially, logging drives were conducted along the Klamath River to feed the Klamathon mill. A logging chute was constructed connecting the Pokegama Plateau with the river. The Klamath Lake Railroad, which reached from Klamathon into the woods in the area of Camp Four, eventually replaced log rafting drives. Early historic towns and mills in the analysis area include Snow, Pokegama, and Dixie. This area was also crossed by numerous early and important travel routes including the Applegate Trail, Southern Oregon Wagon Road, Topsy Road, and Ward Road.

Additional information about cultural resources in the analysis area is in the Topsy/Pokegama Landscape Analysis (pages 169-171) and *Prehistory and History of the Jackson-Klamath Planning Unit: A Cultural Resources Overview* (Follansbee 1978).

The Klamath Tribes do not have any Federally recognized treaty rights within the analysis area, since it is outside their reservation boundary. However, because The Klamath Tribe has concern about land use decisions that may have potential to damage cultural sites/landscapes, the BLM informs The Klamath Tribes about proposed management in the general area. Actions in areas immediately adjacent to the Klamath River Canyon rim are likely to be of concern for The Klamath Tribes.

Members of the Quartz Valley Tribe also have interest in cultural sites in the Klamath River Canyon. Some members of this tribe trace ancestry back to the Shasta who inhabited portions of the Klamath River Canyon. Consequently, members of the Quartz Valley Tribe of Shasta descent may be concerned with actions performed along and near the canyon rim. Currently, both The Klamath and Quartz Valley Tribes are working together to help prevent further damage to cultural sites within the Klamath River Canyon.

The BLM has conducted Class III cultural resource surveys throughout much of the analysis area, including approximately 70 percent of lands included within potential timber harvest units.

Recreation Resources

Because none of the proposed treatments are planned within the corridor, the following discussion of affected recreational resources focuses primarily on those areas outside the wild and scenic river corridor. (*Note*: The corridor is approximately 5,000 acres, encompasses 11 miles of the Klamath River Canyon, and extends rim to rim from the J.C. Boyle powerhouse to the Oregon-California State line.)

Recreational activities outside the Klamath River Canyon consist primarily of hunting, fishing, driving for pleasure, sightseeing, and biking. The analysis area outside the Klamath River Canyon currently receives light dispersed use at most times of the year, except for holiday weekends, opening weekends of hunting and fishing seasons, mushroom picking season, and areas of concentrated use such as boat launches.

Hamaker Mountain, which is within the analysis area, was identified in the Klamath Falls Resource Area RMP as a potential Special Recreation Management Area (SRMA). A SRMA denotes an area requiring more substantial recreation investment and/or intensive recreation management. Winter recreational use on Hamaker is gradually increasing and consists primarily of cross country and downhill skiing, snowboarding, and sledding. In addition, in 1997, a mountain bike race was held on the slopes of Hamaker. Presently, BLM management of winter recreation activities on Hamaker has been limited.

For additional detail about recreational resources in the analysis area, reference the TPLA (pages 173-179).

Visual Resources

The analysis area consists primarily of three visual resource management classes (VRM 2, 3, and 4)

VRM Class 2 - Klamath River Canyon and the east slope of Hamaker Mountain (Class 2 objectives are used to retain existing character of the landscape).

VRM Class 3 - West slopes of Hamaker Mountain and the southern part of the Long Prairie subwatershed. (Class 3 objectives are to partially retain the existing character of the landscape.)

VRM Class 4 - Hayden Creek and Edge Creek subwatersheds. (Class 4 objectives allow major modifications of existing character of landscapes.)

CHAPTER 3 - ALTERNATIVES

Introduction

Four alternatives were developed to address the Topsy/Pokegama/Hamaker Creek Forest Health Treatments.

Alternatives Considered in Detail

Alternative A: Combination of treatments, including the following:

Density Management/Selective cutting of existing uneven-aged stands to maintain the multi-strata stand structure (primarily thinning from below).
Thinning of even-aged stands to improve tree vigor.
Interspersed patch cuts to reintroduce a pine component and/or provide browse habitat and diversity.
Regeneration harvest of appropriate stands, such as those in very poor health
Salvage harvest.
Prescribed fire (underburning).

Alternative B: Harvest limited to Salvage Volume

Alternative C: Fuels Treatment only.

Alternative D: Same as Alternative A with the exception that no mechanized harvester would be allowed.

These four alternatives are described in more detail below. Appendix A describes project design features developed to minimize or reduce adverse impacts. Table 6, located after the alternative's descriptions, summarizes the four alternatives and their project design features.

Management Direction Common to All Alternatives

Certain management actions, including the use of prescribed fire, and best management practices are common to all alternatives and are stipulated in the Klamath Falls Resource Management Plan Record of Decision. These management actions and best management practices are summarized in the Appendix D-4 of the approved KFRA ROD/RMP. Also common to all alternatives is that the KFRA Interdisciplinary Team is working on a Transportation Management Plan for the analysis area concurrently with this environmental assessment to address reducing road densities. As each treatment or timber sale is developed in the analysis area, roads within the boundaries of the treatment area will be identified for blocking and obliteration.

Alternative A (Proposed Action) - Combination of Treatments

Combination of different silvicultural prescriptions including Density Management/Selective Cutting; Commercial Thinning; Interspersed patch cuts; Regeneration Cuts; Salvage Harvest; and Prescribe fire (underburning).

Alternative A meets objectives in the KFRA ROD/RMP, which state that the 23,550 acres of Matrix lands would be managed under an "uneven-aged/multiple canopy" harvest prescription with some allowance for patch cuts and regeneration harvests. Alternative A is more restrictive than the Standards and Guidelines specified in the Northwest Forest Plan. The Northwest Forest Plan states that "16 to 25 large green trees per acre in harvest units" would be retained with no requirement to retain an uneven-aged/multiple canopy component.

This alternative would treat between 6,500 and 8,000 actual acres within an activity area of 8,000 to 10,000 acres and provide up to 20 million board feet (MMBF) in forest products over the next three to six years. Most vegetation treatments would be in the matrix. Some vegetation treatments (thinnings) would occur in the riparian reserves to achieve Aquatic Conservation Strategy objectives such as acquiring desired vegetation characteristics (including maintenance of a pine or old-growth component), controlling stocking, and/or reducing excess fuels.

This alternative includes the following vegetation treatments within the matrix:

Density Management/Selective Cutting - A component of the larger, healthier, older trees would be reserved on most acres with the exception of the patch cuts (see below). Thinning will focus on the understory structure to improve vigor of larger trees. A sustainable uneven-aged understory would be retained so that a multi-strata structure is maintained to meet biological diversity needs. Within the understory, a major objective would be to enhance the resiliency of underrepresented understory tree species such as ponderosa pine, sugar pine, and Douglas-fir.

Commercial Thinning will focus on areas where a residual large tree component is missing and stands are primarily even-aged. This type of harvest would reduce competition and improve vigor and resiliency of residual stand.

Salvage Harvest in areas where the large tree component is sufficiently represented. Some harvest of selected overstory trees in fair to poor condition could occur to capture on-going mortality or remove selected trees heavily infested with mistletoe or insects.

Patch Cuts - Small patch cuts would be interspersed to allow regeneration of ponderosa pine, sugar pine, and Douglas-fir. Up to 15 percent of the matrix area could consist of patch cuts no larger than 3 acres in size. These areas are intended to create stand openings to allow for planting and natural regeneration of shade-intolerant species (pines) and may also benefit some wildlife species. Some residual large trees would be retained within the patch cuts. Within the patch cuts, most of the white fir understory would be removed while any existing healthy understory pine and Douglas-fir component would be reserved. Patch cuts would be located in areas where mortality pockets have already reduced canopy closure and fuel buildup is occurring from the high concentration of snags.

Regeneration Cuts - The purpose and need of regeneration cuts are similar to patch cuts, except on a larger scale. In areas where significantly mortality has occurred (example: loss of 40 percent or more of the canopy closure on over 3 acres), regeneration cuts would be considered to initiate a new cohort of shade-intolerant species, including Douglas-fir, sugar pine, and ponderosa pine. Residual large healthy trees would be retained. (See Appendix D for the criteria to determine when, where, and how to use regeneration cuts).

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Plantings - Patch cuts, regeneration cuts, and other stand openings would also be planted with pines, incense cedar, and Douglas-fir.

Prescribed Fire - In this alternative, prescribed fire (underburning) would follow the harvest treatments in some areas. These areas would be designated by the fuels management specialist and ID Team based upon post harvest monitoring.

Skid Trails - Skid trails not designated for use in future harvesting would be ripped and seeded with native vegetation. A designated skid trail system would be in place after the harvest. This designated skid trail system would be used for stand treatments in the future.

Under Alternative A, approximately 8,000 to 10,000 acres would be included in the proposed activity area, and an estimated 5 to 8 miles of new road construction or road realignment would be necessary. The intent of the road construction/realignment is to allow skidding of timber to areas outside riparian reserves, to move roads outside riparian reserves, or to locate roads in more stable locations. In addition, an estimated 1 to 3 miles of road obliteration will be completed. On a timber sale-by-timber sale basis, each road within the sale area will be analyzed to determine whether to improve, maintain, seasonally block, or obliterate. This alternative is expected to reduce the miles of road that are open to achieve RMP objectives.

This alternative may use selected existing landings, skid trails, and roads within riparian reserves. After harvesting, non-permanent roads and all landings located within riparian reserves would be ripped and planted with native vegetation.

In this alternative, a mechanical harvester would be allowed. Some thinning of submerchantable material would be required, depending on exisiting conditions such as fire hazards, ladder fuels, tree densities, costs, soil impacts, and wildlife needs.

If Alternative A is selected, the next vegetative treatment (excluding fire) in this area would likely occur within 15 to 20 years.

Alternative B - Harvest Only Salvage Volume

Alternative B would treat up to 5,000 acres and provide up to 5 MMBF in forest products. This alternative would harvest only dead and dying trees in the matrix. Dead trees in riparian reserve areas would not be harvested, except along commonly used transportation routes.

Alternative B was analyzed in a previous environmental assessment (Roaming Salvage EA# OR014-96-5).

Alternative B would differ from Alternatives A as follows:

No patch cuts would be used.

No harvest would occur in riparian reserves, except to remove excess snags (where there are more than four per acre) or excess fuel buildup.

No tree seedlings would be planted.

No thinning of dense understories would occur.

No new roads would be constructed under this alternative. All-existing skid trails and landings would be used and left for use in future treatments.

The next vegetative treatment would be within 3 to 5 years, because tree mortality is expected to continue due to the remaining dense stands and potential insect attacks.

Alternative C - Fuel Treatments Only

Alternative C does not propose any harvest activity in the analysis area. Under Alternative C, fuel treatments are proposed as in the KFRA Fire Management EA (EA#OR014-94-09). This alternative involves treating between 5,000 and 10,000 acres using various fuel treatments (including a combination of randomly selected and selected prescribed fire, hand falling/piling/clearing, and others described in the environmental assessment). No forest products (sawlogs/chips/biomass) would be produced under this alternative. Multiple treatments using prescribed fire would be used to accomplish thinning and slash reduction in forested stands. Harvest would take place on other KFRA Matrix allocated lands to meet the KFRA allowable sale quantity.

Alternative D - Same as Alternative A (Proposed Action), except that mechanical harvester would not be allowed.

Under Alternative D, no mechanized harvester would be allowed to cut and prebunch trees. Instead, all merchantable trees seven inches in DBH and greater would be hand felled to the lead of designated skid trails. All yarding equipment (rubber tired/ track skidders) would be equipped with 100 feet of cable to use in yarding all trees to designated skid trails. Submerchantable trees 3 inches to 7 inches would not be thinned under the timber sale contract. Instead, after harvest and contingent on available funds, those stands having a significant component of submerchantable material would be precommercial thinned and the slash would be hand-piled and burned.

