FINDING OF NO SIGNIFICANT IMPACT (FONSI)
for the
Upper Spencer Creek Environmental Assessment
EA No. OR 014-03-03

The Bureau of Land Management, Lakeview District, Klamath Falls Resource Area, has completed an Environmental Assessment (EA) and analyzed alternatives to the proposal to conduct a variety of treatments within the Upper Spencer Creek area on BLM lands. These treatments include:

- Commercial timber harvesting
- Non-commercial silvicultural and fuel treatments using prescribed fire and both manual and mechanical fuel reduction methods.
- Road restoration projects (improvements, decommissioning, obliteration, realignment, construction, seasonal closures and maintenance).
- Other watershed restoration projects.
- Late-Successional Reserve treatments.

The project will contribute to meeting the Management Action/Direction and Objectives of the Klamath Falls Resource Area RMP. Based on the information in the EA, it is my determination that none of the alternatives analyzed constitutes a significant impact affecting the quality of the human environment greater than those addressed in the:

- 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).
- 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).
- Range Reform FEIS (August 1995).
- Standards for Rangeland Health and Guidelines For Livestock Management For Public Lands Administered By The Bureau Of Land Management In the State Of Oregon and Washington (August 12, 1997).
- Final Environmental Impact Statement, Vegetation Treatment On BLM Lands in Thirteen Western States (1991).
- DRAFT – Late Successional Reserve Assessments, Klamath Falls Resource Area, Lakeview District, US Bureau of Land Management, (March 2003).

In addition, it is consistent with applicable scientific findings from the Interior Columbia Basin Ecosystem Management Project.

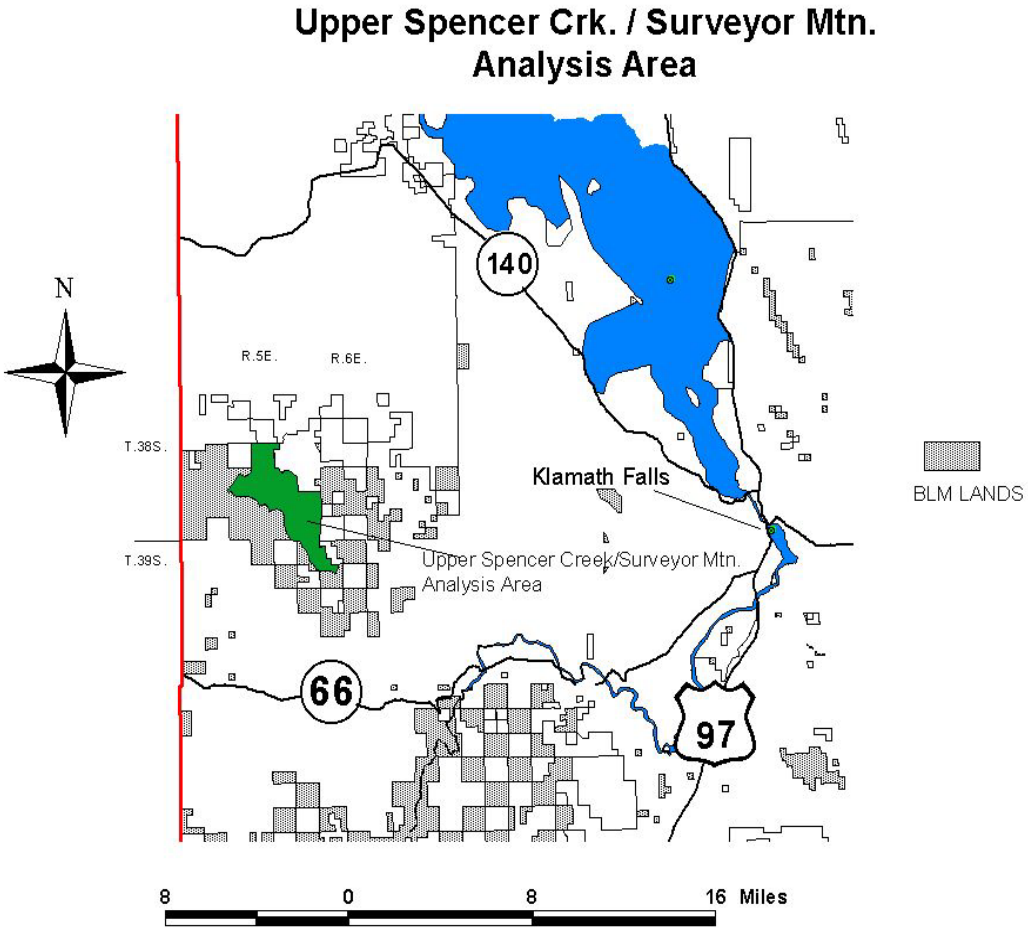
Therefore, an Environmental Impact Statement, or a supplement to the existing RMP or Environmental Impact Statement, is not necessary and will not be prepared.

Signed _____ Date 4/1/03
Jon Raby, Acting Field Manager
Klamath Falls Resource Area

UPPER SPENCER CREEK

ENVIRONMENTAL ASSESSMENT

EA NO. OR014-03-3



DATE:

Abstract: The following Environmental Assessment addresses the environmental impacts associated with a variety of proposed treatments in the Upper Spencer Creek Analysis Area. Proposed treatments include; commercial timber harvesting, road restoration work, riparian habitat restoration, District Designated Reserve treatments, fuels treatments, stream enhancement work, and aspen stand enhancement.

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
LAKEVIEW DISTRICT

EA COVERSHEET

RESOURCE AREA: Klamath Falls

FY& EA #: OR-014-03-03

ACTION/TITLE: Upper Spencer Creek Environmental Assessment -

LOCATION: Klamath Falls Resource Area

FOR FURTHER INFORMATION CONTACT:

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FREEDOM OF INFORMATION ACT AND RESPONDENT'S PERSONAL PRIVACY INTERESTS: The Bureau of Land Management is soliciting comments on this Environmental Assessment. Comments, including names and street addresses of respondents, will be available for public review at the above address during regular business hours. Individual respondents may request confidentiality. If you wish to withhold your name or street address from public review or from disclosure under the Freedom of Information Act, you must state this prominently at the beginning of your written comment. Such requests will be honored to the extent allowed by law. All submissions from organizations or businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses, will be made available for public inspection in their entirety.

List Of Tables:

Appendix:

CHAPTER 1 - INTRODUCTION

Overview

The Klamath Falls Resource Area (KFRA) has established the Upper Spencer Creek/Surveyor Mtn. analysis area (See Cover Map) in which to evaluate an assortment of resource management opportunities on BLM land. An interdisciplinary evaluation of the resources in the analysis area including wildlife, recreation, soils, fisheries, timber, cultural, hydrology, as well as other resources will be documented as part of this environmental assessment (EA). The analysis is accomplished by examining the different resources in the analysis area and recommending a course of action that best meets the objectives outlined in the KFRA Resource Management Plan (RMP).

Location

The Upper Spencer Creek/Surveyor Mtn. analysis area is located northwest of Klamath Falls, Oregon. The legal description and location of the analysis area is shown in Table 1. The analysis area is comprised of BLM, National Forest, and private lands primarily in the upper Spencer Creek watershed (3800 acres) and also includes a small portion of adjacent lands within the Jenny Creek watershed (1820 acres).

Table 1 - Ownership Within The Upper Spencer Creek/Surveyor Mtn. Analysis Area

Proposed Treatment Areas	Location			Approximate Acres Within The Upper Spencer Creek / Surveyor Mtn. Analysis Area (% of area)
	Township	Range	Section	
BLM Lands	38S. 39S. 39S.	5E. 5E. 6E.	15,21,23,25,26,27,35,36 1 6 & 7	**4652** (83%)
USFS Lands	38S.	5E.	35	**127** (2.0%)
Private Lands	38S.	5E.	22, 26	**841** (15%)
Total				**5620** (100%)

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

Objectives

The analysis area contains three land use allocations categories synonymous with the land use allocations described in the Northwest Forest Plan (NFP). These three allocations are Riparian Reserves, Late Successional Reserves, and Matrix. The RMP (pages 12-26) describes in detail the Objectives and the Management Action/Direction for each of these land use allocations. The following objectives for each land use allocation must be considered when developing the Purpose and Need For Action:

For Riparian Reserves:

- Treatments need to meet the Aquatic Conservation Strategy which was developed to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within them on public lands (pg. 7 RMP).

For Late Successional / District Designated Reserves:

- Treatments need to protect and enhance conditions of late-successional and old growth forest ecosystems, which serve as habitat for late-successional and old growth forest-related species including the northern spotted owl (pg. 18 RMP).
- Treatments need to maintain a functional, interacting, late-successional, and old growth forest ecosystem (pg 18 RMP).

For Matrix Lands

- Treatments should produce a sustainable supply of timber and other forest commodities to provide jobs and contribute to community stability (pg. 22 RMP).

- Treatments should provide connectivity (along with other allocations such as Riparian Reserves) across the landscape for forest dependent plant and animal species (pg. 22 RMP).
- Treatments should provide habitat for a variety of organisms associated with both late-successional and younger forests (pg. 22 RMP).
- Treatments should provide for important ecological functions such as dispersal of organisms, carryover of some species from one stand to the next, and maintenance of ecologically valuable structural components such as down logs, snags, and large trees (pg. 22 RMP).
- Treatments should provide early successional habitat (pg. 22 RMP).

Purpose and Need For Action

Using the objectives listed above for each land use allocation, the KFRA has a need to manage the Upper Spencer Creek Analysis Area for the following reasons:

- Opportunities exist to improve stand growth and resiliency in Riparian Reserves, Late Successional Reserves, and Matrix lands especially where stands are overstocked or have stagnated growth.
- Past management has resulted in some overstocked stands that are at increased risk to insect mortality and fire. Treatments are needed to reduce forest health risk in portions of the analysis area.
- Some of the existing roads in the analysis area do not meet current and future transportation needs and/or are causing resource damage. Road densities in the Spencer Creek watershed are high and sedimentation is a concern. Opportunities exist to better manage the road system and to improve watershed conditions through road obliteration, decommissioning, realignment, and improvement,
- Opportunities exist to improve the visual resources in the area.
- Opportunities exist to improve the hydrologic functions in the analysis area.
- The Spencer Creek Watershed Analysis (pages 5-2 to 5-11) lists a number of Management Recommendations as a result of restoration needs identified in the watershed analysis.

The Purpose is to:

- Provide for timber production in the Matrix, while meeting the current RMP.
- Maintain late successional characteristics inside the LSR.
- Treat stands to improve forest health by reducing the risk of insect and disease mortality and fire hazard within the analysis area.
- Manage the road system and further implement the watershed conservation and restoration projects identified in the Spencer Creek Watershed Analysis of 1995 (pages 5-2-5-11) and the RMP.
- Manage the visual resources to reduce edge observation.
- Enhance wildlife habitat by including aspen stand restoration treatments.
- Promote gradual restoration of historic species composition levels.

How This Environmental Assessment & Analysis Process Will Work / Decisions To Be Made

This Environmental Assessment (EA) is tiered to the Final - Klamath Falls Resource Area Resource Management Plan and Environmental Impact Statement. As stated on page 83 of the RMP, "*Site-specific planning by interdisciplinary teams would precede most on-the-ground- management activities*." "*Site-specific environmental analysis and documentation (including environmental assessments, categorical exclusions or administrative determinations where appropriate, and resource management plan conformance determination) will be accomplished for each action or type of treatment under consideration.*" The purpose of this EA is to assess the impacts of the proposed treatments and to determine if the environmental impacts associated with the proposed site-specific treatments are significant and are they greater than those already analyzed in the previous KFRA Final EIS. If the impacts are not significant or greater than analyzed in the KFRA Final EIS, a Finding Of No Significant Impact (FONSI) will be documented upon the completion of the analysis.

The EA will:

- provide the public with information about the proposed treatments
- describe the alternatives and the associated impacts with each alternative
- assist the decision maker in selecting an alternative
- determine if an environmental impact statement is necessary.

The KFRA Field Manager, as the responsible official, will decide:

- Whether to implement the Proposed Action or one of the Alternatives.

- Whether the selected alternative is consistent with the RMP.
- Whether the selected alternative is consistent with other laws and regulations. For example, the Endangered Species Act and Clean Water Act.

One or more Decision Records (DR) will be written prior to implementation of management actions. The proposed treatments or projects would span over a 2-10 year period. Occasionally, new information from on-going biological surveys or other sources may warrant consideration in the Decision Record for additional mitigating measures. In addition, as a result of the *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standard and Guidelines (January 2001)*, the management recommendations for a particular species could change from the time the FONSI is signed and the treatment is implemented[1].

Public Input Summary And Issue Development

A scoping letter dated April 3, 2001, was sent to the Resource Area mailing list of approximately 150 people. The letter explained the project proposal and asked the general public for comments. The Resource Area received two responses. One respondent specifically addressed some of same objectives listed above for Late Successional, Riparian Reserve, and Matrix land allocations. Another respondent did not address any of the specifics, but wished to be notified of future NEPA scoping documents and decision notices.

Issues

The KFRA interdisciplinary team identified a number of site-specific issues that are of concern in the analysis area and were also raised by one respondent public. These issues were used to assist in developing the Proposed Action, alternatives, mitigating measures, and project design features.