Under Alternative D, fewer acres overall are likely to be treated. Many stands contain primarily small diameter material (7 to 14 inches DBH) and logging costs significantly increase as average log size decreases and log pieces increase. Stands with marginal amounts of merchantable material may be dropped due to higher costs associated with hand-falling and bull-lining numerous small stems. Therefore, an estimated 5,500 to 7,000 acres could be treated under this alternative through precommerical thinning, hand-piling, and burning.

Table 6. Summary of Alternatives and Project Design Features

Project Design Feature	Alternative A Combination of Treatments	Alternative B Harvest Only Salvage	Alternative C Fuels Treatment Only	Alternative D No Mechanical Harvester Allowerd
Number of snags per acre to leave	2.5 snags/acre	2.5 snags/acre	All snags except those burned and/or consumed using fire.	2.5 snags/acre
Riparain reserve widths	Constructed Ponds, Reservoirs, and Wetlands greater than 1 acre - 150 feet Wetlands less than 1 acre - The wetland to the outer edge of riparian vegetation Lakes and Natural Ponds - 300 feet Intermittent Streams - 140 feet each side of stream Perennial Nonfish-Bearing Streams - 150 feet each side of stream Perennial Fish-Bearing Streams - 300 feet each side of stream			
Wildlife habitat	Wet Meadow Buffer - 150 feet Seasonal Wetlands Buffer - 150 feet Cliffs/Talus Slopes Buffer - 100 feet Dry meadows buffers - 100 feet Wooded swamps buffer - 150 feet			
Riparian reserve treatment	Could thin up to 35% percent of the riparian reserves to meet Aquatic Conservation Strategy objectives.	Could treat hazard trees in riparian reserves along commonly used roads and recreations sites; excess snags greater than 4 per acre; excess fuel buildup.	Could treat up to 50% of riparian reserves with prescribed fire and/or hand only.	Could thin up to 25 % of the riparian reserves to meet Aquatic Conservation Strategy objectives.
Large trees per acre to be left.	Retain uneven-aged/multiple canopy, including 16 to 25 large green trees per acre.	Retain all large trees, except excess mortality.	Retain all trees.	Retain uneven-aged/multiple canopy, including 16 to 25 large green trees per acre.

Table 6. Summary of Alternatives and Project Design Features (continued)

Project Design Feature	Alternative A Combination of Treatments	Alternative B Harvest Only Salvage	Alternative C Fuels Treatment Only	Alternative D No Mechanical Harvester Allowed
Volume to be removed	Up to 20 MMBF	Up to 5 MMBF	None	12 to 15MMBF
Actual treatment acres	Up to 8,000	Up to 5,000	Up to 8,000	5,500 to 7,000
Estimated percent of exisiting stand (canopy/trees) to be removed	20 to 35%	Less than 10%.	Less than 10%. (Could be more if precommerical thinning is involved.)	20 to 30 %
Mechanical harvester allowed	yes	Not necessary/cost prohibitive due to low volume/acre removal.	No.	No.
Submerchantable material thinned	yes - part of timber sale contract.	Only under a procurement contract and prescribed fire.	Only under a procurement contract and prescribed fire.	Only under a procurement contract and prescribed fire.
Estimated ground disturbance for ground-based equipment.	30 to 50 %	15 to 20%	Less than 10%. (Depends on method of fuel treatment.)	20 to 35%
Roads -New/realignment -Obliteration	 5 to 7 miles 1 to 3 miles	 1 to 3 miles 1 mile	 None None	 5 to 7 miles 1 to 3 miles

CHAPTER 4 - ENVIRONMENTAL CONSEQUENCES

Introduction

Resource values that are either not present in the project area, or would not be impacted by any of the proposed alternatives are: floodplains, wilderness study areas (WSAs), areas of critical environmental concern (ACECs), research natural areas (RNAs), palentological resources, prime or unique farmlands, wild and scenic rivers, lands, and minerals. Also, there are no hazardous waste sites in the analysis area.

Roads

Alternatives A, B, and D would likely result in a net increase in roads of approximately 5 to 6 miles total (see Table 3 and Appendix C-1). Expanded over the EA analysis area, this amounts to an increase of approximately 0.1miles/square mile of roads on BLM-administered lands. As each timber sale contact is designed and the transportation management plan is finalized for the area, opportunities to either block or obliterate roads within the analysis area will be considered. The KFRA FSEIS analyzed impacts for approximately 1 mile of new road construction per year on westside lands. Since June of 1995 when the KFRA RMP was signed, less than one mile of new road construction has been implemented in timber sales approved to date.

Considering the Pokegama Road Closure and the limited amount of new proposed road construction in the analysis area, impacts from all alternatives in regards to roads would be low and are addressed in the KFRA FSEIS. Improvements in road drainage facilities could occur as a result of implementing Alternatives A, B or D. This would provide benefits to water resources by reducing inputs of water and sediments from roads into stream channels.

Under Alternative C, no specific plans for road closure, obliteration, or improvement would be proposed until a Transportation Management Plan was completed and sufficient funds were obtained to implement the plan. As a result, existing road conditions under Alternative C would remain static. The KFRA RMP (page 71) has an objective of reducing the open road densities to 1.5 miles or less per section. With the Pokegama Road Closure, road densities are seasonally reduced to approximately 2.3 miles per section (square mile). The checkerboard ownership of BLM-administered lands in the analysis area and license agreeements with adjacent landowners necessitate keeping some roads open to allow administrative access to adjacent landowners. This situation results in higher road densities than the desired objective.

Soils

Alternative A: Combination of Treatments

Page D-11 of the KFRA RMP states that "The cumulative effects of detrimental soil conditions are not to exceed 20 percent of the total acreage within an activity area (the total area of ground, such as a timber sale unit or a slash treatment area including roads, skid trails, and landings). Detrimental soils conditions include detrimental compaction, displacement, and creation of adverse cover conditions. Sites where the 20 percent is exceeded will require treatment such as ripping, backblading or seeding". Detrimental soil compaction is defined in the KFRA FEIS page 4-12 as "an increase in soil bulk density of 15 percent or more over the undisturbed level and/or a macropore space (pores over 0.038 millimeter) reduction of 50 percent or more."

Based on initial quantitative soil monitoring done for a recently completed RMP timber sale on the resource area, use of a mechanical harvester or shear is resulting in aeral disturbances exceeding the 20 percent guidelines in the KFRA RMP. The extent of how much the areal disturbance is detrimental is as yet undetermined. Due to the limited reach of a mechanical harvester of 20 feet, it normally cannot operate within the confines of a permanent designated skid road system where the skid trails are required to be 150 feet apart. The mechanical harvester must get off the designated skid trails to reach the trees in between. As a result, the potential for higher soil disturbance in terms of areal extent and compaction could occur. Certain soil series are more susceptible to compaction than others. Moderate to high displacement and reduction of soil organic matter reserves (humus) could be expected to occur with use of a mechanical harvester because of the areal extent of its impacts (as evidenced in a recent timber sale). Use of a mechanical harvester could result in 30 to 50 percent of the treated area being disturbed in some form, varying from a single to multiple passes.

By comparison, the use of designated skid trails limited to 150 feet apart with other ground-based logging systems usually results in disturbance of less than 20 percent of the activity area. Because this alternative uses a mechanical harvester, some evidence indicates that soil health will not be promoted and may not be maintained, especially considering the long-term disturbance associated with repeated use of a harvester in future entries. Detrimental soil compaction may occur in some soil series. Whether KFRA RMP standards for detrimental soil disturbance will be met or exceeded under this alternative will have to be assessed with pre- and post-harvest quantitative soil monitoring. The KFRA RMP allowed for a 4 to 5 percent reduction in soil productivity due to anticipated impacts from skid trails. Additional monitoring will help determine whether impacts are within analyzed levels. Soil monitoring will be done for any alternative selected.

Alternative B: Salvage Harvest Only

Because the majority of trees removed under this alternative would be dead and dying trees, the areal extent of soil disturbance would be reduced considerably compared to Alternative A. Timber harvest operations would be focused rather than widespread in the activity area, targeting the fraction of dead and dying trees in any given forest stand total. The narrower treatment prescription would translate into less travel and ground disturbance by logging equipment within the activity area. The areal extent of ground disturbance would likely be less than 20 percent, resulting in less reduction in soil organic reserves and less compaction.

Alternative C: Fuels Treatment Only

Because this prescribed fire alternative does not allow ground-based logging equipment, areal extent ground disturbance would be minimal (less than 10 percent). Through combustion, prescribed fire would reduce soil organic reserves to some extent, depending on fire severity. However, prescribed fire would not be displace and compact soils. Under this alternative, the dense conifer thickets, areas with high fuel loads, and slash piles would burn more intensely, resulting in a corresponding greater reduction in soil organic reserves.

Alternative D: No Mechanical Harvester Allowed

Because this alternative uses ground-based logging equipment other than a mechanical harvester, areal extent soil disturbance would be less than with an alternative using a mechanical harvester. Ground-based logging equipment would be confined to a designated skid trail system with skid roads at least 100 feet apart, and existing skid roads would be used whenever possible. With areal extent disturbance being confined to less than 20 percent of the activity area, less reduction in soil organic reserves and less displacement and compaction would occur than with an alternative employing a mechanical harvester.

Water Resources

Potential adverse impacts to water resources resulting from activities in the four alternatives are described in the FEIS (pages 4-16 through 4-24, and Appendix P - Water Resources and Basic Hydrologic Principles). The potential adverse impacts resulting from Alternative C are also addressed in the KFRA Fire Management EA. Project Design Features selected for the analysis area (see Appendix A-2) would reduce or avoid adverse effects. The level of impacts described below would be greatest under Alternative A; slightly lower for Alternatives D and C; and least for Alternative B.

Direct and indirect impacts to water quality would be low to moderate. Although no new roads would be constructed in riparian reserves, many existing roads are close to streams and some roads cross streams numerous times. Some sediment could directly enter streams as a result of soil disturbance on roads that cross or are in close proximity to streams and riparian reserves and by skidding across streams or in riparian reserves. Indirect sedimentation to streams could result from soil disturbance, road maintenance, renovation and obliteration activities, and hauling activities in close proximity to streams. Some roads have inadequate drainage facilities, which causes water to be routed directly down the road.

Direct and indirect impacts to water quantity would be moderate. Harvest activities and/or vegetation treatments would occur in the transient snow zone, which is assumed to be between 3,000 to 4,200 feet elevation in this region. The TPLA estimated that approximately 30 percent of the Long Prairie Creek, 50 percent of the Hayden Creek, and 95 percent of the Edge Creek watersheds are in the transient snow zone. Because the type of activity proposed in the

alternatives (such as small patch cuts; salvage; thinning/harvest of the matrix to retain 16 to 25 large trees per acre; or treatment by prescribed fire) would result in no more than 35 percent reduction in canopy closure, there would be a low potential for measurable increases in annual water yields above that from previous and ongoing harvest activities on non-BLM lands. Furthermore, canopy closure may be above historic levels in some stands on BLM-administered lands due to the invasion of white fir and high tree densities. Some snow accumulation increases would occur in the patch cuts and regeneration cuts; the level of effect would depend on the number of these openings created in the transient snow zone. Because of the extensive road network, water yield increases from snow melt in patch cuts or regeneration cuts could be routed directly to streams.

Initial analysis indicates the total net increase in road mileage may be 2 to 4 miles in the analysis area (Appendix C-1), which expanded over the analysis area, amounts to an increase of apprxomately 0.1 miles/square mile of road. Considering the Pokegama Road Closure and the limited amount of new proposed road construction in the analysis area, there would be low potential to adversely affect groundwater recharge and aquifer function at a particular site. In addition, improvements in road drainage facilities could occur as a result of implementing Alternatives A, B or D. These improvements would provide benefits to water resources by reducing inputs of water and sediments from roads into stream channels.

Lentic Riparian-Wetland Areas

The extensive existing road network in the TPLA area has likely altered the hydrologic regime of some wetlands in the TPLA area by filling of wetland areas to build a road bed, increasing the water supply to specific wetland areas by runoff from drainage facilities, or interception and redirection of water away from a wetland area by road drainage facilities. Roads are also a significant source of fine sediment, and it is probable that some filling of wetlands with road-derived sediment has occurred. Impacts to lentic riparian-wetland areas from the proposed alternatives could be low to none. As a result of implementing any of the alternatives, water may be taken from a developed water source and used for prescribed fire or road construction and maintenance. This de-watering would have short-term adverse effects on the hydrology of the wetland associated with the water source, but no long-term adverse effects.

Potential impacts to the lotic riparian resources resulting from activities of the four alternatives are described in the FEIS (4-40 through 4-42 relative to Effects on Riparian-Wetland Areas, and P-8 through P-12 on Riparian-Wetland Areas). Potential impacts from Alternative C are also addressed in the KFRA Fire Management EA.

Under all alternatives, harvest within riparian reserves would conform to stipulations in Appendix A-2: Project Design Features for Water Resources. Adherence to these guidelines would minimize any adverse impacts to the riparian resources.

Because any treatments within the riparian reserves would be outside of the no-harvest buffers specified in Table 6 and Appendix A, any adverse impacts to riparian resources would be minimal.

Under Alternatives A and D, use of existing roads and skid trails within the riparian reserves would cause adverse impacts to any riparian vegetation established on these routes since their last use. Vegetation would be directly impacted from machinery passing over the routes, and surrounding vegetation could be indirectly impacted by soil displacement from the roads and trails. Ripping and reseeding of roads and trails after project completion would result in some short-term adverse impacts to the vegetation on the routes and to the immediate surrounding vegetation. However, these impacts would be outweighed by the long-term benefits of eliminating these roads and skid trails.

Under Alternative C, short-term adverse impacts to existing riparian vegetation would result from treatment activities within the riparian reserves. However, the long-term positive impacts to the vegetation community from overstory thinning and reduction of fuel loads would outweigh these short-term impacts.

Upland Vegetation - Forest Vegetation and Noxious Weeds

Forest Vegetation

Structure - Proposed silvicultural prescriptions for all four alternatives should result in little to no reduction in late-successional habitat. There will be low-to-moderate reduction in structure diversity due to thinning of the understory component and ladder fuels beneath the larger trees. Understory densities will be reduced more under Alternatives A and D. Alternative C could result in a mosaic but low reductions in structure, depending on fire intensities and burn presciptions. Patch opening could be created in individual pockets where the prescribed fire burns into the crowns. Alternative B would result in the least structural diversity change.

Canopy Closure - Alternatives A and D could reduce the canopy closure as much as 20 percent, compared to only 5 to 10 percent under Alternatives B and C. Initial post-monitoring of KFRA RMP timber sales recently harvested revealed post-harvest canopy closures remaining with 10 to 20 percent of pretreatment levels except in patch cut areas.

Species Composition - Alternatives A and D, which primarily focus thinning on reducing white fir densities, should have a slight desirable increase in ponderosa pine and Douglas-fir composition. Pre-determined selection by the marking crew will control residual species composition. Under Alternative B, which is designed to capture salvage and dying trees, residual species composition is less controlled and depends on which trees are dying, not on species preference. Under Alternative C, residual species composition depends on prescribed burning prescriptions, fuel loads, and outcome of the prescibed fire. Because selection of the species to retain and remove in certain instances is uncontrollable, some preferred species as well as large trees could be unintentionally killed by the fire. Also, because they are less susceptible to fire than white fir, ponderosa pine and Douglas-fir should gradually increase with repeated prescribed fire treatments proposed in Alternative C.

Forest Health - Thinning below larger, older trees and overstocked stands as proposed in Alternatives A and D should increase tree vigor of residual trees. This increased tree vigor and thinning is expected to result in forest stands that are less susceptible to insect attacks and stand-replacing wildfires. Fuel loads would be reduced most under Alternatives A, due to the capacity of the mechancial harvester to prebunch excess fuel loads into yarding piles. Fuel loads and ladder fuel arrangement would also be reduced under Alternatives C and D, but not as quickly as Alternative A. Fuel loads would be least impacted under Alternative B, which would remove only the merchantable salvagable material.. Treatment of submerchantable 3- to 7-inch stems would be most efficiently done under Alternative A, by using the mechanical harvester. Without use of the mechanical harvester (Alternatives B, C, and D), thinning of this size of material would be done through procurement contracts (precommerical thinning/hand piling) and be subject to funding levels. Under Alternatives B, C, and D, prescribed fire would be used to address the density related forest health issue regarding stems less than 7 inches in diameter.

Overall impacts to forest vegetation should not exceed those impact analyzed in the KFRA FEIS for any of the alternatives.

Noxious Weeds

Alternatives that produce more intense or more extensive ground disturbance could create conditions that give noxious weeds a competitive advantage relative to other plant species. Therefore, Alternative A would have the highest probability, followed by Alternative D and then Alternative B, with Alternative C having the lowest probability (see Table 3) to facilitate establishment and/or spread of noxious weed species.

Wildlife - Terrestrial

Ungulates

The proposed timber harvest in Alternative A would have short-term beneficial consequences with the release of forbs and grasses that respond to ground disturbance. However, in the long term, the proposed harvests could remove some important thermal and escape cover and would increase susceptibility to predation, disturbance, and hunting. Due to past timber harvests and interspersed private lands already heavily harvested, the impacts from this alternative may

have a moderate effect. Proposed road closures throughout the project area, as well as retention of thermal clumps and escape cover, would reduce the potential for predation and disturbance. Alternative D would have similar effects to Alternative A, but a higher percentage of thermal and escape cover would be retained, which would reduce the overall impact. Alternative B would have the beneficial release of forbs and grasses, with less thermal and escape cover loss by the harvest of only dead and dying trees. Cumulative impacts from this alternative should be low. Alternative C (use of prescribed fire) would benefit big game populations by using fire disturbance to encourage the growth of forbs and grasses. This alternative could keep thermal and hiding cover intact for big game species except in areas where fire intensities could not be controlled and the thermal cover is burned. The use of prescribed fire would be recommended in all four alternatives to encourage growth of forbs and grasses, as well as to reduce high fuel loads that have potential to cause a stand-replacing fire.

Upland Birds

All four alternatives should have a low impact on upland game birds. Alternatives A, B, and D may have the potential to remove roosts for both turkeys and grouse. Leaving selected areas for potential turkey roost sites would be beneficial in maintaining current populations. Ground disturbance in the short term would be beneficial to upland birds by encouraging vegetative growth for foraging. Prescribed fires would be recommended to reduce potential stand replacing fuel loads and encourage vegetative growth for foraging.

Raptors

Alternatives A and D could impact several raptor species by reducing canopy closure and structural diversity within the proposed area. Potential perch trees and nest trees may be removed. Loss of structural diversity has potential, in the short term, to negatively affect prey base. Alternative B should have a lower impact, with less green volume removed and only dead and dying trees being taken. Although some perch sites would be lost, much of the structural diversity would remain intact. Alternative C (with the only action being prescribed fire) would have a low impact. All four alternatives should have a low impact on the prairie and peregrine falcon with no proposed project activities occuring within the Klamath River Canyon.

Woodpeckers

Alternatives A, B, and D would remove potential foraging and nest trees, but all four alternatives should have a minimal impact when considering their snag retention guidelines of 2.5 snags/acre (greater than 14 inches). If a snag is not available, a green cull will be left for replacement. The impact on other cavity-nesting birds/mammals should also be minimal due to retention of snags and future snag-replacement trees.

Wildlife - Aquatic

Aquatic species and habitats in the timber sale planning area could be impacted to the extent that hydrologic regimes of tributary streams are altered by ground disturbance and road use (see hydrology report in project files). Because the Klamath River is relatively large and efficiently transports sediments and nutrients, the Klamath River is considered outside the area of impact in this analysis. Fish and other aquatic species that occur in the Klamath River are not considered further in this analysis.

Considering the hydrology analysis in the TPLA and further analysis in the hydrology section of this environmental assessment, Alternative A would likely have the most impacts because more acres are impacted compared to the other alternatives. If ground disturbance (compaction, vegetation removal, loss of duff/organic layer, and increased road use) act in combination to increase the magnitude of peak runoff events, negative impacts to aquatic species, (including fish and invertebrates) from erosion, higher than normal nutrient concentration, and sedimentation are to be expected. Aquatic species known to occur in the area are generally tolerant of intermittent and ephemeral water supplies, high water temperatures, and high sediment/nutrient supplies (TPLA). Implementing the project design features in Appendix A is expected to mitigate impacts to aquatic species to levels analyzed in the FEIS.

The Klamath speckled dace is the only native fish species known to occur in the analysis area. It is common in small perennial streams throughout the Klamath Basin but is known to be present only in Long Prairie Creek, Rock Creek,

and the Klamath River within the TPLA . This species is known locally to be tolerant of low flow conditions, high summer water temperatures, and high nutrient levels. The long-term persistence of this population in the TPLA is dependent on a reliable year-round water supply in the perennial reaches of Long Prairie Creek. Already marginally perennial, the Long Prairie Creek fish population is at high risk from any significant reduction in base flow conditions. It is speculated that base flows have been reduced in the TPLA due to loss of hydrologic connection to floodplain and meadow habitat in Hayden, Long Prairie, and Tom Creeks.

Special Status Species

Plants

Special status plant species are not expected to be impacted from any of the alternatives because all such species with documented populations on BLM-administered lands occur in seasonally wet meadows or their margins, which are buffered. Providing meadows with buffers of 150 feet from the edge protects these populations from impacts of ground-disturbing activities associated with various levels and methods of timber harvest.

Assuming that fire lines would be constructed to avoid the seasonally wet meadows, prescribed fire under any of the alternatives would not be expected to detrimentally affect these plant species, because the vegetative species of this area were adapted to a relatively frequent natural fire frequency before Euro-American settlement.

Animals

Bald Eagles

Seasonal restrictions near any nest sites under the Pacific Bald Eagle Recovery Plan along with the current 30-acre buffer for each nest should protect nesting eagles from project disturbances. In the short term, Alternatives A and D may remove some potential nest trees. However, long-term enhancements of the large tree component should benefit bald eagle nesting and roost habitat.

Alternative B would have less impact, as it would remove only dead and dying trees. Although some potential nest trees may be removed, the large tree component would remain intact overall. Alternative C should not impact short-term nesting and roost habitat. In all four alternatives, an adequate number of potential nest and roost trees would remain and the cumulative impact should be low.

Northern Spotted Owl

Proposed actions in Alternatives A and D may have potential short-term negative effects on nesting and foraging habitat. Although the historic sites have District Designated Reserves and buffers established, thinning from below, thinning even-age stands, and the potential patch cuts in adjacent habitat would remove canopy closure and structural diversity needed for nesting and foraging. At nest sites not within District Designated Reserves, a site-specific modification or adjustment to current prescription may reduce the impact to current nesting habitat. Cumulative impacts for both Alternatives B and C should be low in the short term, but may have a negative effect on long-term forest health due to an overstocked understory. Seasonal restrictions during the nesting and fledgling period, along with road closures in the vicinity of known sites, would reduce the impacts of all alternatives. Surveys for the northern spotted owl will continue to be conducted according to management guidelines.

Other Species of Concern

In Alternatives A and D, the loss of canopy may affect nesting opportunities in the short term; however, thinning of dense stands should promote future late-successional habitat conditions. Snag retention, as well as guidelines for down woody debris, should continue to provide foraging opportuniites. Alternative B should have a minimal impact on goshawk habitat. Removal of only dead and dying trees will maintain a greater canopy closure and should not affect nesting, foraging, or dispersal opportunities. Alternative C should also have low cumulative affects on northern goshawk habitat.

Habitat for the Townsend big-eared bat and other bat species should not be affected by any of the four alternatives. The large tree component and snag retention will provide potential roost habitat.