Issue 1. There is a concern about the hydrologic cumulative impacts in the watershed since the completion of the Spencer Creek Watershed Analysis in 1995. Hydrologic impacts are commonly measured in Equivalent Clearcut Acres (ECA). Since the completion of the Spencer Creek Watershed Analysis, there has been a large increase in harvesting on private lands resulting in an increase in the amount of land with early seral vegetation.

Resolution:
Alternative 1, 2, & 3 address this issue.

Issue 2. There is a concern about the high road densities in the Spencer Creek Watershed (also documented in the Spencer Creek Watershed Analysis) and the impact they are having on hydrologic functions and sediment delivery.

Resolution:
Alternatives 1, 2, & 3 all recommend a net reduction in roads in the Spencer Creek Watershed and the analysis area overall. The Resource Area is completing the Transportation Management Objectives (TMOs) for the area simultaneously to address road issues. A comprehensive road inventory and sediment study was completed in the Spencer Creek Watershed in 2000 & 2001. The data is being used to prioritize which roads should be improved, reconstructed, realigned, decommissioned, obliterated, or blocked. Road restoration work would be done through the timber sale contracts and/or separate service contracts. Only one new permanent road approximately 1800 feet long is proposed in Alternative 1.

Issue 3. The entire analysis area lies within critical habitat for the northern spotted owl. Harvest will result in a loss of nesting/roosting/foraging (NRF) habitat within the analysis area. The Proposed Action may reduce the survival and reproduction of northern spotted owls that use the critical habitat in the analysis area. However, the proposed action is still consistent with the Northwest Forest Plan because loss of habitat in the Matrix was anticipated to occur in the Northwest Forest Plan.

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[1] The Agency has clarified that the date of implementation is the date of the NEPA decision or decision document. For Timber Sales, it is the date the timber sale legal notice appears in the newspaper. For other treatments or projects, it is the date the Decision Record is signed. (See page 17&18 of Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines, January 2001)

Resolution:
Alternatives 1, 2, & 3 address this issue. A Biological Assessment is also done to specifically assess the changes in NRF habitat.

Issue 4. The analysis area includes the northeast slopes of Surveyor Mountain. Past harvesting on these slopes left 5-10 acre strip clearcuts. Most of these strips are 15-20 years old and are completely stocked with 10-20 foot saplings. During the winter months, with the snow backdrop and the straight edges, these strips are visible from long distances. Although the area is classified as Visual Class III and IV, the IDT felt that some manipulation of the edges to reduce the distinct lines would be a visual improvement.

Alternative 1 addresses this issue.

Conformance With Existing Plans

This Environmental Assessment (EA) is tiered to the Klamath Falls Resource Area (KFRA) Resource Management Plan (RMP). Management direction is contained in a number of supporting documents listed below.

- 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)].
- Record of Decision and Standard and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (January 2001).
- 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 Thirteen Western States (1991).
- Interior Columbia Basin Ecosystem Management Project / Eastside Draft Environmental Impact Statement / May 1997 (ICBEMP).
- DRAFT-Late Successional Reserve Assessments, Klamath Falls Resource Area, Lakeview District, US Bureau of Land Management, (March 2003).

In addition, the following watershed analyses and associated environmental assessments will be used as reference material:

- The Spencer Creek Watershed Analysis was completed in August of 1995. It provides both historical and current information on the different resources in the watershed and also provides a number of recommendations for resource protection and restoration opportunities.
- A Jenny Creek Watershed Analysis completed in February of 1995.
- The environmental assessment for BLM lands located in the lower Spencer Creek watershed in May of 1996. This EA addressed impacts from proposed timber harvesting, prescribe burning, road decommissioning, and noncommercial silvicultural treatments like precommercial thinning.

CHAPTER 2 - PROPOSED ACTION AND ALTERNATIVES

Introduction To Alternatives

There are three alternatives analyzed in this Environmental Assessment. Table 2 describes and compares the alternatives in detail. Below is a brief description of each alternative.

Alternative 1 – Proposed Action

The Proposed Action is designed to address the purpose and need for managing the Upper Spencer Creek Analysis Area. It is designed to meet the objectives described in the KFRA RMP for the different land use allocations. The Proposed Action has four aspects:

- Commercial timber harvesting
- Non-commercial silvicultural and fuels treatments using prescribed fire and both manual and mechanical fuel reduction methods
- Road Restoration Projects (improvement, decommissioning, obliteration, realignment, construction, seasonal closure, and maintenance)
- Watershed Restoration Projects.

Alternative 2 - No Action

The National Environmental Policy Act (NEPA) requires analysis of a No Action alternative. It proposes no new management activities in the planning area with the exception of those activities already addressed in the Klamath Falls Resource Area Fire Management EA#-OR014-94-09 (June 10, 1994). Routine road maintenance, forest inventory, and fire suppression would continue to occur.

Alternative 3 - Fuels and Restoration Treatments Only

Alternative 3 does not propose any commercial timber harvest activity in the analysis area. This alternative involves treating up to 2,500 acres over the next ten years in the Matrix, Riparian Reserves, and District Designated Reserves. Treatments would involve a combination of manual, mechanical, and prescribe fire treatments. Only hand or mechanical thinning of submerchantable size trees (1"- 6") would occur to promote growth and resiliency of the remaining trees. Road restoration projects as proposed in Alternative 1 would also be implemented under this alternative (See Table 2).

Other Alternatives Considered But Dropped From Consideration

Salvage Only Alternative - A fourth alternative was considered that analyzed for Salvage Harvest only in the Upper Spencer Creek Analysis Area. This would involve the harvesting and removal of scattered salvage throughout the analysis area only. Salvage is generally classified as dead, dying, or windthrown trees. It is discussed in the RMP (pages 55 and E-4). Annual mortality and blowdown in the resource area has occurred since initiation of the RMP in June of 1995. Moderate amounts of salvage are anticipated if drought conditions continue. In addition, the overstocking of some of the lower elevation mixed conifer stands is predisposing these stands to continual mortality. A portion of the Allowable Sale Quantity has come from the removal of scattered salvage on almost a yearly basis. A separate EA will analyze the impacts of continuing to remove scattered salvage not only from the Upper Spencer Creek Analysis Area, but the entire Resource Area. Therefore, this alternative was dropped from consideration.

Table 2 - Description and Comparison of Alternatives

Project Design Feature	**Alternative 1 - Proposed Action Combination of Commerical Timber Harvest / Non-Commercial Fuel Treatments / Restoration Projects**	**Alternative 2 No Action**	**Alternative3 Fuels & Restoration** Treatments Only
COMMERCIAL TIMBER HARVEST			
Commercial Timber Harvest	Up to 1,200 acres	N/A	None
Silvicultural Prescription	Density Management: Up to 870 acres Regeneration Harvest: Up to 280 acres Patch Cuts: Up to 50 acres	N/A	None
Volume to be removed	Up to 15 MMBF	None	None
Harvest Method	Cable yarding: Up to 200 acres Ground yarding: Up to 1,000 acres	None	None
Estimated Canopy Closure Retention[2]	DM Areas - 870 acres > 70% RHs - 280 acres > 50% PC Areas - 50 acres < 50%	No Change	Overall Analysis Area - >70%
NONCOMMERCIAL TREATMENTS			
Noncommercial Treatments (Manual & Mechanical)	Up to 300 acres	None	Up to 300 acres
RIPARIAN RESERVE TREATMENTS			
Riparian Reserve Treatments	Up to 30% percent of the area within riparian reserves will be treated to meet Aquatic Conservation Strategy objectives. Treatments would include plantation and understory thinning and fuel reduction work using both mechanical and manual methods. Some merchantable material may be removed.	None	Up to 30% percent of the area within riparian reserves will be treated to meet Aquatic Conservation Strategy objectives. Treatments would include; plantation and understory thinning and fuel reduction work using both mechanical and manual methods.
DISTRICT DESIGNATED RESERVE TREATMENTS			
DDR Treatments	Treatments contingent on approved Late Successional Reserve Assessment by Regional Ecosystem Office (REO). Treatments would involve a combination of light understory thinning, culturing beneath the larger pines, reducing fuels loads, hydrologic restoration projects, and road decommissioning and obliteration and seeding.	None	Treatments contingent on approved Late Successional Reserve Assessment by Regional Ecosystem Office (REO). Treatments would involve a combination of light understory thinning, culturing beneath the larger pines, reducing fuels loads, hydrologic restoration projects, and road decommissioning and obliteration and seeding.

[2] **DM** - Density Management Prescription **RH** - Regeneration Harvest Prescription **PC** - Patch Cut Prescription

Project Design Feature	Alternative 1 - Proposed Action Combination of Commerical Timber Harvest / Non-Commercial Fuel Treatments / Restoration Projects	Alternative 2 No Action	Alternative3 Fuels & Restoration Treatments Only
PRESCRIBED FIRE TREATMENTS*			
Prescribed Fire	Up to 2,500 acres	Based Upon Present Fire EA	Up to 2500 acres
ROADS			
New Construction of Permanent roads (including realignment of existing roads)	Up to 2 miles (0.9 miles currently identified)	None	Up to 1 mile
Improvement (resurfacing, culvert replacement, brushing, etc…)	Up to 10 miles & Annual Maintenance	Up to 2 miles & Annual Maintenance	Up to 2 miles & Annual Maintenance
Obliteration[3]	From 2 to 7 miles (3.2 miles currently identified)	None	From 2 to 7 miles (3.2 miles currently identified)
Decommissioning[4]	From 0 to 5 miles (0.4 miles currently identified)	None	From 0 to 5 miles (0.4 miles currently identified)
New Administrative Road Closures	From 2 to 5 miles	None	From 2 to 5 miles
RESTORATION PROJECTS OTHER THAN ROADS			
Large Woody Debris Placement In Stream	Could occur in conjunction with thinning within Riparian Reserves	None	Could occur in conjunction with thinning within Riparian Reserves
Revegetating Within Riparian Reserves	Could occur in conjunction with road obliteration or other projects	None	Could occur in conjunction with road obliteration or other projects
Aspen Stand Enhancment	Up to 100 acres	None	Up to 100 acres

[3] **Obliteration** means that the road would not be open to motor vehicles in the future. The road surface would be ripped in places and recontouring would occur where needed. This term includes both "Full Decommissioning" and "Obliteration" as defined in the Western Oregon Transportation Management Plan.
[4] **Decommission** means that the road would be closed to motor vehicles on a long-term basis, but may be used again in the future. The road would be prepared to avoid future maintenance needs and would be left in an "erosion-resistant" condition.

CHAPTER 3 – AFFECTED ENVIRONMENT & ENVIRONMENTAL CONSEQUENCES

Introduction

A through description of the affected environment of all the resources that will be impacted by the proposed action can be found in the Klamath Falls Resource Area RMP/ROD and FEIS (pages 3-3 to 3-79, the Spencer Creek Watershed Analysis, and the Jenny Creek Watershed Analysis). This chapter is designed to focus on the affected environment and environmental impacts to those specific resources that would be most impacted by the proposed action. In addition, it discusses the mitigation measures that will be implemented to minimize or avoid those impacts.

Upland Forest Vegetation - Affected Environment

Table 3 categorizes the existing stand structures on lands in the Upper Spencer Creek/Surveyor Mtn. Analysis area. As indicated, approximately 68% (3848 acres) of the analysis area contains stands in excess of 80 years of age on BLM and USFS lands combined. Private lands were estimated to contain no stands over 80 years of age (See Table 3).

Table 3 - Existing Stand Structures Lands In the Upper Spencer Creek / Surveyor Mtn. Analysis Area

Owner	Age Class (Years)	Acres	Percent
BLM Lands	Non-forest	11	<1%
BLM Lands	0-10	43	<1%
BLM Lands	10-80	877	16%
BLM Lands	> 80	3721	66%
USFS Lands > 80 Years Old	>80	127	2%
Private Lands < 80 Years Old*	<80	841	15%
Totals		5620	

* Age Class for private lands is estimate only.

Table 4 categorizes the existing canopy closure in the analysis area. These are estimates based upon satellite imagery completed in 1999-2000. Approximately 46% of the existing analysis area has a canopy closure greater than 50% (Table 4). The Environmental Consequence section discusses the possible changes in canopy closure from the proposed treatments.

Table 4 - Approximate Canopy Closure Within The Upper Spencer Creek Surveyor Mtn. Analysis Area

Crown Closure	Acres	Percent	Cumulative Acres	Percent
90-99%	419	9%	419	9%
80-89%	929	20%	1,348	29%
70-79%	240	5%	1,588	34%
60-69%	93	2%	1,681	36%
50-59%	474	10%	2,155	46%
40-49%	1,065	23%	3,220	69%
20-29%	174	4%	3,394	73%
10-19%	196	4%	3,590	77%
0-10%	1,058	23%	4,648	100%

Upland Forest Vegetation - Environmental Consequences

Alternative 1

Table 1 below is an estimation of the changes that will occur within the analysis area that would affect Late Successional Habitat including existing stand structure, canopy closure, and nesting, roosting, and foraging habitat for northern spotted owls.

The preferred alternative would result in some reduction of late successional habitat in the analysis area. The primary prescription, Density Management, would result in some loss of larger trees and the functioning capacity of the habitat for species dependent upon older forested stands. Up to 50 acres in the analysis area will receive patch cuts up to 5 acres in size. Approximately 22 acres of patch cuts (the largest one being 2.4 acres in size) are proposed primarily for visual manipulation of the strips that presently exist on Surveyor Mtn. Late successional habitat will be removed within the patch cut boundaries.