All four alternatives should have little effect on potential great gray owl habitat. Removal of the larger tree component in some instances in Alternatives A, B, and D may remove potential nest trees, but snag retention guidelines should provide nesting opportunities. Buffers around existing meadows would minimize impacts on potential nesting and foraging habitat. All three alternatives also should have low potential to impact white-headed woodpecker and pygmy nuthatch habitat. Retention of large ponderosa pine, and implementation of snag guidelines would provide potential nesting structure and foraging opportunities.

Survey And Manage Species

Mollusks

Aquatic Mollusks

Negative impacts to survey and manage aquatic mollusks could occur under any of the alternatives if the drainage area above the population is disturbed to the extent that sedimentation and nutrient concentrations are increased significantly above background levels. Sensitive mollusk species are likely to occur near perennial springs or seeps where water is cold year-round and is well oxygenated.

Terrestrial Mollusks

The magnitude of direct impacts to existing populations of terrestrial mollusks would be proportional to the percent of ground disturbed. Assuming that the total equivalent clear-cut acreage (ECA) is a surrogate for ground disturbance, impacts to terrestrial mollusks would be greatest under Alternative A, and less for Alternatives D, C, and B, respectively. Terrestrial mollusks are generally found in moist areas between the soil and some organic (duff/organic layer) or mineral cover (talus, rocky outcrop, or cliffs). Since desiccation is a primary limiting factor, activities that affect microclimate (such as overstory and understory removal or reduction) would likely have negative impacts. Underburning would have direct negative effects from heat, understory removal, duff layer reduction, and desiccation. The overall reduction of the organic soil layer would likely have long-term impacts. Any modification that would affect soil moisture retention and humidity may impact terrestrial snails, which depend on moisture for survival.

Nonvascular Cryptogams

Existing and new sites of survey and manage lichens, bryophytes, and fungi are being documented for the resource area. Giving consideration to management recommendations prior to ground-disturbing activities would minimize impacts to known sites of survey and manage bryophytes, lichens, and fungi.

Vascular Plants

Survey and manage vascular plant species are not expected to be impacted under any of the alternatives, because botanical surveys of the area did not detect any populations of these species.

Cattle Grazing/Wild Horses

In general, all four alternatives would have little, if any, impacts to cattle grazing or the wild horse herd. In areas with livestock grazing leases (Dixie, Chicken Hills, and the Ward pasture of Edge Creek), the impacts would be minimal and generally positive. Opening up the forest canopy allows for an increased abundance of herbaceous plants, which are favored by grazing animals including cattle, horses, and elk. Alternative A would have the highest (relative) positive effect since it treats the most acres; Alternative B would have the least. However, cattle grazing in the analysis area is at only 20 percent of the intensity of a few years ago, and the Pokegama wild horse herd is at its lowest level since the 1970s. Forage abundance and availability are currently not a concern with either cattle or horses, unless the elk herd reaches much higher levels or grazing leases are re-issued on private lands.

Timber harvest and burning activities may disturb the wild horse herd, displacing them to less preferred areas. However, the extensive harvest activities of Weyerhaeuser and U.S. Timberlands in recent years has not created this problem.

Air Quality

Prescribed burning is common to all alternatives. Under Alternative C, the impacts to air quality could be higher. Fuel loading and density control would be done primarily with fire, which results in more frequent treatments to reduce densities to a lower risk level. Instead of reducing densities and fuel loads mechanically, fire would be used.

Cultural Resources

Conducting surveys for cultural resources prior to implementing BLM actions would reduce the potential for impacting cultural resources. Another protective measure is the forwarding of survey reports to the State Historic Preservation Office for review and concurrence to proceed with planned projects, which has been done for this environmental assessment. Sites discovered during survey are identified in the field and either avoided or protected during ground-disturbing actions.

Currently, BLM Class III surveys generally do not incorporate subsurface techniques for locating archaeological sites. Using surface survey methods in a forested environment has the potential of missing significant sites, because the organic litter above the mineral soil prevents their discovery.

With regards to cultural resources, the alternative with the greatest potential to cause ground disturbance would be the alternative with the greatest risk to sites not discovered during surface survey. All four alternatives must be considered for their potential to cause ground disturbance, which is ranked below:

Greatest Soil Disturbance

Alternative A: Combination Treatment - Mechanical Harvester
Alternative D: Combination Treatment - Hand Falling
Alternative B: Salvage

Least Soil Disturbance

Alternative C: No Action/Fuels Treatment

When considering only cultural resources, the preferred alternative with the least ground disturbance would be Alternative C.

Recreation Resources

Forest treatments in Alternative A would have minimal adverse impacts, including short-term disruptions to dispersed recreation, in addition to the effects described in the KFRA FEIS (pages 4-104 to 4-108). Due to safety hazards associated with forest treatment activities, areas may be temporarily closed to entry. These closures may inconvenience or displace some recreational users. There would also be additional short-term disturbances from noise and dust associated with harvest activities in these areas.

Environmental consequences under Alternatives B, C, and D would be similar to those described above.

Visual Resources

The forest treatment activities proposed under Alternatives A, B, C, and D would maintain the visual resources and scenic quality rating for which the area is being managed. Effects on visual resources would not exceed those described in the KFRA EIS on pages 4-90 to 4-101.

Social/Economics

Alternative A is the most cost-effective method for harvesting the material proposed for removal, including those stands having stems less than 7 inches in diameter that need thinning (see Table 7). Falling and yarding costs would be moderately higher if all felled trees were winched to a designated skid trails (Alternative D). In addition, procurement funds would be needed to precommercial thin and hand pile those stands having a significant component of stems less than 7 inches in diameter and where thinning was nescessary. Alternative B would likely result in higher logging costs as well, because less volume per acre would be removed and scattered over large acres. Under Alternative C, harvesting would be deferred in the analysis area and be done on some other matrix land within the resource area.

Table 7 - Treatment Cost Comparisons of Alternatives

Alt.	Logging Costs Per MBF*	PCT Costs Per Acre	Hand Piling Costs Per Acre	Burning Costs Per Acre	Number of loads per day used to estimate logging costs.
A	$93	None	None	$200	10 loads/day
B	$162	$125	$250	$250	5 loads/day
C	None	$125	$250	$250	n/a
D	$115	$125	$250	$300	7 loads/day

*Source of Logging Costs: Pacific Northwest Logging Costs, World Forest Institute (1997)

Cumulative Effects

Water Resources

The TPLA described the current hydrologic condition of the analysis area (see pages 84-87). Since the TPLA was written, another cumulative effects analysis has been completed for the TPLA area using interpreted satellite imagery. The imagery, which was acquired in 1993, was classified into vegetation types and canopy closures. The results of the cumulative effects analysis using the satellite imagery are on Table 8.

Table 8 - Results of Cumulative Effects Analysis Using Satellite Imagery

Watershed/Area	Historic ECA*	Current ECA**	Percent of Area in ECA**
Long Prairie Creek	Not Available	4,414 acres	22
Hayden Creek	Not Available	5,373 acres	25
TPLA Area	9,000-10,000 acres	15,072 acres	11

* From the TPLA. Includes the *entire* TPLA area, including Long Prairie and Hayden Creek watersheds.
** ECA = Equivalent Clearcut Acres. as of 1993 imagery.. Please refer to the TPLA (pages 85-87) for information about cumulative effects analysis and equivalent clearcut acres.

Based on the information in Table 8 and assumed effects of the activities described in the alternatives, all four alternatives could increase the area considered in equivalent clearcut condition (see Table 9).

Table 9 - Equivalent Clearcut Acreage for TPLA Area and Watersheds by Alternative

Alternative	Percent of TPLA Area in Equivalent Clearcut Area	Percent of Hayden Creek Watershed in Equivalent Clearcut Area	Percent of Long Prairie Creek Watershed in Equivalent Clearcut Area
A	14	27-28	25
B	12	25	22
C	12	26	23
D	13	27	24

Studies of cumulative effects to water resources resulting from forestry practices suggest that measurable change in magnitude of peak flows does not occur until approximately 20 to 30 percent of a watershed is clearcut. Because harvest practices in this area result in only partial removal of trees, "equivalent" clearcut acres are used as a surrogate analysis tool. Since the percent of the Hayden Creek and Long Prairie Creek watersheds considered in equivalent clearcut condition ranges between 20 and 30 percent, a measurable change in peak flows may have resulted from past management activities. Implementing any of the four alternatives could maintain or magnify this increase. However, the level of effect from any of the alternatives would be low and may not be detectable. Reference the hydrology report in the project files for more information on the process used to assess cumulative effects of canopy reduction from timber harvest.

Table 4-1 in the KFRA FEIS estimated that an average of approximately 960 acres per year of ground-based yarding would occur on west-side lands in the first decade of the plan (for a total of 9,590 in 10 years). To date, the KFRA has completed/planned approximately 560 acres per year of Density Management sales and approximately 1,800 acres per year of salvage type sales. The Density Management sales normally treat all acres listed. However, the salvage sales cover a large contract area, but the actual amount of acres salvaged (land impacted) is approximately 30 percent of contract area. In many instances, only one or two individual trees are removed from an acre on a salvage sale.

The increase in acres of ground-based yarding estimated by alternative is as follows:
Alternative A: up to 8,000 acres
Alternative B: 500 acres
Alternative C: None
Alternative D: 7,000 acres

The third-year evaluation will fully analyze the amount of acres treated to date, compared with that addressed in the FEIS, and will incorporate the alternative selected in this environmental assessment.

The FEIS (Table 4-1) analyzed up to one mile of new road construction (average) per year on westside lands. To date, there has been no net increase of road mileage on BLM-administered lands on the westside. In addition, implementation of the first phase of the Transportation Management Plan in the Lower Spencer Creek Watershed should reduce the total open road miles within that watershed. Therefore, if up to 0.10 miles per year of new roads are built and other roads are either permanently or seasonally closed (as outlined in Alternative A) or only existing roads are used as in other three alternatives, the road construction proposed in all of the alternatives is within levels analyzed in the FEIS.

Lentic Riparian-Wetland Areas

No long-term change in the extent or condition of lentic riparian-wetland areas is expected from implementation of any of the alternatives.

Lotic Riparian-Wetland Areas

Application of silvicultural practices in riparian reserves would be done to control stocking, re-establish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives. These would

include thinning around pines to provide for future large woody debris and the reduction of fuel loads to prevent catastrophic wildfires within the Riparian Reserves.

Aquatic Species and Habitat

The TPLA and hydrology report indicate that management activities (including existing roads, past and recent harvest on private and BLM-administered land, and livestock/wild horse grazing) have affected the function of aquatic ecosystems in the TPLA. There are no known species that could be categorized as sensitive to degraded ecological condition (such as cold water fish). Cumulative effects from the proposed action would likely not be detectable since there are few "indicator species" and the proposed action would result in only a 2 to 3 percent change in equivalent clearcut acreage. Furthermore, the cause and effect of any detectable change in habitat condition would likely be overshadowed or hidden by activities on private land. Activities on private land that would affect overall aquatic habitat condition in the near future include a reduction in livestock and wild horse numbers, increased intensity of timber harvest, and active road maintenance and road closure (see discussion regarding Pokegema Road Closure). As stated earlier, any further reduction in base flow (minimum summer flow) is of primary concern for the persistence of aquatic dependent species in the TPLA. Road management changes, restoration activities, and changes in grazing/wild horse management will likely ameliorate cumulative hydrological changes of past harvest and ground disturbance.

Possible Mitigating Measures

Table 10 - Possible Mitigating Measures to Reduce Soil Impacts

Possible Mitigating Measure	Advantages	Disadvantages
1. Use a rubber-tired mechanical harvester limited to flatter ground.	Less soil displacement than a track-mounted machine; also less organic layer disturbance.	More PSI (pounds per square inch) tire pressure than a track-mounted machine.
2. Use a rubber-tired or track-mounted harvester/processor (limbs left in woods).	Uses available limb debris to place in skid trail to lessen direct soil contact; machines run on debris layer where available.	Raises fuel loadings and potentially increases fire hazard and mortality during underburning operations.
3. Do not mechanically treat the 3"-7" material.	Reduces overall disturbance. Also provides additional thermal and escape habitat.	Additional cost to treat this material by PCT and/or through underburning. Also, fuel ladder arrangement is an additional risk to the overstory.
4. Treat only 3 to 7 inch material that can be reached from mechanical harvester trail (every 40 feet).	Thins some 3 to 7 inch material, but also leaves some.- Mechanical harvester does not leave trail when thinning only 3 to 7 inch material.	Some additional hazard to overstory from ladder fuel arrangement but lessened somewhat.
5. Absolutely limit the mechanical harvester to a trail every 40 to 50 feet. It is not allowed off the trail. If it cannot reach the tree, or the tree is too large to harvest due to ballast, then the tree has to be hand-felled	Anticipating a mechanical trail 10 feet wide for every 50 feet equates to a disturbance level of a *minimum* of 20 percent.	Because mechanical harvester trail and skid trail would be basically synonymous, the amount of skid trail is likely to be 20 percent or more as well. Harvester would prebunch the material in the trail for skidder.
6. Limit skid trails (SR1)* to 100 feet apart and require skidder to stay on these trails. Allow mechanical harvester off these trails to do needed thinning. Require harvester to pack trees back to these (SR1) trails. Larger trees and hand felled trees will be winched to these trails.	Fewer (SR1) trails.	Undetermined yet whether (SR3) trails (primarily mechanical harvester tracks with 1-3 passes) are detrimentally impacting soils.
7. In Alternative D: Do not allow mechanical harvester. Place skid trails 100-150 feet apart. Winch all trees, with limbs and tops attached. No mechanical treatment of any 3 - 7 inch material.	Would likely meet FEIS impact analysis.	May or may not go "No Bid" due to economics. Also, limited number of operators still do this type of logging.
8. Purchaser incentive clause. Reduce contract price if soil impact objectives are met.	Benefit soil resources. Encourage cooperation from operators.	Difficult to develop criteria to interpret detrimental soil impact.

* SR1 = Main skid trail to landing used both by mechanical harvester and skidding machine (7+ passes).
SR2 = Secondary trail used primarily by mechanical harvester (4-7 passes).
SR3 = Tributary used only by mechanical harvester (1-3 passes).

Appendix A-1. General Project Design Features

Project design features (PDFs) are specific measures included in the design of proposed projects to minimize adverse impacts to the natural and human environment. The PDFs for the proposed action were developed by members of an interdisciplinary team (IDT).

Project Design Features that mitigate impacts to watershed, wildlife, fisheries, and other resources are applied as described in the KFRA FEIS.

The project design features listed below are common to all alternatives unless otherwise specified. Additional project design features for watershed and soil resources are in Appendix A-2.

Timber Reserved From Cutting

In the Matrix and for each prescription unit, retain an average of at least 16 green trees per acre from the larger size classes present in the unit.

For uneven-aged stands, maintain a multi-strata stand structure. Thin primarily from below to maintain the vigor of the larger trees. Remove only a limited number of large overstory trees.

For even-aged stands, thin trees to basal area range from 70 to 160 square feet per acre.

In uneven-aged and even-aged stands (primarily in solid white fir stands where past and on-going mortality rates are high), intersperse patch cuts (up to 3 acres in size) on up to 15 percent of the treatment area. Within the patch cuts, retain up to 5 large overstory trees, in addition to understory pines, Douglas fir, and incense cedar.

In the vicinity of each patch cut, reserve a thermal clump of at least 0.10 acre.

Consider a regeneration cut where mortality pockets exceed 3 acres in size and over 50 percent of the trees have died. In a regeneration cut area, at least 16 green trees per acre from the larger size classes will be retained (See Appendix D).

On all Matrix lands, retain a minimum of 2.5 snags per acre, where available, in the following categories:
1 snag >20" dbh; species should be ponderosa pine, sugar pine, or Douglas fir if available;
1.5 snags >12" dbh; species retained should be a mix proportional to the stand composition.

On all Matrix lands, retain (where available) a minimum of 120 linear feet of Class 1 and 2 down logs that are at least 16 inches in diameter and 16 feet long.

Reserve (in the cutting area) any identified wildlife trees that are cut or knocked down.

General Riparian Reserve Guidelines

Retain riparian reserves, per the Northwest Forest Plan standards and guidelines, along all wetlands, seasonally flowing (intermittent), and perennial streams.

Flag and post riparian reserves within the treatment areas, as follows:
- Intermittent streams: 140-foot riparian reserve (height of one-site potential tree) on each side of the stream.
- Non-fish bearing perennial streams: 150-foot wide riparian buffer on each side of the stream.
- Fish-bearing perennial streams: 300-foot wide riparian buffer on each side of the stream.
- Constructed ponds and reservoirs and wetlands greater than 1 acre: 150-foot riparian buffer.
- Lakes and natural ponds: 300-foot riparian buffer.

On lakes, reservoirs, and ponds, measure riparian reserves from the historical high water marks. On streams and drainages, measure riparian reserves from the high water and/or floodplain boundaries.

Some harvest may occur in the riparian reserves as previously described. Any harvest inside a riparian reserve would be conducted only to attain Aquatic Conservation Strategy objectives in that riparian reserve and only with the concurrence of the Klamath Falls Resource Area Riparian Team.
All snags would be retained in riparian reserves except where sufficient down woody debris are present or safety, fire hazard, or potential resource damage dictate their removal.

The 100 percent snag level requirements for wildlife would be met before any salvage is removed from a Riparian Reserve. The 100 percent levels include retention of at least 3.8 snags per acre. In addition, no salvage would be removed from a riparian reserve unless adequate down woody debris are present (see Appendix A-1, General Project Design Features). Hazard trees adjacent to roads or recreation sites would be felled in riparian reserves, including within the no cut buffer. Felled hazard trees would be left in the riparian reserves, except where adequate down woody debris exists or where they would create resource damage. Hazard trees felled within the no-cut buffer would be left in place except where they would cause resource damage.

Within the riparian reserves, no timber harvesting would occur from the natural topographic break to the stream except falling of hazard trees. In areas where topographic break is not evident the following guidelines would be implemented. On intermittent streams with slopes less than 10 percent, a 50-feet no harvest buffer would be established on each side of the stream. On slopes greater than 10 percent, an 80-feet no harvest buffer would be established on each side of the stream. On perennial streams with less than 10 percent slope, a minimum of 100-feet no harvest buffer would be established. On perennial streams with slopes greater than 10 percent, a no harvest buffer of 160-feet would be established.

Generally, harvest/treatment methods that would disturb the least amount of soil and vegetation (yarding over snow or frozen ground, pulling line to each tree, minimizing skid trails) would be used in riparian reserves.

Reserve other buffers, as follows:
- Wet meadows, seasonal wetlands, and wooded swamps: 150-foot buffers.
- Dry meadows and cliff/talus slopes: 100-foot buffers.

Note: All buffer widths are specified in the KFRA ROD page B-4 (Table R1).

Logging

Falling

Require directional falling away from property lines, reserve trees, roads, streams, springs, meadows, cultural resource buffers, riparian reserves, and fences.

Restrict log lengths to 41 feet or less in areas where stand damage is occurring.

No limbing would be allowed except where large limbs are causing damage to the residual stand. Tops would remain attached to the last log.

Require a mechanical harvester with a lateral boom (Timco) of at least 20 feet for falling trees 20 inches DBH and smaller. Cut non-sawlog material 3 to 7 inch DBH at a specified spacing and remove concurrently with sawlog operations. In addition, do not allow a mechanical harvester within 20 feet of any pine 20 inches DBH or greater.

On slopes in excess of 30 percent, hand fall all trees designated for cutting to the lead of designated skid trails.

Yarding

Tractor logging would be the primary logging system used.

Require whole tree yarding in areas of ground-based yarding, except where limbing and/or bucking is required to protect residual trees or where large cull logs are left for down woody debris purposes. Tops would remain attached to the last log and would be yarded to landings.

Cull logs greater than 18 inches in diameter at the small end, that are not removed from the landing, would be yarded back into the sale area to locations determined by a resource specialist.

Restrict ground-based logging equipment to designated skid trails except to yard bunched piles located off the skid trails. Require line pulling and winching in designated hand falling areas.

Restrict all ground-based yarding to slopes averaging less than 35 percent.

No yarding would occur directly up or down any stream or drainage.

Minimize designated crossings of riparian reserves and the size of yarding corridors.

Do not locate any new landings within riparian reserves, unless approved by the KFRA riparian team.

The maximum width of any yarding corridor through a riparian reserve would be 30 feet.

Do not locate any new skid trails in riparian reserves, except at designated crossings. Any crossings that are required would be designated by authorized personnel prior to yarding and also be located at right angles to the drainage.

Logging on snow would be allowed in conformance with seasonal restrictions when snow depths average 20 inches or greater and negligible ground surface exposure occurs during the operation. Logging on frozen ground may also be allowed when the ground is frozen to a depth of 6 inches.

The following restrictions would apply to mechanized equipment:

- Restrict operations to dry conditions (generally less than 15 to 20 percent soil moisture by weight).
- Use the lowest ground pressure machine capable of meeting objectives, when available.
- Do not allow a mechanical harvester on slopes averaging greater than 35 percent unless approved.

Seasonal Restrictions

Require seasonal restrictions to prevent soil erosion and to protect wildlife. Require seasonal restrictions in areas where the following wildlife species are actively nesting: bald eagle, northern spotted owl, American marten, survey and manage species, and protection buffer species. Seasonal restrictions for specific species can be found on pages 231-240 of the KFRA FEIS.

To protect riparian areas, soil resources, and water quality while limiting erosion and sedimentation to nearby streams and drainages, do not allow logging operations during the wet season (October 15 to May 1). Permit logging activities during this time period if frozen ground or sufficient snow is present, or as approved by a resource specialist.

To protect soil resources and water quality, close unsurfaced roads during the wet season (October 30 to June 1) unless waived by authorized personnel.

Threatened and Endangered/Special Status Species/Other Wildlife Protection

Five Late-Successional/District Designate Reserves (DDRs) of approximately 100 acres have been established for old-growth related species. In addition, five District Designated Reserve Buffers/DDRBs will be located around the DDRs.

Reserve a 30-acre buffer around the eagle nest sites in the analysis area, and restrict operations near the nest site (KFRA ROD, page 38). Within designated eagle habitat area, emphasize silvicultural treatments that encourage maintenance and recruitment of habitat components necessary for nesting and roosting bald eagles. Retain the largest snags (greater than 24 inches DBH). Give preference to ponderosa pine, sugar pine, and Douglas-fir with large open limb structure suitable for perching by eagles (KFRA ROD, page 38).

Reserve a 30-acre buffer around the two known Northern Goshawk nest sites in the analysis area (KFRA ROD, page 38).

Continue conducting great grey owl surveys (a protection buffer specie) in the analysis area and prior to disturbance. If a nest site is located, establish a 0.25-mile protection zone around the nest site area; the area will become an unmapped Late-Successional Reserve subject to the Standard and Guidelines for LSRs in the NFP (May 12, 1995, Great Gray Owl Survey Protocol Memo from Regional Ecosystem Office).

Provide snag mitigation measures (100 percent population potential) for one protection buffer species; whiteheaded woodpecker will be addressed as specified in the NFP (page C46). Increase snag retention requirements from 1.9 to 2.5 snags per acre.

Allow purchaser to pump water only out of designated water sources. Notify wildlife and hydrology staff at least one week prior to intended pumping dates to confirm adequate water supplies.

Close roads to reduce wildlife disturbance. Where possible after treatment is completed, implement road closures to approach objective of 1.5 miles/section open road density.