It is anticipated that approximately 320 acres of late successional habitat will be reduced to habitat that would no longer be classified as either nesting, roosting, or foraging habitat for the northern spotted owl. On the remaining areas scheduled for harvest (900 acres), some will still meet either nesting or roosting habitat, and all will meet, at a minimum, foraging habitat upon completion of the harvest.

Overall impacts to forest vegetation would not exceed those analyzed in the KFRA FEIS for any of the alternatives. The following project design features are stipulated (see Appendix B) to reduce the impact of Alternative 1 to the forest vegetation and dependent species:

- Both the Density Management and Regeneration Harvest prescriptions in the KFRA are constrained by the RMP and NFP standard and guideline that requires 16 to 25 large green trees per acre be left for each prescription unit. This requirement reduces the impact to late successional dependent species by maintaining a certain amount of connectivity, crown closure, and residual structure.
- Due to the concern about historic wind throw problems on Surveyor Mtn., the resource specialists proposed a lighter thinning than normal, particularly along the windward sides of the units.

Impacts from previously harvested sales have been monitored and reveal that in many post harvested stands, sufficient late successional habitat still remains to sustain late successional dependent species (KFRA Annual Program Summaries, 1999, 2000, 2001). In addition, after eight years since the signing of the RMP, the KFRA has implemented a total of 64 acres of regeneration harvests. The KFRA RMP projected and analyzed impacts for 131 acres of regeneration harvest per year for a decadal total of 1,310 acres. Alternative 1 will result in up to 280 acres of additional regeneration harvests. By the end of the first decade, the KFRA will have implemented approximately 26% of the scheduled regeneration harvests analyzed in the RMP. Impacts from Regeneration Harvests would actually be less than those anticipated for the decade resulting in less long-term effects to late-successional dependent species and habitat.

Alternative 1 was slightly modified since the initial public scooping letter in April of 2001. Initially, Alternative 1 was designed to allow up to 15% (180 acres) of the proposed harvest treatments in patch cuts. As a result of the issues addressed in Chapter 1, the interdisciplinary team determined that impacts would be mitigated by limiting the acres of patch cuts to 50 acres (4-5%).

Table 5 - Anticipated Impacts To Late Successional Habitat, Canopy Closure, And Nesting, Roosting, and Foraging Habitat For The Northern Spotted Owl As A Result Of Alternative 1.

Alternative 1 – Total Proposed Harvest – 1200 Acres				
Prescription Type	**Density Management**	**Regeneration Harvest**	**Patch Cuts**	**Totals**
Acres of Proposed Treatment	870	280	50	1200 Acres
Upon Completion Of Harvest, Anticipated Habitat Remaining:	*Nesting and Roosting Habitat *Late Successional Habitat *Canopy Closure >70%	*All Foraging Habitat *Some Roosting Habitat *Late Successional Habitat *Canopy Closure >50%	*No Nesting or Roosting Habitat *Some Foraging Habitat *Canopy Closure <50%	

Assessment of 15% Standard and Guide For Late Successional Habitat Under Alternative 1

Within the entire Spencer Creek Watershed, approximately 35% of all late-successional stands on federal land are reserved (not part of the Matrix land allocation). The amount of late-successional forest in this watershed will never approach the 15% threshold unless a catastrophic fire occurs. An estimated 5,727 acres of late-successional forest remain in the timber harvest base that is available for harvest on both BLM and USFS lands combined. Of significant note, the uneven-aged, density management silivicultural prescriptions adopted by both the Klamath Falls Resource Area RMP and recently implemented by the USFS on their Spencer Creek timber sale are designed to maintain structural and functional late-successional characteristics. As a result, density management prescriptions proposed for most of the area are expected to result in only a slight reduction of late-successional habitat within the Upper Spencer Creek / Surveyor Mtn. analysis area. Some of the Regeneration Harvests and Patch Cuts that are planned to modify the visual characteristics on the northeast side of Surveyor Mountain will result in a reduction of late-successional habitat of up to 280 acres. However, with the requirement that 16-25 large green trees be left per acre, there will be some connectivity habitat remaining even after the regeneration harvests. A complete discussion of late-sucsessional habitat can be found in the Spencer Creek Watershed Analysis, pages 4-84 to 4-92.

Alternative 2

Alternatives 2 would result in little to no reduction of late-successional habitat in the analysis area. The resource specialists would have to evaluate other areas on the resource area to meet the commercial timber production objective for Matrix lands. Alternative 2 would result in no change in the forest vegetation except that induced by on-going drought and insect related mortality as well as risk of wildfire and windthrow.

Alternative 3

Alternative 3 proposes primarily non-commercial treatments designed to treat only the understory vegetation and hazardous fuel conditions. The resulting impacts to forest vegetation would be minimal. There would virtually be no change in species composition, canopy closure or late successional forest structure. The KFRA would have to evaluate other areas on the resource area to meet the commercial timber production objective for Matrix lands.

Special Status Plant Species - Affected Environment

Portions of all sections within the analysis area have been surveyed for special status species from 1987 through 1995. Green-flowered wild ginger (*Asarum wagneri*) occurs within each section of the analysis area. Numerous and/or high density populations of green-flowered wild ginger occur throughout T38S R5E sections 15 and 21, and in portions of T38S R5E sections 26 (SW/NW, SW/SE and SE/SW), 27 (NW/SW and SE/SE), and T39S R5E section 1 (NW/NW).

The mountain lady slipper orchid (*Cypripedium montanum*), a Bureau tracking and Survey and Manage category C (pre-disturbance surveys, manage high priority sites) has potential to occur in the analysis area, but no populations were found during the botanical surveys conducted within this area.

In any areas not surveyed previously, pre-disturbance surveys will be completed before implementation of ground disturbing activities.

Special Status Plant Species - Environmental Consequences

Alternatives 1 (various treatments) and 3 (fuels and restoration treatments only) would have the potential for a moderate-to-high negative impact from ground disturbing activities on the populations of the special status plant species, green-flowered wild ginger (*Asarum wagneri*). Alternative 2 (no action) would have low to no direct impacts. As a result of the random selection process under the prescribed fire EA, prescribed fire will occur in parts of the analysis area under the no action alternative. However, since green-flowered wild ginger is part of a plant community which is adapted to periodic fires, impacts would be expected to be low.

The recommendation for preserving long-term viability for *Asarum wagneri* is to provide protection from disturbance to the largest and most vigorous populations, and to those that occur in unique or unusual habitats. Winter harvesting on at least 20 inches of snow in timber sale areas within T38S R5E sections 15 and 21, where dense concentrations of *A. wagneri* occur, would significantly reduce the impacts to *A. wagneri*.

The presense of decadent, over-stocked stands of *Abies concolor* (white fir) was also found to preclude the occurence of *Asarum wagneri*, as well as any appreciable degree of biological diversity in the understory flora. Too little or too much sun seems to be the main inhibitor of the occurence of *A. wagneri*. Therefore, the proposed treatments in both alternative may benefit *A. wagneri* by reducing canopy cover and thereby increasing light levels on the forest floor, if direct physical disturbance of the plant populations is avoided through the recommended snow logging.

Noxious Weeds - Affected Environment

Four species of noxious weeds have been located on BLM lands within analysis area. Weed populations are primarily in roadside habitats or past harvest units, and seem to be primarily associated with physical disturbance. Noxious weed species located within the analysis area inlcude Scotch broom (*Cytisus scoparius*), Canada thistle (*Cirsium arvense*), and Dalmatian toadflax (*Linaria dalmatica*). Bull thistle (*Cirsium vulgare*) is present on disturbed sites throughout the analysis area. It is often a dominant species in clearcuts, on landings, and on ripped units, where it persists for approximately 5-10 years following disturbance.

Noxious Weeds - Environmental Consequences

Alternatives that produce more intense or more extensive ground disturbance would create conditions under which noxious weeds would have a competitive advantage relative to other plant species. Thus alternative 1 (various treatments) would have the highest probability to facilitate the establishment and/or spread of noxious weed species followed by Alternative 3 (fuels and restoration treatments only). Alternative 2 (no action) would have the lowest probability to facilitate the establishment and/or spread of noxious weed species. If snow logging (Mitigating Measure No. 4) is required, ground disturbance would be reduced considerably with a corresponding reduction in potential noxious weed infestation. Weed prevention measures (see Appendix B) will reduce the potential for the higher probability alternatives to result in the establishment or spread of noxious weeds.

Roads - Affected Environment

The BLM-administered lands in the analysis area have an average of approximately 4.6 miles of road per square mile. Of the 4.6 miles per square miles of road within the analysis area, approximately 1.5 miles per square mile are blocked or contain a seasonal closure resulting in an open road density of about 3.1 miles of road per square mile from early May through late November. Of particular note, most of the roads in the Upper Spencer Creek Analysis Area are usually blocked by snow from early December through April. The only use of the roads during this time period is by snowmobiles (See Recreation Section). Table 6 summarizes the road densities in the Upper Spencer Creek / Surveyor Mtn. Analysis area.

Table 6 - Road Densities - Upper Spencer Creek / Surveyor Mtn. Analysis Area

Road Type	**Miles**	**Miles / Square Mile (7.3 Square Miles - 4650 acres)**
BLM Arterial Roads	3.9	0.5 miles/sq mile
BLM Collector Roads	4.7	0.6 miles/sq mile
BLM Locator Roads	25.0	3.5 miles/sq mile
Total BLM Controlled Roads	33.5	4.6 miles/sq mile
Total BLM Open Controlled Roads	22.9 (10.6 miles closed)	3.1 miles/sq mile
Private & Other Roads	7.2	0.8 miles/sq mile

All roads in the analysis areas would be evaluated on a case-by-case basis to determine benefits and resource concerns. As each project or timber sale is designed within the analysis area, roads within the treatment area would be analyzed.

Roads found to be adversely affecting natural resources would be considered for decommissioning, obliterating, realignment, improvement, and/or increased maintenance (See Appendix C Roads - for a complete description of road decommissioning and obliteration). Decommissioning or obliterating BLM roads that provide access to private lands and residences may not be possible. Table 2 identifies miles of additional roads proposed for closure, decommissioning, improvement, construction, or obliteration under Alternatives 1, 2, & 3.

Roads - Environmental Consequences

The overall goal would be to continue to improve watershed conditions by reducing road densities in the analysis area and allowing for no net increase in roads within the watershed. The RMP states there is to be no net increase in roads in Tier 1 watersheds (Page D-14). Furthermore, the federal land management agencies are directed to reduce road mileage in Tier 1 watershed (Northwest Forest Plan ROD Page B-14). Since the initiation of the KFRA RMP in 1994, the KFRA has constructed approximately 4.0 miles of road (0.5 miles/year) and obliterated approximately 6.0 miles of roads (0.8miles/year) on the westside of the resource area. Only 0.1 miles of new road construction has occurred in Tier 1 watersheds since the signing of the RMP. The KFRA FSEIS analyzed impacts for approximately 1 mile of new road construction per year on westside lands.

New road construction in the Upper Spencer Analysis area is proposed for two primary reasons:

1. To provide access to timber sale units presently inaccessible. Approximately 0.3 miles of new road construction would be needed to harvest identified stands.
2. To realign existing roads to allow obliteration of roads with Riparian Reserves. Approximately 0.6 miles of new road has been identified for construction to replace roads within Riparian Reserves.

Alternative 1 would result in the greatest amount of new road construction as a result of both harvest and realignment needs. Alternative 3 would result in new construction as well, but only for realignment needs. Alternative 2 would result in no new road construction.

Environmental impacts from the new road proposed for harvesting would be minimal because the new road would be located on a ridge top away from any riparian reserves. Impacts from the proposed road realignment would be a short-term increase in sediment within the Riparian Reserve due to road obliteration, but would result in a long-term benefit as the Riparian Reserve begins to reestablish native vegetation and hydrologic function.

Impacts from all alternatives would be mitigated as follows:

- Annual road maintenance and improvements to road drainage features would occur regardless of the proposed alternative. This provides benefits to water resources by reducing inputs of water and sediments from roads into stream channels.
- For each additional mile of new permanent road, a corresponding reduction (obliteration) of existing roads would occur (See Table 2). Within the analysis area, approximately 0.9 miles of road construction has been identified for construction and 3.2 miles of road has been identified for obliteration.
- An additional 0.4 miles of road has been identified for decommissioning.
- In addition to the approximately 10.6 miles of road in the analysis area already blocked, an additional 2 to 5 miles will be considered for closing.

For additional information on the effects of roads, see Riparian and Hydrology Sections of this environmental assessment (pages 17-24). Road decommissioning or improvement work would be implemented as part of the timber sale contract or through a separate service contract using restoration funds.

Soils - Affected Environment

Soil issues and concerns for the affected environment are addressed in detail in the Spencer Creek Watershed Analysis (pages 4-76 to 4-83) and the KFRA RMP (pages 28 to 30 and Appendix D). The following narrative summarizes the major soil issues and concerns discussed in the Upper Spencer Creek analysis area.