In Timber Sale Stipulations, include Special Provision E4 (limited operating season) for Threatened or Endangered Species, which provides protection for Federally listed species, Federal Candidates, and sensitive or state-listed species protected under BLM Manual 6840, protection buffer species, survey and manage species, and specific species listed for protection in the KFRA ROD/RMP.

Apply seasonal operating restrictions to actively nesting raptor species.

Apply seasonal operating restrictions to any active elk calving areas located during the duration of this project.

Specific to the northern goshawk, consider recommended habitat guidelines issued by the BLM Oregon State Office (memorandum OR-94-112).

Survey and Manage Mollusks: Pending release of official management recommendations for survey and manage mollusks, interim protection measures will be considered when known sites are found.

Aquatic Mollusks: Because populations tend to be concentrated in small areas, impacts to aquatic mollusks are easily ameliorated by minimizing disturbance (less that 20-30% disturbed) in the drainage area immediately upstream/upslope of known populations. Avoid stream crossings over intermittent and ephemeral streams that have the potential to deliver sediment to waterbodies with sensitive aquatic mollusks.

Nonvascular Cryptogams. For FY-99 timber sales, conduct surveys for nonvascular cryptogam species listed under survey and manage strategy 2.

Visual Resources

Where possible, maintain visual screening along roadways.

Within recreation sites, concentrated recreation use areas, or Special Areas, implement the following design features to reduce visual impacts from harvesting:

- Cut stumps close to ground (less than 4 inches).
- Disperse small (hand) piles of slash for firewood use.
- Minimize use of tree marking paint on trees identified for harvest.
- Do not create large landings.
- Minimize number of skid trails and amount of ground disturbance
- Minimize damage to residual trees through careful timber falling.

All treatments will meet appropriate Visual Class objectives specified in the KFRA ROD/RMP (page 44).

Cultural Resources

Follow procedures for cultural protection and management outlined in the KFRA ROD/RMP (page 43), and protect identified sites by buffering.

In accordance with guidelines and directives in the Klamath Falls Resource Area RMP, BLM regulations, and the National Historic Preservation Act, areas not included in previous archaeological surveys will be surveyed before any ground-disturbing action is undertaken.

Road Construction, Maintenance, and Use

This EA will analyze for up to 5 to 7 miles of new road construction and 1 to 3 miles of road obliteration. A long-term transportation management plan for the analysis area to determine which roads are necessary and which can be blocked is being prepared concurrently with this EA. In addition, as each sale is finalized, a final determination on roads within the contract area will be made and implemented as part of the timber sale contract.

Where required, primary access roads would be maintained, renovated, or improved to facilitate general access. Some secondary roads not identified for closure would receive maintenance or improvement in areas of active erosion. Examples of improvements would include spot surfacing and installation of culverts or other drainage features where needed to protect resources. Other secondary roads that are more stable would receive minimal or no maintenance to provide high clearance vehicle recreation opportunities.

Obliterate or close some roads, including spur roads not needed for continued resource management, after completion of the proposed management activities. Roads to be obliterated or closed would be identified by resource specialist and the KFRA Interdisciplinary Team (IDT).

Currently closed roads that would be opened to facilitate harvest activities would be closed again after completion of those activities. The roads would be closed in a similar fashion to the currently existing closures.

Use dust pallatives or surface stabilizers (water) on roads during dry periods to prevent surface material loss and the buildup of fine sediments that may wash off into water courses. Closely control application of dust pallatives and surface stabilizers, equipment cleanup, and disposal of excess materials to prevent contamination of water resources.

Road graders used for road construction or maintenance would grade towards any known noxious weed infestations. If a good turnaround area does not exist within 0.50 mile to allow grading towards the noxious weed infestation, the operator would leave the residual material within the boundaries of the noxious weed infestation. The grader would not grade through noxious weed infestations.

Environmental Protection/Forest Health Features

Require cleaning of all equipment and vehicles prior to moving on-site to prevent spread of noxious weeds. Also, if the job site includes a noxious weed infestation, require cleaning of all logging and construction equipment and vehicles prior to leaving the job site. Removal of all dirt, grease, and plant parts that may carry noxious weed seeds or vegetative parts could be accomplished by using a pressure hose to clean the equipment.

Mow noxious weeds in the immediate area of yarding operations to ground level prior to seed development.

Conduct monitoring activities related to proposed treatments as described in the Klamath Falls ROD.

Within laminated root rot *(Phellinus weirii)* centers, and in a strip 50 feet around, remove susceptible tree species (white fir and Douglas-fir), and reserve resistant tree species (pines and incense cedar). Treat white fir and pine stumps with borax to prevent the spread of Annosus root rot.

Construct waterbars on roads, spurs, skid roads, yarding corridors, and fire lines prior to fall rains, and according to specifications outlined in the Best Management Practices in the KFRA RMP and project design features in Appendix A-2.

Where feasible and as designated by authorized personnel, spur roads, skid trails, and landings that are not needed for a permanent logging system would be ripped to remove ruts, berms, and ditches and/or to reduce soil compaction.

During yarding and piling operations, adhere to practices and methods in the project design features in Appendix A-2.

Limit cumulative effects of unmitigated detrimental soil conditions to 20 percent of the total acreage within an activity area (the total area of ground, such as a timber sale unit or a slash treatment area including roads, skid trails, and landings).

Detrimental soil conditions include compaction, displacement, and creation of adverse cover conditions. Sites where the 20 percent standard is exceeded would require treatment, such as ripping, backblading, or seeding.

Riparian Reserves

Allow purchaser to pump water only out of designated water sources. Notify wildlife and hydrology staff at least one week prior to intended pumping dates to confirm adequate water supplies.

Designate riparian reserves according to the guidelines in Appendix A-1.

Do not permit refueling, equipment maintenance, fuel storage, or other handling of petroleum products or other chemicals in or adjacent to riparian reserves.

Do not permit ripping, piling, or mechanical site preparation (except for designated skid trail crossings, landings, roads, or yarding corridors) in riparian reserves, except for riparian wetland enhancement or wildlife projects designed to meet Aquatic Conservation Strategy Objectives of the Final Supplemental EIS and objectives in Appendix C of the KFRA RMP.

Avoid removal of down trees and logs in riparian reserves, unless they are causing resource damage. Any removal would be approved by KFRA Riparian Team.

Fire Prevention and Control

Require all contractors to adhere to Oregon State fire safety and preparedness rules and regulations and Industrial Fire Precaution Class restrictions as directed by authorized personnel.

Slash Disposal/Site Preparation (Machine Ripping and Piling)

Re-introduce fire in forest stands on a random basis as addressed in environmental assessment (EA # 014-94-09). In all alternatives, prescribed fire (applied mostly as underburning) could occur in some matrix and riparian reserve areas after timber harvesting to improve plant and wildlife diversity and reduce fuel loads in the area. No ignition would occur 50 feet from the stream. Areas to be underburned would be selected by either site-specific election or through a random process discussed in the prescribed fire EA.

Within the proposed analysis area, elected prescribed fire would be used on approximately 500 to 2,000 acres for hazard reduction on the lower elevation, drier site forest stands. In addition, elected prescribed fire will be used as a site preparation tool to prepare sites for reforestation.

Where feasible, require whole tree yarding with limbs attached. Where potential exists to damage the residual stand, trees will be limbed and bucked to keep the tree top attached to the last log. Landing debris not removed for sawlog material may be chipped, shredded, or ground and removed from the site. In isolated areas, some burning of residual landing material would occur.

Lop and scatter residual slash and damaged saplings in the units to depths no greater than 12 inches.

Conduct all burning in accordance with standards established by the Oregon Smoke Management Plan.

Some reserve trees, particularly high resource value trees, would have slash pulled back by hand and piled at least 20 feet away from the base of the tree.

Conduct piling of any slash in riparian reserves by hand. Any excessive concentrations of logging slash in riparian reserves resulting from the current timber sale would be removed prior to fall rains and placed above the high water mark.

Within 100 feet above culverts, all logging slash resulting from the current timber sale, would be removed and placed above the high water mark.

Conduct mechanical site preparation activities, such as slash piling, only when soil moisture is less than 15 to 20 percent.

Within the analysis area, up to 300 acres could be ripped. Ripping would be done with a winged ripper under specific moisture conditions in isolated areas. No ripping would occur within one crown width of any tree.

Within the analysis area, down accumulations of fuels on up to 500 acres would be piled with a track-mounted excavator. This would occur mostly in areas where existing fuel loads exceed KFRA ROD/RMP objectives.

Down Woody Debris

Retain, where available, a minimum of 120 linear feet of down logs on the site. The minimum diameter of the down logs would be 16 inches.

Recreation - Chase/Hamaker Area

Design vegetation treatment activities in the Chase and Hamaker mountain areas to enhance recreational opportunities. On Hamaker mountain, non-motorized winter sports and mountain biking are to be targeted as benefitting activities. Consider the following criteria when designing and implementing forest treatment activities:

- The parking/staging area for winter sports is in the flat located to the west of the main road in the Hamaker-Chase mountain saddle. If this area is used for any harvest activities, ensure that it is adequately cleaned afterwards and returned to its pre-treatment condition.

- The powerline area on the north side of Hamaker mountain is currently used for downhill shuttle skiing, snowboarding, and sledding. The use of patch cuts, regeneration cuts, and heavy thinning in this area could enhance the downhill skiing potential of this area. Cleared areas could be planted with grasses and other low lying vegetation to maintain openings for skiing and allow for better ski conditions on a thin snow cover. Design any forest treatment activities on the north side of Hamaker, between the saddle and the summit, to maintain and/or enhance the downhill skiing recreation opportunities at this site.

- Design skid trails and roads in the Hamaker-Chase area to connect to existing trails and ways and to enable conversion to multiple sport recreational trails after forest treatment activities are completed.

Appendix A-2: Project Design Features for Water Resources

The best management practices (BMPs) selected for these proposed treatments are designed to achieve the objectives of maintaining or improving water quality and the protection of riparian-wetland areas. The goal of the practices listed below is to prevent or mitigate adverse impacts while meeting other resource objectives.

Maps/Contract Requirements

(1) Specify water sources available for purchaser's use on maps and in the timber sale contracts.

Riparian Reserve Designation

(1) Establish riparian reserves on streams and water bodies as listed in the table below. Each proposed treatment area will be surveyed to determine the classification of streams and the location of wetlands, ponds, reservoirs, and unstable and potentially unstable areas. To use this table:
   a) Determine if stream in a proposed activity area is fish bearing.
   b) Determine if stream is perennial or intermittent.
   c) Determine if area is unstable or potentially unstable (this will be a rare designation in the KFRA).

Table A-2.1. Riparian Reserve Widths by Land Type

Stream/Waterbody/Wetland Type	Slope Distance of Riparian Reserve (in Feet)
Fish-Bearing Streams	300 feet
Perennial, Nonfish-Bearing Streams	150 feet
Intermittent Streams	140 feet
Constructed Ponds and Reservoirs and Wetlands greater than 1 acre	150 feet
Lakes and Natural Ponds	300 feet
Wetlands less than 1 acre and Unstable and Potentially Unstable Areas	The extent of unstable and potentially unstable areas or the wetland to the outer edges of the riparian vegetation.

A site-potential tree is defined as the average maximum height of the tallest dominant trees (200 years old or more) for a given site class. In the Topsy-Pokegama Landscape Analysis, the height of a site potential tree was determined to be 140 feet.

Minimum widths of riparian reserves are expressed as whichever slope distance is greatest. The widths listed in the above table are those that would be applied to one side of the stream. For example, a fish-bearing stream would have a 600-foot buffer (300 feet each side). In addition to these widths, riparian reserves must extend from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain and to the outer edges of riparian vegetation. Wetland, pond and reservoir riparian reserves must include the body of water or wetland and the area from the outer edges of the riparian vegetation, or to the extent of seasonally saturated soil, or to the extent of unstable or potentially unstable areas. Reservoir and pond riparian reserves are to be measured from the edge of the maximum pool elevation.

(2) Use the following sequence of decisions when establishing riparian reserve boundaries:

   a. *Identify Floodplain Boundaries* The entire 100-year floodplain should be included within the riparian reserve. The topographic break in slope between hillsides and the relatively flat floor of the stream valley will define a floodplain boundary. Floodplain soils and substrates are characterized by rounded edges on gravels, cobbles, or boulders as a

result of being tumbled by streams. In contrast, hillslope substrates are more sharp and angular. Vegetation may change in age or composition at floodplain boundaries; however, many floodplains have forest vegetation as old or older than hillslope stands. Smaller, incised (downcut) streams and lower order (first, second, and third) streams frequently lack floodplains. Also, floodplains may not exist along non-riverine wetlands and lakes. In the absence of floodplains, historical high water levels should be used (see Section b, below).

b. *Locate Margins of Active Channels and Shorelines (High Water Mark).* After floodplains (if they exist) have been identified, riparian reserves are delineated. Delineation of the riparian reserve starts at the edge of the active channel or mean high water level, and extends outward horizontally on both sides. Active channels consist of all portions of the stream channel carrying water at normal high flows, not just the current wetted channel. This includes side channels and backwaters which may not carry water during summer low flow. All islands and gravel bars are included as part of the active channel. Active channel boundaries are indicated by abrupt topographic breaks where frequent channel scour has steepened streambanks. Frequently, plant abundance is reduced in areas of active channel modification, and plant communities are dominated by herbs and forbs. The high water mark is often marked by the vegetative litter carried in high flows and then deposited or caught in live vegetation.

Riparian reserves around reservoirs, ponds and lakes should be measured from the high water level. This level may be indicated by evidence of erosion by wave action, reduced plant cover, topographic features and sharp transitions in plant community composition.

c. *Lay Out Riparian Reserve Boundaries.* For optimal management of riparian and other resources, riparian reserves should have variable widths that are delineated at ecological boundaries, not at arbitrary distances from the stream, lake or wetlands. Riparian-wetland areas are naturally irregular or asymmetrical in shape, in response to local topography, geology, groundwater, and plant communities. Consideration of topographic irregularities can both protect riparian resources and simplify harvest unit layout. Avoid straight, uniform riparian reserve boundaries.

Riparian Reserve Protection

(1) Design timber harvest within riparian reserves to meet Aquatic Conservation Strategy objectives (see Table 6 of this environmental assessment and Appendix A).

(2) Retain all snags in the riparian reserve except where safety or fire hazard dictate removal (RA-2).

(3) Avoid refueling, equipment maintenance, fuel storage, or other handling of petroleum products or other chemicals in or adjacent to riparian reserves.

(4) No ripping, piling or mechanical site preparation (except for designated skid trail crossings, roads, or yarding corridors) will occur in riparian reserves.

(5) Directionally fell trees away from riparian reserves when harvesting within a tree length of any stream or riparian reserve.

(6) Where feasible, leave in place unbucked and unlimbed any hazard trees felled within a riparian reserve, consistent with management for fish habitat or other resource protection.

(7) Avoid yarding through riparian reserves when possible.

(8) Designate yarding corridors prior to yarding.

(9) Minimize number and width of yarding corridors. The maximum width of any corridor will be 30 feet. No more than one yarding corridor per 200 linear feet of stream will be allowed.

(10) Leave vegetation in riparian reserves that is cut for yarding corridors to meet stream and riparian objectives. Consider falling conifers into the stream and leaving them to contribute to the stream ecosystem.

(11) Do not place skid trails in riparian reserves except at designated crossings. Where feasible, locate skid trails perpendicular to riparian reserves and stream channels. Avoid tractor yarding across fishery streams and associated

riparian reserves. All skid trails that enter riparian reserves will be seeded with native species after use or prior to first rains (whichever comes first), or skid trails will be planted with conifers.

(12) Install temporary stream crossings across riparian reserves of non-fishery streams prior to tractor yarding operations. Stream crossings will be selected and designed with input from a hydrologist, fish biologist, or riparian specialist. Select stable, naturally armored areas. Minimize the area of disturbance. Use a culvert and clean rock or logs for temporary stream crossings. Install during low flows and remove prior to fall rains in the same season.

(13) Avoid removal of down trees or logs in stream channels and riparian reserves.

(14) Remove excessive concentrations of logging slash in streams for a distance of 100 feet above culverts. Hand pile slash above high water mark.

(15) Avoid locating new landings within 50 feet of riparian reserves.

Landings

(1) Minimize size and number of landings.

(2) Locate landings at approved sites.

(3) Avoid placing new landings adjacent to or in meadows or other wetland areas.

(4) Clear or excavate landings to minimum size needed for safe and efficient operations.

(5) Select landing locations considering the least amount of excavation, erosion potential, and where sidecast will not enter drainages or damage other sensitive areas.

(6) Deposit excess excavated material on stable sites where there is no erosion potential.

(7) Restore landings to the natural configuration or shape to direct the runoff to preselected spots where water can be dispersed to natural, well vegetated, gentle ground.

(8) Return landings not needed for future resource management to resource production through ripping and/or revegetation with native species. Apply weed-free mulch and fertilizer, where appropriate.

Road Construction

(1) Locate roads away from riparian reserves (RF-2).

(2) Locate roads on stable positions (such as ridges, natural benches, and flatter transitional slopes near ridges and valley bottoms). When crossing unstable areas is necessary, implement additional mitigation measures.

(3) Avoid headwalls, midslope locations on steep unstable slopes, seeps, old landslides, slopes in excess of 60 percent, and areas where the geologic bedding planes or weathering surfaces are inclined with the slope.

(4) Locate roads to minimize heights of cutbanks. Avoid high, steeply sloping cutbanks in highly fractured bedrock.

(5) Locate roads on well-drained soil types. Vary the grade to avoid wet areas.

(6) Locate stream crossing sites where channels are well defined, unobstructed and straight. Minimize the area of road that enters a Riparian Reserve. Stream crossings will be designed with input from a hydrologist or riparian specialist.

(7) Limit road construction to the dry season (generally between May 15 and October 15). When conditions permit operations at the limits of the dry season, keep erosion control measures current with ground disturbance, to the extent that the affected area can be rapidly closed/blocked and weatherized if weather conditions warrant.

(8) Manage road construction to enable completion of any construction and to protect and stabilize bare soil prior to fall rains. Protective measures may include water bars, grass seeding, planting deep rooted vegetation, and/or mulching. Armor or buttress fill slopes and unstable areas with rock that meets construction specifications. Revegetation with native species is preferred, except where overriding concerns to reduce sediment dictate the use of annuals or other quickly establishing species.

(9) Avoid sidecasting where it will adversely affect water quality or weaken stabilized slopes. Place excavated material away from Riparian Reserves.

(10) Place surface drainage prior to fall rains (see Surface Cross Drain Section below).

Surface Cross Drains for Roads

(1) Design cross drains in ephemeral or intermittent channels to lay on solid ground rather than on fill material to avoid road failures.

(2) Design placement of all surface cross drains to avoid discharge onto erodible (unprotected) slopes or directly into stream channels. Provide a buffer or sediment basin between the cross drain outlet and the stream channel.

(3) Locate culvert or drainage dips in such a manner to avoid discharge onto unstable terrain such as headwalls, slumps, or block failure zones. Provide adequate spacing to avoid accumulation of water in ditches or surfaces through these areas.

(4) Provide energy dissipators (such as rock material) at cross drain outlets or drain dips where water is discharged onto loose material or erodible soil or steep slopes.

(5) Place protective rock at culvert entrance to streamline water flow and reduce erosion.

(6) Use the guide for drainage culvert spacing by soil erosion classes and road grade shown in Tables C-3 and C-4 in Appendix C of the ROD/RMP.

(7) Use drainage dips in place of culvert on roads which have gradients less than 10 percent or where road management objectives result in blocking roads. Avoid drainage dips on road gradients greater than 10 percent. Dips should be designed with an adverse grade on the downhill side and, where economically feasible, should be armored with aggregate to prevent traffic (if the road is open) from cutting through the structure.

(8) Locate drainage dips where water might accumulate or where there is an outside berm which prevents drainage from the roadway. The recommended spacing of drainage dips is 400 feet ÷ percent slope + 150 feet (for example, a 4 percent grade would have culverts installed at a 400/4 + 150 = 250 feet spacing).

(9) When sediment is a concern, design cross drainage culverts or drainage dips immediately upgrade of stream crossings to prevent ditch sediment from entering the stream.

(10) Varying gradients is recommended in erodible and unstable soils to reduce surface water volume and velocities and culvert requirements.

Road Use, Improvement, Maintenance, Closure, and Obliteration

Road Use

(1) Use seasonal restrictions on unsurfaced roads.

(2) Remove snow on haul roads in a manner which will protect roads and adjacent resources. Remove or place snow berms to prevent water concentration on the roadway or on erodible sideslopes or soils.

(3) Use dust palliatives or surface stabilizers to reduce surfacing material loss and buildup of fine sediment that may wash off into water courses.

(4) Closely control application of dust palliatives and surface stabilizers, equipment cleanup, and disposal of excess material to prevent contamination or damage to water resources.

Road Improvement

(1) Identify potential water problems caused by off-site disturbance and add necessary drainage facilities.

(2) Surface inadequately surfaced roads that are to be left open to traffic during wet weather.

(3) Keep road inlet and outlet ditches, catchbasins, and culverts free of obstructions, particularly before and after winter snowfall and spring runoff. However, hold routine machine cleaning of ditches to a minimum during wet weather.

(4) Grading operations are to be conducted to prevent sedimentation and to dispose of surface water without ponding or concentrating water flow in unprotected channels. Schedule grading operations during time periods of the least erosion potential.

Road Maintenance

(1) Conduct grading operations to prevent sedimentation and to dispose of surface water without ponding or concentrating water flow in unprotected channels. Schedule gracing operations during time periods of the least erosion hazard (generally during the dry season, May 15 to October 15).

(2) Retain vegetation on cut slopes and ditches unless it poses a safety hazard or restricts maintenance activities. Cut roadside vegetation rather than pulling it out and disturbing the soil.

(3) Inspect areas subject to road or watershed damage during periods of high runoff.

Road Closure and Obliteration

(1) Barricade or block roads using gates, guard rails, earth/log barricades, boulders, logging debris, or a combination of these methods. Avoid blocking roads that will need future maintenance (such as for culverts, potential slides, etc.) with unremovable barricades. Use guardrails, gates, or other barricades capable of being opened for roads needing future maintenance.

(2) Provide maintenance of blocked roads in accordance with design criteria.

(3) Install waterbars, cross drains, cross sloping, or drainage dips on blocked roads (if not already) to assure drainage. See Surface Cross Drains for Roads section for surface cross drain requirements.

(4) Scarify, mulch (weed free), and/or seed blocked natural surface roads for erosion control.

(5) Return roads or landings not needed for future resource management to resource production through ripping and/or revegetation with native species. Apply weed free mulch and fertilizer where appropriate.

Appendix B - Cumulative Effects Analysis Procedure for Timber Sale Analysis Files

Assumptions/Information

The following assumptions and information were used in this analysis:

Equivalent Clearcut Acres Acres Hydrologically Unrecovered Acres in Early Seral Condition

Equivalent clearcut acreage factors are based on the land allocation (matrix or riparian reserve) and the proposed treatment of each land allocation in the four alternatives. For this cumulative effects analysis, the acres of each treatment under each alternative are estimated to be as follows:

Table B-1. Acres Treated By Land Allocation and Alternative

Land Allocation	Acres Treated in Alternative A*	Acres Treated in Alternative B*	Acres Treated in Alternative C*	Acres Treated in Alternative D*
Matrix	10,000	5,000	10,000	8,000
Riparian Reserves**	1,222 to 2,528	35 to 72	1,750 to 3,611	875 to 1,806

* Based on highest acreage estimates for proposed activities provided in Chapter 3 of this environmental assessment.