The analysis area contains some of the steeper ground in the resource area that lies primarily on the northeast side of Surveyor Mtn. Slopes range from 0 to 60 percent. Most of the Surveyor Mtn. area presently has roads from which cable-logging operations can be implemented. An additional spur road of approximately 1800 feet would be needed to access the last remaining unaccessible stand of about 40 acres. Appendix D contains a map showing the different soil types that occur in the analysis area. Soil compaction and erodibility varies with soil types. The Spencer Creek Watershed Analysis rated most of the soils on the northeast side of Surveyor Mtn. as moderate surface erosion and compaction susceptibility. The steeper the slope, the higher surface erosion potential. The flatter ground within the analysis area, which lies primarily just west and north of Buck Lake, was rated as low to moderate surface erosion and compaction susceptibility.

The two soil disturbance issues of greatest concern are (1) reduction (through displacement and/or compaction) of surface and subsurface organic matter reserves (humus), and (2) compaction. Repeated use of ground-based logging equipment (tractors and skidders) has, in some places, displaced or compacted soils and contributed to the reduction of soil organic matter reserves. Past harvesting has primarily occurred around Buck Lake in sections 15, 23, and 25 and skid trails presently exist. In contrast, much of the steeper ground has not been entered due to the complexity of selective cutting on steeper ground. Tree growth losses from soil compaction of approximately 4.8 percent were accounted for in the growth and yield models for the KFRA RMP.

Winter snow depths in the area range from 3 to 10 feet of snow. Feasibility and impacts of requiring snow logging to minimize soil disturbances are discussed in the environmental consequences section. In addition, post treatment monitoring of completed sales has been done and is discussed in the environmental consequence section below.

Soils - Environmental Consequences

Alternative 1

Implementing Alternative 1 would result in some detrimental soil conditions. Detailed definitions of detrimental soil condition can be found in Appendix C. If detrimental soil impacts exceed 20 percent of the total acreage within an activity area, the BMP guidelines (Appendix D – page D11) state that impacts will be mitigated with treatments such as ripping, backblading, or seeding. To minimize areal disturbance, three of the most common BMPs required are:

- Use of existing newly designated skid trails, marked in advance for logging operators to confine soil disturbance.
- Seasonal restrictions to limit logging operations to the dry season to prevent compaction, puddling, and erosion.

- In areas of slopes in excess of 35%, require cable logging.

Based upon soil monitoring on completed timber sales, soil impacts have been minimized by implementing the Best Management Practices described in the KFRA RMP Appendix D, (pages D11 & D23). Three sales have been monitored to date. The first sale, Too Frosty Timber Sale, was monitored using only post treatment surveys. The results indicated that slightly more than twenty percent (20%) of the treatment area was compacted. Pre and post treatment plots were monitored on a second timber sale, Kakapoo. The results indicated that approximately sixteen percent (16%) of the treatment area was detrimentally compacted. Different monitoring techniques were used on a third timber sale, Grenada East. The percent of main skid trails and landings were determined using GPS equipment. Approximately 880 acres of skid trails and landings were surveyed. The data indicated approximately 7-9% of the treated area was in skid trails or landings. This was within the standard of no more than twelve percent (12%) of the area in skid trails on most harvest units (Appendix D – page D-23).

Approximately 200 acres of the analysis area will be cable logged which would result in less soil disturbance than ground based logging. Of the three alternatives, Alternative 1 would result in the most soil impact but within the RMP specified thresholds because the standard BMPs will be utilized.

Cumulative Effects
In addition to the effects produced by harvest machinery, additional entry of the analysis area by slashbusting machinery may produce additional area of detrimental soil compaction. See Alternative 3 for a more detailed discussion of the impacts of slashbuster use. The combined use of both machines will increase the area of detrimental compaction, and moving closer to the RMP threshold.

Additional Mitigation For Alternative 1
Under Alternative 1, soil disturbance would be further minimized in the analysis area if snow logging were required. Because the analysis area is located at an elevation that normally receives sufficient snowfall, it is feasible to require snow logging if the snow pack persisted and the area remains accessible. Logging costs will be higher if snow logging is required. Table 7 summarizes the soil impacts and a relative cost comparison of the different alternatives and mitigating measures. The KFRA recently completed a timber sale, Clover Hookup (2002), where the entire sale was logged over 20 inches of snow. Monitoring indicated almost no disturbance to the surface organic layer.

Alternative 2
Of the three alternatives described, the No Action Alternative (Alternative 2) would result in the least soil impact. Basically no soil impact would be incurred under Alternative 2 because no soil disturbing treatments would be implemented.

Alternative 3
Soil impacts from Alternative 3 (Fuels and Restoration Treatments Only) are expected to be lower than those for Alternative 1. Under Alternative 3, fuel treatments would occur primarily in areas where fuel levels are in excess of historical ranges. Fuel treatments would consist of a mix of both mechanical and hand treatments, and use of prescribed fire. The potential for medium to high soil impacts would be limited primarily to the mechanical (slash busting) areas and immediately beneath the piles that are burned. Resource specialists in the resource area are presently monitoring the soil impacts of mechanical treatments, primarily slash busting treatments. Slash busting machinery makes only 1-2 passes over the ground while skidding equipment will often make 10-20 passes on a designated skid trails. In addition, slash busting equipment often operates on top of existing slash and does not disturb the soil surface horizon. Observations by the resource area specialists to date indicates that soil impacts from harvesting are generally higher than impacts that normally occur from fuels treatment projects alone.

Monitoring of slashbuster operations on a neighboring resource area indicates that approximately seventeen percent (17%) of the project area may be in direct contact with the tracks due to the cutting swath of the cutting

head. Of the 17% of the area that is contacted by the slashbuster machine, a smaller portion of that area may become detrimentally compacted. There is a correlation between the amount and type of vegetation/slash in a project area, and the potential for soil compaction from mechanical slashbusting. In a timbered area with an 8" to 12" layer of cut vegetation, only two to four percent (2-4%) of the project area was detrimentally compacted. This is due to the weight of the slashbuster being spread over a larger surface area of slash. In a non-timbered area with less vegetation, up to 8% of the project area may be detrimentally compacted. (Maurer, 2001).

Slash that is left on the project area from either mechanical slashbusting or manual treatments will serve to reduce surface soil erosion and sedimentation. Future prescribed burning of treated areas, as part of this Alternative, should result in a mosaic of burned and unburned areas which should not result in significantly increased erosion in the analysis area. (Maurer, 2001)

The standard set of BMPs that are being applied to the use of harvest machinery in Alternative 1 will be applied to the use of slashbuster machinery in Alternative 3. These BMPs should further reduce the occurrence of detrimental soil compaction. Based on this information, the effect of Alternative 3 to soil resources would be within the RMP guidelines for soil compaction (RMP page F-11 and S-4).

Table 7 - Summary Of Relative Soil Impacts And Associated Costs Of The Different Alternatives

Mitigating Measure	Traditional Ground-Based Logging - Limited To Dry Season & Designated Trails		Cable Logging		Snow Logging	
	Soil Impact	Costs	Soil Impact	Costs	Soil Impact	Costs
Alternative 1	Medium	Medium	Low	High	Low	Medium
Alternative 2	NA	NA	NA	NA	NA	NA
Alternative 3	Low	Low	NA	NA	NA	NA

Riparian Resources - Affected Environment

Lotic Riparian Resources

Lotic riparian areas are a category of riparian-wetland habitat associated with running water, such as streams and flowing springs. Perennial streams in the area are associated with springs and/or wet meadows that provide year-round discharge (see maps in Appendix D). Ephemeral and intermittent streams are more common, and are found where surface and subsurface flow from a sufficiently large drainage area collects. Most ephemeral streams in the area do not have a noticeable surface expression but rather take the form of swales.

Stream channels in the analysis area range in condition from exhibiting no response to past/current management to being severely affected by management actions. Channel processes have been affected by roads and stream crossings (Table 8).

Table 8 - Road network features in the analysis area that potentially affect riparian reserves

Portion of Analysis Area	Number of Stream Crossings	Miles of Road within 160' of Streams
Spencer Creek	16	2.2
Jenny Creek	6	1
Data from 2001 BLM/USFS Road Inventory Data		

Some roads can intercept and redirect runoff into streams. Where roads cross or are immediately adjacent to streams, they may cause diversion of natural flow paths. If peak flows are increased by management actions, channels can downcut and widen. This leads to increased stream energy (due to less interactions with floodplain areas) and may cause water quality degradation.

The intermittent stream channel that flows through the south half of T 38S, R 6E, section 23 displays these effects. Past logging activities removed riparian conifers, and a skid trail and roads direct runoff into the stream channel. As a result of increased runoff and decreased channel-stabilizing structure (i.e., large wood), the stream channel has incised and widened.

Vegetation communities with riparian characteristics are found along portions of the perennial and intermittent streams in the area. Wet meadows and deciduous plant communities occur adjacent to streams in sections 15, 22, 23, 25, and 36 of the Spencer Creek watershed, and in sections 21, 27, and 28 of the Jenny Creek watershed. Some of these riparian areas have been affected detrimentally by past logging activity (including the removal of large pines within the active stream channel and location of landings and skid trails), road construction, and grazing. Ongoing effects include loss of large woody debris recruitment, compaction and loss of site potential, loss of stream shading, trampling of riparian vegetation, and loss of vertical and lateral streambank stability.

Although Proper Functioning Condition surveys have been completed for fish-bearing streams downstream from the analysis area (see Aquatic Wildlife Section), they have not been completed for the smaller streams within the analysis area. Informal surveys of the stream channels by the KFRA hydrologist suggest that most of the streams are likely either "Properly Functioning" or "Functional At-Risk" with a stable or improving trend. Restoration opportunities could have a strong beneficial effect on streams that are currently Functional At-Risk.

For a further description of lotic riparian resources in the analysis area, refer to pages 4-126 to 4-137 in the Spencer Creek Watershed Analysis and pages 86 to 90 in the Jenny Creek Watershed Analysis.

Lentic Riparian Resources

BLM-administered land in the Spencer Creek watershed has relatively few springs, wet meadows, and riparian areas associated with lentic riparian areas, or still-water habitats. Therefore, the lentic riparian areas that do occur are highly valuable to the species associated with them. Portions of the Tunnel Creek district designated reserve are within section 23, while other wetlands not associated with perennial or intermittent streams occur in sections 23, 26, and 36. No lentic riparian areas have been identified in the Jenny Creek portion of the analysis area.

Proper Functioning Condition surveys have not been completed for these riparian areas. Informal surveys suggest that they are generally Properly Functioning. Some areas are bisected by, or are downslope from, roads which may affect flow routing.

Riparian Resources - Environmental Consequences

Lotic and Lentic Riparian Resources

Riparian resources associated with wetlands and fish-bearing, perennial, and intermittent streams in the project area will be included within designated riparian reserves. Riparian reserves will be established following

guidelines in Appendix B: Project Design Features for Water Resources. Fish bearing streams will receive a 320 foot buffer on each side, and perennial and intermittent non-fish bearing streams will receive a 160 foot buffer (see maps in Appendix D). The Spencer Creek Watershed Analysis recommended that thermal protection for spring areas, seeps and constructed ponds under one acre be provided by buffering these areas with a Riparian Reserve of a width equal to one site potential tree (160 feet), starting from the edge of the wetland area (Spencer Creek WA, page 5-41). As prescribed in the KFRA ROD/RMP (page B-4, Table R-1), the buffer widths for wet meadows and seasonal wetlands will be 150 feet. In many cases, the buffers for lentic areas overlap substantially with those of lotic riparian reserves. Field verification work will be done prior to any ground disturbance to finalize all stream classifications and riparian reserve boundaries.

Alternative 1

Effects of Timber Harvest Activity and Non-commercial Treatments

Although yarding corridors may cross Riparian Reserves, they will be designed and used consistent with Timber Harvest Best Management Practices (as described in the KFRA ROD/RMP page F-22). No new landings or permanent roads would be constructed within Riparian Reserves (except where construction or re-alignment of short road segments allows obliteration of longer road segments within Riparian Reserves).

Although ephemeral streams would not be buffered, sites where skid trails cross ephemeral channels would be spaced at least 300 feet, and no skid trails would be located in the bottom of draws where surface runoff or subsurface flow could collect.

For timber harvest and yarding activities that occur within Riparian Reserves, implementing the Project Design Features discussed above and listed in Appendix B would limit detrimental impacts to lotic riparian resources.

Proposed non-commercial treatments and prescribed fire use would reduce the risk of future catastrophic wildfires. Were they to occur, catastrophic wildfires could burn intensely within canyons, resulting in extensive mortality within Riparian Reserves and reducing the future supply of LWD and stream shade. Non-commercial treatments and prescribed fire use could occur within Riparian Reserves. These activities would be designed to achieve desired vegetation characteristics and to limit detrimental impacts to soils, vegetation, and water quality.

Effects of Road Treatments and Thinning within Riparian Reserves

Proposed road treatments include obliterating, re-aligning, and improving roads that impact Riparian Reserves. Proposed road treatments in T38S-R6E-sections 15 and 23 would result in substantially reduced road mileage within the Riparian Reserves of two spring-fed intermittent/perennial streams. These actions, along with actions taken to address flow diversion by roads in T38S-R6E-section 23, would reduce the delivery of peak flow runoff and sediment to stream channels. In the long-term, reduced road mileage within Riparian Reserves would make it possible to restore canopy closure, stream shading, recruitment of large woody debris (LWD), habitat connectivity, and stream channel geomorphology.