** Because the exact acreage of riparian reserves is not known, the range discussed in Chapter 2 (3,500 to 7,222 acres) is used.

For this analysis, a "worst case" scenario is used. It is assumed that all of the reductions in canopy closure will create hydrologically unrecovered acres. Even if a treated area is 'over dense', any reductions in canopy closure will be counted.

The following equivalent clearcut acreage factors have been assigned to the various treatment alternatives (where clearcuts and roads = 1, and no treatment = 0):

Table B-2. Equivalent Clearcut Acres by Alternative for Matrix and Riparian Reserves

Alternative	Formula Based on Planned Activities	Equivalent Clearcut Acres: Matrix	Equivalent Clearcut Acres: Riparian Reserves
Alternative A	0.35 ECA factor x 10,000 acres	3,500 acres	
	0.10 ECA factor x 1,225-2,528 acres		122-253 acres
Alternative B	0.10 ECA factor x 5,000 acres	500 acres	
	0.10 ECA factor x 35-72 acres		4 to 7 acres
Alternative C	0.10 ECA factor x 10,000 acres	1,000 acres	
	0.10 ECA factor x 1,750-3,611 acres		175 to 361 acres
Alternative D	0.30 ECA factor x 8,000 acres	2,400 acres	
	0.10 ECA factor x 875-1,806 acres		88 to 181 acres

Analysis

Table B-3. Analysis of Equivalent Clearcut Acres

TOPSY-POKEGAMA LANDSCAPE ANALYSIS AREA

Alt.	Current ECA*	ECA from the Alternative	Cumulative Total ECA	Percent of Area in ECA	
				Currently	After Alternative
A	15,072	3,622-3,753	18,694-18,825	11	14
B	15,072	504-507	15,576-15,579	11	12
C	15,072	1,175-1,361	16,247-16,433	11	12
D	15,072	2,488-2,581	17,560-17,653	11	13

HAYDEN CREEK WATERSHED

Alt.	Current ECA*	ECA from the Alternative**	Cumulative Total ECA	Percent of Watershed in ECA	
				Currently	After alternative
A	4,414	471-488	4,885-4,902	25	27-28
B	4,414	66	4,480	25	25
C	4,414	153-177	4,567-4,591	25	26
D	4,414	323-336	4,737-4,750	25	27

LONG PRAIRIE CREEK WATERSHED

Alt.	Current ECA*	ECA from the Alternative**	Cumulative Total ECA	Percent of Watershed in ECA	
				Currently	After Alternative
A	5,373	652-676	6,025-6,049	22	25
B	5,373	91	5,464	22	22
C	5,373	212-245	5,585-5,618	22	23
D	5,373	448-465	5,821-5,838	22	24

* Current as of 1993, when satellite imagery was acquired.

** Acres of ECA were pro-rated for each watershed using estimations for the entire TPLA area. Levels of ECA may be higher or lower for these watersheds than estimated in this analysis.

Appendix C - Road Information

Proposed Construction, Improvement, Obliteration, and Seasonal Closures

Table C-1. Proposed Roads Changes in the Topsy/Pokegama/Hamaker EA Analysis Area

Location	New Construction (miles)	Obliteration (miles)
Township 41 South, Range 7 East		
Section 10	0.35	
Section 9	0.22	
Section 3	0.60 (realignment)	0.60
Township 41 South, Range 6 East		
Section 11	1.00	
Section 1	0.25 (moved road)	0.25
Township 40 South, Range 7 East		
Section 9	0.20	
Section 19	0.50	
Section 21	0.44 (0.20 realignment)	0.95
Section 29	0.90	
Section 33	0.52	
Section 35	0.10 (realignment)	0.05
Township 40 South, Range 6 East		
Section 23	0.15	
Township 40 South, Range 5 East		
Section 25	0.54	
Section 7	0.70	
Section 8	0.32	
Totals	6.8 miles	1.9 miles

Table C-2. Acreage and Road Data by Ownership in Analysis Area and Pokegama Closure Area

Ownership	Analysis Area		Pokegama Road Closure Area		Roads in Analysis Area		Roads in Pokegama Closure Area	
	Acres	Sq. Miles	Acres	Sq. Miles	Miles	Mi./Sq. Mi.	Miles	Mi./Sq. Mi.
Private Lands	69,721	109	37,032	58	incomplete data		incomplete data	
BLM-Administered Lands	27,674	43	9,600	15	169	3.9	63	4.2
Total	97,395	152	46,632	73	169	3.9	63	4.2
BLM Roads closed year round					7.4			
BLM Roads seasonally closed							63	

Note: Adjusted miles per square mile with Pokegama Road Closure (BLM-Administered Lands Only):
169 miles minus 70 miles (7.4 + 63) = 99 miles
99 miles divided by 43 sq. miles = 2.3 miles per square mile

Source: GIS data, BLM

Appendix D - Criteria For Using Regeneration Cuts and Patch Cuts

Regeneration Cuts

Page G-10 of the KFRA FEIS states the following criteria for using regeneration cuts:

> "Regeneration harvests would not be programmed for stands under 120 years of age and generally would not be programmed for stands under 150 years of age within the next decade unless required by deteriorating stand condition, disease, or other factors that threaten the integrity of the stand. Priority for harvest in stands under 150 years of age would be commercial thinning.
>
> Regeneration strategies would be planned to produce the highest probability of success at the lowest practical cost and will include provisions for species diversity and long-term site productivity within the design. Practices will be strongly influenced by consideration of ecological site potential, for retention of sufficient canopy to assure control of competing vegetation, by the requirements of owl habitat connectivity at the stand level, and by factors including growing season frost potential."

Generally, regeneration cuts would be used as follows:

- Mortality exceeds 40 percent of the canopy.
- Dead and dying trees are producing excessive fuel loads and increasing fire risks.
- Regeneration of preferred species (pines and Douglas-fir) is necessary.
- Large disease pockets are preventing the re-establishment of habitat.

Patch Cuts

Up to 15 percent of the sale area could be patch cuts less than 3 acres is size. These cuts will create stand openings to allow establishment of shade-intolerant species, mainly ponderosa pine

The patch cuts should be selected prior to marking, since marking methods will be modified in the patch area. West to southwest aspects are best, with patches scattered around a unit. Areas of solid white fir with evidence of past and present fir-engraver mortality are good candidates. In addition, areas where past mortality had reduced canopy closure by 30+ percent and fuel loads are exceeding manageable levels are good candidates. The area selected must also be plantable (not too rocky).

Mark patch cuts with an orange painted "P" and locate on aerial photo and/or GPS units.

Retain up to 5 large overstory trees. In the understory, retain pines, Douglas-fir, and incense cedar (thinning thickets of these is okay). Cutting within patch cuts will concentrate on white fir.

Mark an adjacent thick understory clump at least 0.10 acre in size to provide wildlife hiding cover and structural diversity. Mark boundaries with "TC" in orange paint.

Appendix E - Layout Diagram of an Intermittent Riparian Reserve

Appendix F - References

Agee, J.K. 1993. Fire Ecology Of Pacific Northwest Forest. Island Press, Washington, D.C., Covelo, California.

Bureau of Land Management. Final Environmental Impact Statement, Vegetation Treatment On BLM Lands In Thirteen Western States (1991).

Bureau of Land Management. Final Klamath Falls Resource Area Management Plan and EIS (FEIS) (September 1994). (KFRA FEIS), and its Record of Decision (ROD) and Resource Management Plan (RMP) (June 2, 1995). (KFRA ROD/RMP).

Bureau of Land Management/U.S. Forest Service. Final Supplemental Environmental Impact Statement on Management Habitat for Late-Successional and Old-Growth forest Related Species Within the Range of Northern Spotted Owl (1994) (FSEIS).

Bureau of Land Management/ U.S. Forest Service. Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl. (April 1994/Also known as Northwest Forest Plan (NFP).

Bureau of Land Management/U.S. Forest Service. Interior Columbia Basin Ecosystem Management Project/Eastside Draft Environmental Impact Statement/May 1997 (ICBEMP).

Bureau of Land Management. Klamath Falls Resource Area Fire Management EA#-OR014-94-09 (June 10, 1994).

Bureau of Land Management. Klamath Falls Resource Area Integrated Weed Control Plan (EA July 21, 1993).

Bureau of Land Management. Range Reform FEIS (August 1995).

Bureau of Land Management. Standards For Rangeland Health And Guidelines For Livestock Grazing Management For Public Lands Administered By The Bureau Of Land Management In The State Of Oregon And Washington. (August 12, 1997).

Bureau of Land Management. Roaming Salvage EA, EA#-OR014-96 (May 1996).

Bureau of Land Management. Topsy/Pokegama Landscape Analysis, July 1996 (TPLA).

Leiberg, John B. 1899, Cascade Range Forest Reserve from Township 28 South to Township 37 South, inclusive, together with the Ashland Forest Reserve and forest regions from Township 28 South to Township 14 South, inclusive, and from Range 2 West to Range 14 East, Willamette Meridian, inclusive. Twenty-first Annual Report of the United States Geological Survey to the Secretary of the Interior, 1899-1900, Charles D. Walcott Director, in Seven Parts, Part V-Forest Reserves, Henery Gannett, Chief of Division, Washington Government Printing Office 1900.

Pacific Northwest Logging Costs, World Forest Institute, January 31, 1997, Prepared For: Bureau of Land Management, Oregon Department of Forestry.

FINDING OF NO SIGNIFICANT IMPACT (FONSI)
for the
Topsy/Pokegama/Hamaker Forest Health Treatments EA
EA No. OR 014-98-01

FONSI Determination

The Bureau of Land Management, Lakeview District, Klamath Falls Resource Area, has analyzed the following proposal, as well as three alternatives:

Treating up to 8,000 acres and removing up to 20 MMBF of timber from the analysis area.
Implementing treatments over six years.
Using a combination of treatments, including elected prescribed burning and thinning.

Resource concerns and impacts to the environment are addressed in the environmental assessment. The project design features and best management practices to be incorporated will mitigate impacts to levels similar to, or less than, those disclosed in the documents listed below.

The Klamath Falls Resource Area has been conducting implementation monitoring, including post-treatment monitoring of completed timber sales. Monitoring results will be summarized in a third-year evaluation of the Klamath Falls Resource Area RMP, which is scheduled for 1999. Results of the monitoring will help determine the levels of impacts that have occurred since the RMP was signed in June 1995, as well as whether the impacts are within those analyzed in the Klamath Falls Resource Area Final Environmental Impact Statement.

To incorporate new information from ongoing monitoring and also the third-year evaluation, a separate Decision Rationale will be written for each timber sale proposed under this environmental assessment prior to the advertisement date.

Based on the information in the environmental assessment and the information presented above, it is my determination that none of the alternatives analyzed constitutes a significant impact affecting the quality of human environment greater than those addressed in the following documents:

Final - Klamath Falls Resource Area Management Plan and EIS (FEIS) (Sept. 1994), and its Record of Decision and Resource Management Plan (June 2, 1995) (KFRA ROD/RMP).
Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl (April 1994; Also known as the Northwest Forest Plan).
Final Supplemental Environmental Impact Statement on Management Habitat for Late-Successional and Old-Growth forest Related Species Within the Range of Northern Spotted Owl (Feb. 1994).
Klamath Falls Resource Area Fire Management EA#OR-014-94-09 (June 10, 1994)

Klamath Falls Resource Area Integrated Weed Control Plan EA (July 21, 1993).
Topsy/Pokegama/Hamaker Landscape Analysis (July 1996)
Range Reform FEIS-Klamath Falls Resource Management Plan/EIS (June 2, 1995).

In consideration of the above, it is my decision that an Environmental Impact Statement is unnecessary and will not be prepared.

Signed____Mel Crockett, for __Date__6/15/98_____
A. Barron Bail, Area Manger