Silvicultural practices (including thinning) would be applied within Riparian Reserves to acquire desired vegetation characteristics needed to attain ACS objectives. These actions would be implemented in two distinct types of stands: (1) Older stands with trends of increasing proportions of white fir and decreasing proportions of pines and Douglas-fir; or (2) Extensive young even-aged stands such as are found in plantations or areas that experienced large-scale catastrophic mortality. In the older stands, thinning would focus on maintaining the vigor of large overstory trees (particularly the underrepresented pines) and desired understory trees, in order to ensure an adequate long term supply of stream shading and LWD. In the younger plantation-like stands, thinning would occur as needed to achieve densities and tree spacing appropriate for stand development. The proposed thinning would maintain and restore stand characteristics and LWD recruitment rates, and would thereby help meet ACS objectives.

Additional activities would benefit the form and function of riparian resources. Decommissioning of landings within Riparian Reserves would include revegetation and soil aeration (if necessary) and would reestablish

natural vegetation communities. Thinning or burning within aspen patches would prevent the eventual loss of these stands due to the advancement of successional processes in the absence of disturbance.

To protect riparian resources, mechanical equipment use would be limited to the outer one-half of Riparian Reserve widths. In addition, when silvicultural treatments are applied in older stands, no-cut buffers would be established adjacent to streams and wetland areas (see Appendix B). Mechanical treatments would be allowed in aspen stands only during periods when detrimental soil impacts would be least likely to occur. Utilization of cut material would occur within some Riparian Reserve treatment units. Appropriate BMPs (as described in Appendix B), would be implemented to reduce detrimental impacts to water quality, soils, and residual vegetation.

Alternative 2
Treatments within Riparian Reserves would occur only as described in other NEPA documents. Impacts associated with roads located within Riparian Reserves would continue to occur. The composition and character of forest stands adjacent to streams would not be altered at this time.

Alternative 3
Timber harvest activity would not occur under this alternative, so direct impacts of yarding through, or adjacent to, Riparian Reserves would be reduced. Actions that would affect Riparian Reserves include noncommercial treatments, prescribed fire use, road treatments, thinning within Riparian Reserves, and other restoration treatments. The beneficial and detrimental effects of these actions are described in the discussion of Alternative 1. Road treatments would be less extensive under Alternative 3 than Alternative 1, but would still result in reduced impacts associated with roads located within Riparian Reserves of T38S-R6E-sections 15 and 23.

Hydrology& Water Quality - Affected Environment

Hydrology
A thorough discussion and analysis of hydrologic and water quality conditions in the analysis area is presented in Appendix C. The following is a summary version.

The proposed treatments are located in the upper part of the Spencer Creek and Jenny Creek watersheds, which are both Tier 1 Key Watersheds. Perennial streams in or near the analysis area include Spencer Creek (as it flows through Buck Lake), Tunnel Creek, Miners Creek, and Johnson Creek. Streams in the analysis area either drain east into Spencer Creek, via Buck Lake or Miners Creek, or west into the headwaters of Jenny Creek, via Johnson Creek or Cold Creek. Except for those streams that receive inflow from springs, tributaries to these streams typically flow only intermittently or ephemerally. Because of the high infiltration capacity of soils within these watersheds, it is common for water to be routed to streams via subsurface translatory flow, rather than overland flow, even on highly disturbed slopes.

Land management actions can affect numerous aspects of the watershed hydrologic cycle, including evapotranspiration, interception, snow melt patterns, and infiltration (Harr, 1976; Berris and Harr, 1987). Effects of timber harvest on streamflow can include higher water yields, higher peak flows, earlier peak flows, and higher baseflows. These effects can persist until harvested areas are “hydrologically recovered” - that is, until the effects of timber harvest on evapotranspiration, interception, and snow dynamics are no longer evident. Research suggests that hydrologic recovery requires between around 10 to greater than 30 years following timber harvest (Ziemer 1964; Troendle and King 1985; Jones and Grant 1996) (for this analysis, a 25 year recovery period was assumed). The Equivalent Clearcut Area (ECA) methodology is commonly used to assess the cumulative hydrologic impacts of past and proposed timber harvest (Spence et al. 1996).

Assessment of Current Condition for the Spencer Creek and Jenny Creek Watersheds
The ECA procedure was used to estimate the extent of past timber harvest units that are hydologically unrecovered (Table C 2). It is estimated that approximately 31 percent of the Spencer Creek watershed is currently in a hydrologically unrecovered condition, a proportion similar to that described for 1995 in the

Spencer Creek Watershed Analysis. Public land survey data indicate that approximately 17 percent of the watershed was in ECA in 1899, primarily as a result of natural fires (Spencer Creek Watershed Analysis, page 4-41). Although both of these values are approximations based on assumptions, the magnitude of difference between the historic and current conditions suggests that past and recent management actions have affected hydrologic processes in the watershed (Spence et al. 1996).

Given that land ownership and vegetation patterns in the upper portion of the Jenny Creek watershed are roughly similar to those in the Spencer Creek watershed, it can be assumed that the type and extent of past management actions, and thus the overall condition of the watershed, are roughly similar between the two watersheds.

Hydrologic impacts associated with roads are important components of the cumulative effects analysis. As discussed in the Spencer Creek Watershed Analysis (pages 4-146 to 4-148) and the KFRA RMP (Appendix P), road surfaces have low infiltration rates, can intercept subsurface flows (which are an important aspect of the hillslope hydrologic cycle) and can reroute surface flow and act as extensions of the drainage network. The 2001 BLM/USFS road inventory assessed 291 miles of roads in the Spencer Creek watershed, 65 miles of which are on BLM land. GIS analysis suggests that about 820 miles of road are located within the Jenny Creek watershed.

The assessment of watershed-scale impacts suggests that the magnitude of management impacts has detrimentally affected hydrologic processes in both the Spencer Creek and Jenny Creek watersheds. Reduced canopy closure and the increased extent of large openings are likely causing peak streamflows and baseflows in these watersheds to be higher that they were historically. The magnitude of these effects, if they are indeed occurring, cannot be quantified.

Assessment of Current Condition for the Analysis Area

The data used for watershed-scale ECA estimates (described above) is not in a format that allows it to be used at finer spatial scales, such as the analysis area. It is possible, however, to determine the approximate extent of stands less than 25 years old (assumed to be hydrologically unrecovered) and the road density within individual catchments (7^{th} field hydrologic units) of the analysis area. (catchments are the individual drainage areas within subwatersheds, which, in turn, are the drainage areas within watersheds.) Most, but not all, of the analysis area is within six catchments within the Buck Lake and Lower Spencer Creek subwatersheds of the Spencer Creek watershed. The remainder is within the Johnson Creek and Sheepy Creek subwatersheds in the Jenny Creek watershed (See Map C 1).

The proportion of area within each catchment that is estimated to be currently hydrologically unrecovered ranges from 10 to 45 percent. Road densities in analytical catchments range from 3.2 to 6.2 miles per square mile. Due to the combination of existing road networks and past forest treatments, each of the analytical catchments is likely experiencing elevated peak flows and elevated water yields (Jones and Grant 1996) (Table C 3).

The catchments that are tributary to the southeastern portion of Buck Lake, as well as the headwaters of Miners Creek, have relatively low road densities and the lowest extent of unrecovered forest. Due to the their condition and the presence of extensive federal ownership, appropriate management in these catchments has a high potential for maintaining and restoring hydrologic characteristics. The remaining catchments generally have higher road densities and more extensive areas that have not recovered from previous timber harvest.

Water Quality

The primary water quality concerns in the Spencer Creek and Jenny Creek watersheds are temperature and sediment. Throughout the mainstem of Spencer Creek and Jenny Creek, as well as in Johnson Creek, summer water temperatures exceed State of Oregon water quality standards. This is due primarily to a lack of stream shading and reduced summer flows (Spencer Creek Watershed Analysis, page 4-158). Excessive fine sediment, primarily associated with extensive road networks, is detrimentally affecting aquatic habitat

complexity and integrity (as discussed in the Spencer Creek Watershed Analysis on page 4-153, and in Weyerhauser, 1994). Ongoing restoration projects have begun addressing these concerns.

Detailed information regarding the quality and quantity of water resources in the analysis area can be found on pages 4-139 to 4-153 in the Spencer Creek Watershed Analysis and pages 10 to17 and 77 to 82 in the Jenny Creek Watershed Analysis.

Hydrology & Water Quality - Environmental Consequences

Alternative 1

Hydrology

Effects of Timber Harvest and Non-Commercial Treatment on Hydrology

Commercial timber harvest and road treatments proposed in Alternative 1 would create up to about 370 additional ECA acres (Table C 5). Generally, reduced canopy closure can lead to decreased evapotranspiration, increased runoff and discharge from springs, and increased peak flows, especially in early winter (Chamberlain et al., 1991). Effects of timber harvest may persist for more than 25 years following treatment (Harr, 1976; Jones and Grant, 1996; Jones, 2000).

It is assumed that sufficient canopy closure and basal area would be retained in non-commercial treatment units and non-Matrix treatment areas (riparian reserves and DDRs) to prevent or minimize effects to streamflow.

Effects of Density Management

Proposed matrix density management treatments account for approximately 60 percent of the ECA acreage created by the proposed action. These treatments would, in the long-term, generally maintain forest composition and canopy closure. In the short-term, these treatments would reduce canopy closure, and resulting decreases in evapotranspiration will make more soil water available for streamflow and may cause slightly increased early winter water availability. Due to the porous soils and generally high elevations within the analysis area (above the transient snow zone), it is not likely that increased early winter water availability will cause increased peak flows.

Effects of Patch Cuts and Regeneration Harvest

In addition to affecting evapotranspiration rates, patch cuts and smaller regeneration units would cause increased snow accumulation. This could result in delayed snow melt (depending on spring weather conditions) that would make more water available for streamflow in some parts of the analysis area during the later spring and early summer. Because these units occur above the transient snow zone and on predominantly northeast aspects, rain-on-snow processes that could generate higher peak flows will not be impacted.

Effects of Riparian Reserve and DDR Treatments

These treatments would cause immediate reductions in canopy closure but would favor the long-term maintenance or restoration of hydrologic processes. These treatments will occur over a limited area and will generally not involve creation of large openings, thereby making it unlikely that hydrologic processes will be impacted in the short term.

Effects of Prescribed Fire and Non-Commercial Treatments

These projects could cause minor reductions in canopy closure, but will reduce the risk of catastrophic wildfire and will encourage understory vegetation to develop. Implementing appropriate BMPs (see KFRA ROD/RMP pages F-26 to F-31) and PDFs would minimize detrimental hydrologic effects of noncommercial treatments and prescribed burning.

Effects of Road Networks and Road Treatments

Road Construction, Realignment, and Improvement
No net increase in open road mileage in either the Spencer Creek or Jenny Creek watersheds would occur. Construction of a new permanent road is proposed near the Jenny-Spencer watershed divide (38S-5E-26). New roads would also be constructed in 38S-5E-23 and 38S-5E-15 to facilitate obliteration of roads within riparian reserves or other, longer road segments (See Appendix D – Map D-6).

The new road proposed in 38S-5E-26 is unlikely to cause detrimental impacts to streams. Soil characteristics in that portion of the watershed make it unlikely that road runoff will cause channels ("gullies") to form. Implementation of appropriate road construction BMPs (see KFRA ROD/RMP pages F-13 to F-21) will also mitigate road impacts. Road realignment and improvement (as proposed in 38S-5E-23 and 38S-5E-15) would reduce delivery of road runoff to streams and would facilitate reducing overall road densities in the analysis area.

Road Closures, Road Decommissioning, and Obliteration
Implementing road closures and decommissioning or obliterating roads would reduce road runoff and diversion of flow paths. The magnitude of these effects cannot be quantified, since the number and location of road closures has not been determined. A number of roads have been identified for decommissioning or obliteration. These include roads that route runoff directly into streams. By removing these roads, human-caused impacts to peak flows and channel-forming processes will be reduced.

Cumulative Effects
Overall, the management proposed in this alternative will result in maintaining and restoring hydrologic conditions in the watershed, to the extent that conditions on BLM-administered land contribute to watershed processes.

Road obliteration, resurfacing/renovation, and closure would reduce road-related runoff and peak flows, and would help attain ACS objectives and goals identified in the Spencer Creek Watershed Analysis (page 5-43). Reduction in total road miles and open road miles in the analysis area would reduce the potential to adversely affect groundwater recharge and aquifer function.

Water Quality
Direct and indirect impacts to water quality would likely be relatively minor. Implementing appropriate BMPs (see KFRA ROD/RMP pages F-11 to F-13) and PDFs would reduce the likelihood of adverse impacts (see Table 9).

Table 9 - Potential Effects On Water Quality And Proposed Mitigation Measures

Management Action	Potential Effect	Mitigation
- Haul traffic on roads that cross or are in close proximity to streams - Yarding across streams or Riparian Reserves	- Soil disturbance - Sediment could directly enter streams	- Delineate riparian reserves - Avoid hauling during wet weather - Maintain or improve haul roads - Implement riparian reserve, timber harvest, and soil protection BMPs
- Road maintenance, renovation and obliteration activities, and hauling activities	- Soil disturbance - Indirect sedimentation to streams	- Implement riparian reserve, timber harvest, soil protection, and road management BMPs - Avoid hauling during wet weather - Maintain or improve haul roads - Place slash on skid trails subsequent to timber harvest
- Mechanical vegetation treatments	- Soil disturbance - Indirect sedimentation to streams	- Implement riparian reserve, timber harvest, soil protection, and road management BMPs
- Prescribed burning	- Increased bare ground - Nutrient volatization and increased supply of nutrients to streams	- Implement riparian reserve and prescribed fire BMPs
- Timber harvest near or within riparian reserves Yarding within riparian reserves Non-commercial treatments within riparian reserves	- Reduced stream shading as a result of reduced canopy closure	- Delineate riparian reserves Establish "no-cut" areas adjacent to streams Implement riparian reserve BMPs

Vegetation treatments, road use, and road treatments could cause sediment and nutrients to be mobilized and delivered to stream channels. Proposed road treatments would improve water quality in the long term by reducing overall road densities, riparian road mileage, and road-stream connections. In the short term (one to two years) following road removal and improvement, sediment production from disturbed roads and ditches would increase. The beneficial effects of riparian road removal on stream shading would not be realized until trees become established and grow to a sufficient height (this could take more than 10 years).

The width of riparian reserves and no-cut buffers would be sufficient to protect stream channels and wetlands from direct adverse changes to water temperature caused by timber harvest activities. Despite the delineation of no-cut buffers (see Appendix B), treatments within riparian reserves may reduce stream shading. Such treatments generally will occur along intermittent streams that do not flow during the period when water temperature is a concern. Stream shading would increase as a result of road obliteration within riparian reserves. Slight increases in water yield and/or baseflows, were they to occur, would also help reduce water temperatures.

Alternative 2

Hydrology

This alternative would have no direct effect on evapotranspiration rates and water yield, except those caused by implementation of the KFRA Fire Management and Roaming Salvage EAs. Road runoff contributing to stream channels would continue unabated, and human-caused impacts to peak flows would not be addressed. Were a wildland fire to burn through the analysis area, fuel loading might be such that fire intensity would be higher under this alternative than the others analyzed, with subsequent large increases in runoff.

Water Quality

Soil disturbance under this alternative would be limited to that caused by prescribed burns or salvage activities. Prescribed burning carried out under the KFRA Fire Management EA may cause some small increases in sediment and nutrient delivery to stream channels. Such increases are usually short-lived, with water quality soon returning to pre-fire levels (Gottfried and Debano, 1990). Due to the more limited extent of fuels treatments under this alternative in comparison to the other alternatives, the relative magnitude of such

increases would likely be lowest under this alternative. Implementing appropriate BMPs would mitigate potential detrimental impacts associated with salvage harvest, yarding, and hauling (Appendix B).

Alternative 3

Hydrology

Proposed noncommercial treatments and prescribed burns would reduce fuel loads, thereby reducing the potential for extensive high intensity wildfires. Were they to occur, large wildfires would likely have a greater and longer lasting impact on hydrologic processes than would the proposed action (DeBano et al., 1996). In the short-term, noncommercial treatments and prescribed fire will reduce evapotranspiration, interception, and infiltration, thereby increasing the potential for runoff generation and hillslope erosion (DeBano et al., 1996).

Implementing road closures and decommissioning or oliterating roads would reduce road runoff and diversion of flow paths. The magnitude of these effects cannot be quantified, since the number and location of road closures has not been determined. A number of roads have been identified for decommissioning or obliteration. These include roads that route runoff directly into streams. By removing these roads, human-caused impacts to peak flows and channel-forming processes will be reduced.

Water Quality

Prescribed burning may cause some small increases in sediment and nutrient delivery to streams. In comparison to the other alternatives, the relative magnitude of fire-related increases would likely be highest under this alternative.

Proposed road treatments would reduce overall road densities, riparian road mileage, and road-stream connections. Stream shading would increase as a result of road obliteration within riparian reserves. Despite the delineation of no-cut buffers (see Appendix B), treatments within riparian reserves may reduce stream shading. Such treatments generally will occur along intermittent streams that do not flow during the period when water temperature is a concern.

Wildlife Species – Terrestrial - Affected Environment

A description of wildlife species that may be found within the proposed project area and their habitats is located in the Spencer Creek Watershed Analysis (pages 3-6, 4-93 to 4-124) and Topsy/Pokegama Landscape Analysis (pages 61-73). Management guidelines, seasonal restrictions, wildlife buffers, wildlife habitat objectives, and specie specific actions are located in the Klamath Falls Resource Area RMP/ROD (pages 3-37 to 3-41).

The analysis area supports a diversity of mammal and bird species generally associated with a late successional mixed conifer forest. The area is dominated by late successional forest, but has a mix of early seral and mid-seral stage habitat, pocket meadows and riparian habitat. Upland game birds, songbirds, woodpeckers, raptors, black-tailed deer, elk, bats, small mammals, black bear and forest carnivores have all been documented in the analysis area. Special Status Species are covered in the Special Status Species Section.

Wildlife Species – Terrestrial - Environmental Consequences

Alternative 1

Disturbance from machinery and other human activities associated with Alternative 1 may have direct impacts to local wildlife populations. During activities there is potential for loss of individual animals, especially young, due to direct mortality from the proposed activity. This loss would be very localized and have minimal to no impact to local populations. Timing of disturbance (spring, summer, winter, fall) would dictate the degree of negative impacts to local populations. Spring activities during the reproductive season would have a greater risk resulting in nesting or reproductive failure. Generally moisture restrictions limit access into the proposed area until later in the spring or early summer. Disturbance later in the nesting season would minimize impacts to nesting birds. Overall, impacts from human disturbance would be considered a short-term effect and would cease after treatment activities were completed. Seasonal restrictions and nest site buffers

(see Appendix B) would also reduce these impacts to wildlife. The proposed reduction in road densities over the long-term would improve habitat quality for wildlife.

Density management units will maintain and improve overall health of the stands and reduce the risk of catastrophic wildfires within wildlife habitat. Project Design features that maintain CWD, snags, and understory vegetation are described in Appendix B). Maintaining these characteristics would maintain the foraging, cover, prey base and nesting habitat necessary for wildlife. Thermal clumps (see Appendix B) will also be designated to maintain diversity within the stand. They are generally designated by a resource specialist and placed in areas to maintain habitat diversity. These areas generally range from ¼ to 5-acre size patches of habitat. Thermal clumps provide diversity within the stand as well as hiding, roosting, escape cover and thermal qualities for wildlife.

Patch cut and regeneration harvest areas would reduce overall canopy closure and create openings and more edge. This will result in the loss of thermal cover and nesting and roosting habitat in these areas. Generally these areas are lacking in understory vegetation and this type of treatment creates early successional habitat. This translates into foraging habitat for big game as well as early successional habitat for species dependent upon it.

Prescribed fire treatments would reduce the fuels and therefore reduce the risk of a catastrophic loss of habitat should wildfire occur. Some shrub habitat and understory vegetation used by wildlife would be lost within the proposed treatment area. This could result in a temporary loss of thermal, hiding, nesting and escape habitat. Designing treatments (see Appendix B) that result in a mosaic of burned and unburned areas would minimize the loss of habitat and rejuvenate vegetation. Habitat modifications from fuel treatments would be considered short-term impacts and the shrub component would re-vegetate within a few years after treatment.

Alternative 2
The No Action Alternative would have no direct impacts to wildlife or their habitat. However, not allowing management activities from the planning area would reduce habitat quality over time. Due to overstocked stands and heavy fuel loads, this alternative would increase the risk of large scale, catastrophic loss of wildlife habitat due to wildfire, and on-going, small scale loss of wildlife habitat to insect and diseases.

Alternative 3
Impacts from this alternative would be concentrated primarily in the understory vegetation and fuels. Very little disturbance of the overstory vegetation would occur and the overall impacts would be similar to alternative 2. Avoiding timber harvesting would in the short-term be less disturbing to wildlife. However, overall forest health may decline. Many of the stands planned for harvest are currently overstocked and fuel loads are high. Prescribed fire alone may not reduce the current fuel loads and maintain wildlife habitat.

Special Status Wildlife Species – Terrestrial - Affected Environment

Threatened and Endangered Species
Bald Eagles (*Haliaeetus leucocephalus*)
Under the Endangered Species Act, the U.S. Fish and Wildlife Service (FWS) lists the bald eagle as Threatened in Oregon. No bald eagle nest sites occur within the proposed project area. One nesting territory is within a ¼ -mile of the project area on USFS lands. The next closest site is over 2 miles away. The proposed project area could provide nesting habitat, but would not affect foraging habitat within the analysis area because it is limited.

Northern Spotted Owl (*Strix occidentalis caurina*)
The northern spotted owl was listed as Threatened under the Endangered Species Act in 1990. In January 1992, FWS determined the lands that comprise proposed critical habitat for the spotted owl. The proposed analysis area falls within this designated habitat. Currently there is approximately 3058 acres considered nesting, roosting, and foraging (NRF) habitat for the spotted owl in the planning area, although there are

currently no known active nest sites. There are two historic activity centers within the analysis area that are no longer active. Both were monitored for at least 3 years with no owls detected and subsequently removed from the site list. Three active spotted owl home ranges (1.2 miles from the site center) extend into the planning area (Table 10). These sites have been occupied and/or produced young within the past three years and are currently monitored to determine occupation and reproductive success.

Table 10 - Spotted Owl Home Ranges within Planning Area

Site #	Last Known Activity	Current Acres of NRF available within Home Ranges (1.2 miles)	Acres of Home Range within Planning Area	% of available Home Range NRF within Planning Area
2265	2002	993	11	1
0979	2002	2128	221	10
2065	2002	761	187	25

Miscellaneous detections of spotted owls have occurred within the planning area, but to date no new nest territories have been found. The Surveyor Mountain area will be surveyed again in 2003 and adjacent known nest sites will be monitored for occupation and reproductive success.

Canada Lynx (*Lynx canadensis*)
The lynx is listed as Threatened within its range under the Endangered Species Act. In 1999, a lynx habitat analysis was conducted using interagency guidelines, as recommended by the Lynx Science Team, to determine if lynx habitat existed within the Lakeview District of the BLM, including the analysis area. Following the criteria for identifying and mapping suitable lynx habitat, no lynx habitat exists within the Lakeview District. Due to this analysis and its findings, the potential impacts to the Canada lynx from this action will not be analyzed further in this document.

Other species of Concern

Great Gray Owl (*Strix Nebulosa*)
The great gray owl is listed as a Survey and Manage Species (formerly a protection buffer). Protocol Surveys were conducted on areas within the proposed analysis unit that had the highest potential to be great gray owl habitat. No nest sites were found. In 1997, one survey route had a detection of a great gray owl. No detections have occurred since. Surveys were last conducted in 2002. Since there is no current information that would indicate the presence of great gray owls within the analysis area, they will not be discussed further.

White-headed Woodpecker (*Picoides albolarvatus),* Black-backed Woodpecker (*Picoides arcticus*), Pygmy Nuthatch (*Sitta pygmaea*), and Flammulated Owl (*Otus flammeolus)*
Systematic surveys have not been conducted for any of the above species. The white-headed and black-backed woodpecker and pygmy nuthatch have been documented or thought to occur in the planning area. Surveys have been conducted for the northern spotted owl and great gray owl within the analysis area and during these surveys, no incidental detections of the flammulated owl have occurred.

Northern Goshawk (*Accipiter gentilis*)
The northern goshawk is considered a bureau sensitive species by the BLM and is highly associated with mature forests. There is one known nest site located in the analysis area and another within ¼-mile. Known nest sites are currently monitored annually for occupation and reproductive success.

Special Status Wildlife Species – Terrestrial – Environmental Consequences

Threatened and Endangered Species

Effects to Bald Eagles

Alternative 1

Planned habitat modifications would have minimal impacts on bald eagles. Any new nest territory located within the planning area would be buffered and seasonal restrictions would be in place to avoid disturbance caused from human activity. Impacts on the bald eagle, under the proposed alternative, would be low. Under the proposed action, seasonal restrictions and buffers (see Appendix B) around nest sites would reduce potential impacts from hauling or other human disturbances to bald eagles adjacent to the planning area.

Alternative 2

The No Action Alternative would have no direct impacts on bald eagles. Avoiding management activities could have long-term impacts to forest health. Accumulation of fuels and stand density could put the nest stand at risk from a catastrophic fire or disease.

Alternative 3

Impacts to the bald eagle, under this alternative, would be low. Seasonal restrictions and distance buffers (see Appendix B) on nest sites would reduce potential impacts from human disturbances to bald eagles adjacent to the planning area.

Effects to the Northern Spotted Owl

Alternative 1

Disturbance from the proposed action should have minimal impacts to spotted owls. Hauling activities outside the analysis area may increase disturbance if routes used to haul logs pass near owl centers. Overall, Project Design Features (Appendix B), including seasonal restrictions and nest site buffers would reduce these impacts.

The proposed 1200 acres planned for timber harvest are considered NRF habitat for the spotted owl. Timber harvest would occur in approximately 39% of the NRF habitat within the planning area. An estimated 870 acres (density management) would be maintained as NRF habitat (>70% canopy closure) after treatment. Up to 330 acres (280 acres regeneration harvest, 50 acres patch cuts) may be reduced to dispersal habitat (< 50% canopy closure). These expected changes to NRF habitat are based upon the results of post-treatment monitoring of areas to date that have received similar harvest treatments. As treatments are applied in the analysis area, spotted owl habitat would be monitored to verify what areas continue to serves as NFR habitat. PDF's maintaining adequate snags, course woody debris (CWD), and a diverse understory, including shrubs, would reduce the impacts to spotted owls and their habitat.

Prescribed fire is expected to have a low impact on this species. Fire intensity would dictate the degree of impacts on spotted owl habitat. Intense fires may create openings in the canopy and add to any previous openings that already occur naturally or have occurred from timber harvests. The potential exists for some trees to be killed by fire (snag creation) and for some understory removal depending on the timing and intensity of the fire. In areas where the understory is impacted, spotted owl prey base may be reduced. Low intensity fires, in the short-term, would reduce areas of foraging opportunities but overall should benefit owl habitat. Creating a mosaic of burned and unburned areas would maintain spotted owl habitat while reducing fuels and the risk of a catastrophic fire.

Treatments within DDR's and riparian habitats are expected to benefit spotted owls and their habitat. These treatments would be specifically targeted to improve late successional characteristics and enhance spotted owl habitat.

The streamlining processes for ESA consultation were initiated in October of 2001. Formal Consultation will be completed by May of 2003. Specific discussions regarding proposed treatment prescriptions and locations have and will occur with the FWS in areas that are considered part of a spotted owl's home range. BLM is also cooperating on a radio-telemetry study that is currently being conducted. All three of the spotted owl pairs adjacent to the planning area are being monitored. Radio-telemetry data may modify location and prescriptions of proposed treatments.

Alternative 2
The no action alternative would, in the short-term, have little to no impact on owl habitat, but long term effects may not be beneficial to owl habitat. Avoidance of forest health and fuels treatments in spotted owl habitat would continue to increase fuel loads to dangerous levels increasing the risk of a stand replacing fire. Prescribed fire would assist in removing decadent understory, down fuels, and assist in the rejuvenation of understory vegetation where it is absent.

Alternative 3
This alternative would have a low impact on spotted owl habitat. Potential impacts from burning may be minimal depending on the timing and intensity of the burn. Some understory would be consumed and some foraging habitat lost in the short-term. The reduction of fuel loading and the rejuvenation of vegetation would have a long-term positive effect on the prey base. Project Design Features (see Appendix B) would minimize impacts to spotted owl habitat.

Deferring timber harvest would in the short-term be less disturbing to wildlife but overall forest health may decline. Many of the stands planned for harvest are currently overstocked and fuel loads are high. Prescribed fire and noncommercial fuels treatments alone may not resolve the current fuel loads and forest health issues.

Treatments within DDR's and riparian habitats are expected to benefit spotted owls and their habitat. These treatments would be specifically targeted to improve late successional characteristics and enhance spotted owl habitat.

Other Species of Concern

Effects to White-headed Woodpecker , Black-backed Woodpecker , Pygmy Nuthatch , and Flammulated Owl

Alternative 1 and 3
The effects to the above species would be low. Project Design features and Survey and Manage ROD/Standard and Guidelines (2001) would protect and maintain habitat for these species. Disturbance created from these Alternatives would have some short-term adverse impacts but these would cease after the proposed project ended.

Alternative 2
The no action alternative, in the short-term would have minimal impact on these species, but long-term affects may not be beneficial to their habitat. Not allowing forest health and fuels treatments would eventually increase fuel load to potentially dangerous levels in which a stand replacing fire may occur.

Effects to Northern Goshawk
Impacts to the northern goshawk would be similar to that of the northern spotted owl for all alternatives.

Cumulative Effects
Overall habitat for wildlife will be maintained or continue to improve on most of the public lands after implementation of the proposed project. Habitat management guidelines, seasonal restrictions, buffers,

BMP's, and regulations within the NFP, KFRA RMP/ROD, would reduce the risk of impacts to wildlife species and their habitats.

Maintaining wildlife habitat on public lands will continue to increase in importance as adjacent private lands are harvested and wildlife habitat on private lands diminishes. The loss of corridors and connectivity due to harvesting practices on private lands will continue to impact wildlife and their ability to move between habitats. This project will not add to these losses and will maintain the current connectivity on public lands. Other projects on BLM lands are monitored to ensure that their impacts to wildlife will not be additive or reduce habitat quality.

Consultation

The bald eagle and northern spotted owl may be affected by the proposed action. The BLM is in the process of consulting with the USFWS on these affects. For Alternative 1, the BLM has made the following determination for the different listed threatened and endangered species:

Bald Eagle: The proposed action will result in a "May Affect, Not Likely Adversely Affect" determination due to the potential for disturbance.

Northern Spotted Owl: The proposed action will result in a " May Affect, Not likely to Adversely Affect" determination due to the potential for disturbance.

Northern Spotted Owl / Proposed Critical Habitat: The proposed action will result in a "May Affect, Likely to Adversely Affect" due to the degradation of that habitat.

For all other listed species and critical habitat: The proposed action will result in a "No Effect" determination.

Consultation will be completed prior to implementation of the proposed treatments.

Wildlife - Aquatic Species - Affected Environment

Present Condition of Aquatic Species and Habitat

The Upper Spencer analysis area supports a cadre of native aquatic species (Table 11). Description of species distribution and status is further described within Appendix C - Fisheries Report to the Upper Spencer EA.

Table 11 - Fish species known to occur within Spencer Creek and Jenny/Johnson Creek Watersheds, including state and federal status and known or suspected distribution within the analysis area.

Common Name	Scientific Name	Status	Distribution
Lost River sucker	Deltistes luxatus	Endangered[1]	Limited to lower Spencer Creek
Shortnose sucker	Chasmistes brevirostris	Endangered[1]	Limited to lower Spencer Creek
Klamath largescale sucker	Catostomus snyderi	Species of Concern[1]	Limited to lower Spencer Creek
Klamath smallscale sucker	Catostomus rimiculus	None	Widely distributed in Spencer Creek
Klamath redband	Onchorhynchus mykiss	Species of Concern[1]	Widely distributed in Spencer Creek
Speckled dace	Rhinichthys osculous	None	Widely distributed in Spencer and Jenny Creek
Sculpin species	Cottus ssp.	None	Widely distributed in Spencer and Jenny Creek
Lamprey species	Lampetra ssp.	None	Distribution unspecified
Jenny Creek sucker	Catostomus rimiculus	Species of Concern[1]	Widely distributed in Jenny and Johnson Creek
Jenny Creek redband	Onchorhynchus mykiss	Vulnerable Species[2]	Widely distributed in Jenny and Johnson Creek
Oregon Spotted Frog	Rana pretiosa	Candidate[1]	Present in Buck Lake
Cascade frog	Rana cascadae	Species of Concern[1]	Miner Creek (trib. to Spencer Creek) below Analysis Area
Pacific Giant Salamander	Dicamptodon tenebrosus	None	Downstream of Buck Lake

1 – Federal status, source Oregon Natural Heritage Program (2001)
2 – State of Oregon status, source Oregon Natural Heritage Program (2001)

Habitat is crucial to abundance and distribution of aquatic species. The Northwest Forest Plan (NFP) and KFRA RMP identified the Aquatic Concervation Strategy (ACS) as a means of maintaining and/or restoring the ecological health of watersheds, providing a scientific basis for protecting the aquatic ecosystem and enabling planning for sustainable resource management (USDI BLM 1995).

Watershed analysis completed for all of Jenny Creek indicated habitat conditions limited by past logging and grazing practices and water withdrawal (USDI BLM WA 1994). Recently completed proper functioning condition (PFC) surveys downstream of Johnson Creek and its tributaries, indicate better overall conditions at the site level than assessments included in the Jenny Creek Watershed Assessment. Proper functioning surveys of Johnson Creek and its tributaries indicated 89% PFC, 11% functional at risk, and no streams were identified as non-functional.

The watershed assessment of Spencer Creek notes that the health of the aquatic ecosystem is impaired by changes in function due to management activities (USDI BLM 1995b). Three changes in habitat condition were determined to be chronic and problematic for native fish species in Spencer Creek; fine sediments, high temperature, and low flows. The causes of a downward trend in habitat condition for Spencer Creek are predominantly related to road crossing, streamside timber harvest, and channelization and grazing in Buck Lake. PFC surveys in Spencer Creek, downstream from the analysis area, indicate approximately 49% of the streams are proper functioning condition, 41% of the streams surveyed are functional at risk, and 10% are nonfunctional.

Wildlife - Aquatic Species - Environmental Consequences

Alternative 1

Effects to Habitat, Populations, Distribution and TES

Implementation of this alternative with the application of the identified mitigation and appropriate BMP's and PDF's are expected to minimize short term impacts to aquatic resources (See Appendix B). In the long-term,

restored and/or maintained riparian forest stand health would be anticipated to maintain, protect and restore aquatic resources.

Streams in the treatment areas are generally small in size and intermittent in nature. On these small streams, trees and brush within the "no entry" (no entry for machines) buffer provide the majority of shading and stability. Locating mechanical treatments outside the no-entry buffers, and following recommended PDF's (Appendix B), are anticipated to minimize compaction and soil displacement which potentially could contribute to surface erosion reaching the stream channel. Application of manual non-commercial treatments located within the "no-entry" buffer are designed to control stocking, reestablish and manage stands and acquire desired vegetation characteristics to meet ACS objectives, and are not expected to negatively affect the aquatic resource in the short-term. Prescribed fires ignited outside the riparian reserves that are allowed to back into the riparian reserves are not expected to affect the aquatic resources.

Road construction, improvement, decommissioning, and obliteration could result in a short-term, through the first winter after construction, increase in sedimentation reaching stream channels by removing cover vegetation and exposing loose soil to ditchline and surface run-off. Minimal impacts from surface erosion, ditchline runoff, and sediment transport to stream channels are expected with appropriate applications of project design features (See Appendix B). No negative effects to the aquatic environment are anticipated from the proposed road improvements. It is anticipated that road improvement, realignment, decommissioning, and obliteration would improve the aquatic habitat in the long-term by reducing sediment delivery from roads.

Alternative 2

Effects to Habitat, Populations, Distribution and TES

There would be no stand manipulation management, road construction, road renovation and upgrading, road closures, or road decommissioning as part of this action. Impacts to the aquatic resources from existing chronic source areas would be expected to continue to occur. Indirect and cumulative impacts based upon the current watershed conditions and environmental baseline would also be expected to continue to occur. Road densities, vehicular access, and road conditions within the subwatershed would not change as part of the No Action Alternative.

Alternative 3

Effects to Habitat, Populations, Distribution and TES

Implementation of this alternative with the application of the identified mitigation and appropriate BMP's and PDF's are expected to minimize short term impacts to aquatic resources (See Appendix B). In the long-term, restored/maintained riparian forest stand health would be anticipated to maintain, protect and restore aquatic resources.

Streams in the treatment areas are generally small in size and intermittent in nature. On these small streams, trees and brush within the "no entry" buffer provide the majority of shading and stability. Locating mechanical treatments outside the "no-entry" buffers, and following recommended PDF's (Appendix B), are anticipated to minimize compaction and soil displacement that potentially could contribute to surface erosion and sediment delivery to the stream channel. Application of manual non-commercial treatments located within the no-entry buffer are designed to control stocking, reestablish and manage stands and acquire desired vegetation characteristics to meet ACS objectives and are not expected to negatively affect the aquatic resource in the short-term. Prescribed fires ignited outside the riparian reserves that are allowed to back into the riparian reserves are not expected to affect the aquatic resources.

Road construction, improvement, decommissioning, and obliteration could result in a short-term, through the first winter after construction, increase in sedimentation reaching stream channels by removing cover vegetation and exposing loose soil to ditchline and surface run-off. Minimal impacts from surface erosion, ditchline runoff, and sediment transport to stream channels are expected with appropriate applications of project design features (See Appendix B). No negative effects to the aquatic environment are anticipated from

the proposed road improvements. It is anticipated that road improvement, realignment, decommissioning, and obliteration would improve the aquatic habitat in the long-term by reducing sediment delivery from roads.

Survey and Manage Species - Affected Environment

Background

Below is a summary of the changes that have occurred in managing Survey and Manage Species since the KFRA RMP was signed in June of 1994.

- Under the 1994 Northwest Forest Plan , 1,200 species were listed as Survey and Manage Species. In 1996 the Klamath Falls Resource Area began surveys for species suspected to be in the resource area including the analysis area.
- Beginning in FY1999, pre-disturbance surveys were done for fungi according to protocol (O'Dell, T. 1999. Survey Protocol for Bondarzewia mesenterica (=B. montana), Otidea leporina, O. onotica, O. smithii, Polyozellus multiplex, Sarcosoma mexicana, and Sowerbyella (= Aleuria) rhenana Version 1.3.).
- Beginning in FY 1999, surveys were also done for mollusks within the analysis area according to protocol (Furnish, J., T. Burke, T. Weasma, J. Applegarth, N. Duncan, R. Monthey, D. Gowan, Survey Protocol For Terrestrial Mollusk Species From The Northwest Forest Plan Draft Version 2.0 October 29, 1997).
- In January 2001, the Record of Decision and Guidelines was signed and amended the 1994 Northwest Forest Plan SEIS. As a result, many species were dropped or changed categories. Surveys in this area, and region wide, showed that many species were common or not associated with late successional or old growth forest.
- In June 2002, the 2001 Annual Species Review (ASR) amended the 2001 Survey and Manage ROD. Table 1-1 of the 2001 ASR shows these currently listed species. Under the 2001 ASR there are 14 fungi species, 1 vascular plant, 2 terrestrial mollusks and 3 aquatic mollusks suspected or documented in the Klamath Falls Resource Area.

Present Status:

- For Fungi: No pre-disturbance surveys are required for fungi in the Klamath Falls Resource Area. Incidental finds and previously found sites will be managed as Known Sites.
- For Mollusks: Pre-disturbance surveys are required for aquatic and terrestrial mollusks in high priority habitat.

Table 1-1 from the 2001 Annual Species Review lists all Survey and Manage fungi species and their category (See the *2001 ROD Standard and Guidelines* pgs 7-13 for a complete description of categories). The 1994 Northwest Forest Plan, 2001 ROD and the BLM Survey and Manage website is a good reference for further information on Survey and Manage species and Survey Protocols.

Fungi

Table 12 below lists fungi found in the analysis area. Habitat requirements for fungi are different on a species by species basis. Some fungi species require down woody debris. Others require duff, pinecones and litter as substrate. Many fungi are dependent on specific tree or shrub species that act as mycorrhizal hosts. Fungi are sensitive to changes in microclimate conditions (light, wind, temperature, and moisture). More information can be found about individual fungi species on the Survey and Manage Website.
http://www.or.blm.gov/surveyandmanage/

Terrestrial Mollusks

Neither of the two terrestrial mollusks suspected to be in the Klamath Falls Resource Area have ever been found. Surveys have been completed in the analysis area and in other areas listed below in Table 12. In any areas not surveyed, pre-disturbance surveys will be completed in high priority areas before ground disturbing activities take place.

Aquatic Mollusks

Pre-disturbance surveys have been completed in the analysis area and in other areas listed below in Table 12 that shows the locations of known sites. In any areas not surveyed, pre-disturbance surveys will be completed before ground-disturbing activities take place.

Table 12 - List Of Fungi and Mollusks Found Within the Upper Spencer Creek Analysis Area
(Category of Fungi, Number of Sites Found, Location of Site, and Habitat)

Species	2001 ASR Category	# Of Sites and Location					Habitat
Fungi		Surveyor Timber Sale	Lower Spencer Creek DDR	Tunnel Creek LSR	Buck Again Timber Sale	Surveyor Old Growth Area	
Albatrellus ellisii	B	1				4	
Chromsera cynanophylla*	Removed (SSS review)	39	25	1			
Gyromitra melaleucoides*	Removed (SSS review)	4	4				
Rhizopogon evadens	B	1	0	0	0	0	
Gyromitra californica	B				1		
Boletus pulcherrimus	B				1	0	
Mollusks							
Fluminicola sp. no. 1, 3, and 16	A	1 sent to verify	0	0	0	2 sent to verify	Spring, cold water associated.
Helminthoglypta hertleini	E	0	0	0	0	0	Rocky, talus slopes
Pristoloma articum crateris		0	0	0	0		Riparian areas.

Survey and Manage Species - Environmental Consequences

All Alternatives - Terrestrial Mollusks

No sites of Survey and Manage Terrestrial Mollusks have been found in the analysis area. The Proposed Action and Alternatives will have minimal impact on Survey and Manage Terrestrial Mollusks. If any sites are found they would be managed as Known Sites according to Management Recommendations described in Table 13.

Alternatives 1 & 3 - Aquatic Mollusks

Fluminicola n. 1, 3 and 16

Aquatic Mollusks are most commonly found in or adjacent to riparian sites. Table 13 describes the standard buffers that are placed adjacent to springs, meadows, intermittent streams and perennial streams. Within some buffers, there may be some loss of shade under Alternatives 1 & 3. However, the loss of shade would be minimal and impacts would be low because of the standard riparian buffers that are implemented.

The Proposed Action and Alternative 3 would reduce stream sedimentation in the long-term by application of road management actions that would obliterate, realign, decommission, improve, revegetate and repair roads. The risk of stand replacing fires that could eliminate aquatic mollusk habitat will be reduced under both of these alternatives.

Table 13 - Survey and Manage Species In The Klamath Falls Resource Area –
Present Category, Management Requirement, Buffer Size, Management Inside Buffer

Survey and Manage Species	2001 ASR	Management Required	Buffer Size	Management in Buffer
Fungi				
No pre-disturbance surveys are necessary. Sites found during previous surveys, incidental finds and sites found during strategic surveys will become Known Sites				
Albatrellus ellisii	B	Manage All Known Sites	60 foot radius	Can reach in and Cut.
Boletus pulcerrimus	B	Manage All Known Sites	60 foot radius	No entry within buffer.
Chromosera cyanophylla	Removed*	Manage All Known Sites	25 foot radius	No entry within buffer.
Clavariadelphus ligula	B	Manage All Known Sites	60 foot radius	Can reach in and Cut.
Clavariadelphus sachalinensis	B	Manage All Known Sites	60 foot radius	No entry within buffer.
Clavariadelphus truncates	D	Manage High Priority Sites	60 foot radius	No entry within buffer.
Collybia bakerensis	F	None	N/A	N/A
Gyromitra californica	B	Manage All Known Sites	60 foot radius	No entry within buffer.
Gyromitra infula	Removed*	Manage All Known Sites	60 foot radius	Can reach in and Cut.
Gyromitra melaleucoides	Removed*	Manage All Known Sites	60 foot radius	Can reach in and Cut.
Mycena overholtsii**	D	Manage High Priority Sites	60 foot radius	No entry within buffer.
Mycena monticola	Removed*	Manage all Known Sites	25 foot radius	No entry within buffer.
Rhizopogon evadens.var. subalpinus	B	Manage All Known Sites	60 foot radius	No entry within buffer.
Spathularia flavida	B	Manage All Known Sites	60 foot radius	No entry within buffer.
Mollusks				
Pre-disturbance and Purposive surveys will be done for the mollusks listed below.				
Aquatic Mollusks				
Fluminicola No. Sp 1	Removed*	Manage All Known Sites	160 foot riparian buffer	
Fluminicola No. Sp 3	A^2	Manage All Known Sites	160 foot riparian buffer	
Fluminicola No. Sp 16	A	Manage All Known Sites	Protect from Grazing. 160 foot riparian buffer	
Terrestrial Mollusks				
Helminthoglypta hertleini**	E^4	Manage All Known Sites		
Pristoloma articum crateris**	B^4	Manage All Known Sites		
Vascular Plants				
Cypripedium montanum	C	Manage High Priority Sites		
* Removed from the S&M species list but still required to be managed as a Known Site until disposition in the special status species program is determined.				
** These species have never been found on the KFRA but are suspected to be in our area				

Alternative 2 – Aquatic Mollusks

Under this alternative, mollusks will see no immediate change in their habitat and in the short-term the populations should remain the same. However, in the long-term, the risk of a catastrophic fire could increase. The lack of action on repairing roads could cause increased sedimentation in aquatic mollusk habitat.

Alternative 1 - Fungi

Under the Proposed Action, impacts include reduced canopy closure, greater areal soil disturbance, increased soil compaction, reduced litter, reduced woody debris, and removal or damage to host trees for mycorrhizal fungi species. Most timber harvest practices on the east slope of the Cascades, including this resource area, are accomplished with the use of a mechanical harvester. Regional soil guidelines and the KFRA RMP (Appendix D) state that the cumulative effects of detrimental soil impacts are not to exceed 20 percent of the total acreage within an activity area without amelioration of the compaction. Soil compaction and disturbance causes damage to the underground mycorrhizal component of fungi and could cause extirpation of some fungi species. Regeneration cuts and patch cuts remove more of the over story canopy cover, decreasing shade and wind protection. Hand pre-commercial thinning will have the least amount of detrimental impacts on fungi. There would be less ground disturbance and less canopy removed using these treatments. The affects of slashbusting on fungi are similar to those caused by logging. In addition, slashbusting also reduces the shrub layer that provides shade for fungi species and reduces the amount of down woody debris.

Prescribed fire's effects on fungi include soil disturbance, host tree or shrub species elimination, and disturbance and removal of canopy. Foam used in prescribed fire operations can detrimentally affect fungi mycorrhiza. The intensity of the burn seems to be important. Several recent studies have examined the impact of both wildland and prescribed fire on ectomycorrhizal fungi communities (Penttila, R. and H. Kotiranta 1996; Baar, J. et al. 1999; Visser, S. 1995; McIver, J.D. and L. Starr, 2000). Impacts result from burning conditions and fire intensity among other factors. Most evidence indicates that higher fire intensity is associated with greater long-term damage to ectomycorrhizal fungi. High intensity fires may kill forest stands and greatly affect ground cover and deeper soil conditions. Lower intensity fires may be much less disruptive to soil integrity underneath burned surfaces, where most ectomycorrhizal fungi reside (Jonsson, L. et al. 1999). Low intensity prescribed fire may be beneficial, contributing to species persistence in those ecosystems with historically short fire return intervals (e.g. eastern Cascades). In our area, the 2001 Survey and Manage ROD pg. 20 Standard and Guidelines) states, " In high fire frequency areas such as east of the Cascades or in the Klamath Province, specific consideration should be given to the acceptability of the use of prescribe fire in known sites to reduce the risk of future large-scale or high intensity fire even if it entails some risk to individual site occupancy" (BLM-instruction memorandum No. OR-2002-080, Attachment 1, August 2002).

Cumulative Effects

There are risks associated with the compounded effects from multiple treatments occurring within the same units. Cumulative effects from two or more separate entries of machines or fire would likely cause increased soil disturbance, affecting mycorrhiza and reducing or altering down woody debris.

Alternative 2 - Fungi

Under this alternative there will be no immediate effects to Survey and Manage fungi. Habitat will not be altered and persistence of the species would not be threatened. However, under this alternative the risk of catastrophic wildfire would increase or species composition of host trees could decrease if shade intolerant tree species (Douglas fir, Western white pine and Ponderosa pine) are shaded out.

Alternative 3 - Fungi

Under this alternative, the impacts will be similar to those under the Proposed Action. The same concerns about slashbusting, prescribed fire, cumulative impacts and managing known sites would remain. The impacts would be lower because no commercial timber harvesting would occur, thus there would be lower impacts from mechanical equipment. The overall analysis area would retain 70% canopy, an important component of fungi habitat.

The Mitigating Measures described below and repeated in Appendix B would be implemented to reduce the impact from the proposed treatments.

Mitigation Measures:

Impacts from implementing Alternative 1 or 3 would be reduced by:

- Any remaining pre-disturbance surveys will be completed to protocol before ground disturbing activities take place.
- Known sites will be marked on the ground and site information recorded in ISMS.
- Any known sites will be buffered according to Management Recommendations and the KFRA Buffer Management Team.
- The currently listed buffer sizes and management plan shown in Table 12 will be used for commercial and non-commercial projects. Sites that occur where regeneration or patch cuts are planned will have their buffer size doubled.
- Slashbusting and prescribed fire projects will use Management Recommendations from "Amendments to Survey and Manage Management Recommendations in relation to fuels reduction treatments" released in August of 2002 in BLM Instruction memorandum No.OR-2002-080, Attachment 1. These recommendations give a partial list of species specific and general Management Recommendations for fungi species in relation to fuels reduction treatments. These recommendations were released specifically to address management of sites found around communities "at risk." The analysis area does not fall into this category but species information found here is useful in determining buffer sizes and treatment within the buffers
- When possible, Known Sites will be combined to provide for connectivity in the landscape.
- Cable logging will be used on the steeper slopes to reduce soil disturbance (applicable to Alternative 1 only)
- Logging over snow (see soils discussion) (applicable to Alternative 1 only).

Cumulative impacts of multiple entries will be monitored. Current soil compaction monitoring in other parts of the resource area will provide applicable information on the impacts of slashbusting immediately following a logging operation. Known fungi sites will be monitored for the persistence of the species after any of the proposed treatment methods. This would assist in determining the impacts of different treatment methods on fungi persistence.

Cattle Grazing & Wild Horses - Affected Environment

The treatment areas lie within portions of the Buck Lake (#0104) and Buck Mountain (#0103) allotments. Cattle grazing is permitted within the proposed treatment areas, though due to slopes, thick timber, and limited herbaceous growth, most of the treatment areas receive little if any grazing. A complete description of the grazing activities in these allotments, including current use levels, historical use, allotment boundaries, etc. is found in the Spencer Creek Pilot Watershed Analysis - Part 1: Social Ecosystem - "Livestock Grazing". Additional information is found in the KFRA RMP/FEIS, KFRA ROD/RMP and Rangeland Program Summary. In addition, during FY 2000, "Rangeland Health Standards Assessments" were completed for both grazing allotments; these assessments may also be referenced for more information on livestock grazing.

The proposed project area does not lie within or immediately adjacent to a Wild Horse Herd Management Area**.**

Cattle Grazing & Wild Horses - Environmental Consequences

Harvesting activities as described in Alternatives 1 (proposed action) and 3 would have a small, short-term (2 to 10 years) positive effect on livestock grazing due to an increase of palatable, herbaceous plant species that would be more abundant once some of the overstory trees are removed. There could be a short-term (0 to 2 years) negative effect on forage amounts due to the ground disturbing impacts of the timber harvesting machinery. Observations of the grazing use in the proposed activity area by BLM range personnel, however, has indicated that cattle make very little use of the vast majority of these lands. Most of the grazing use in this area is made on the intermingled, though dominant, private lands at lower elevations; particularly U. S. Timberlands and other privately owned properties. Alternative 2 (No Action) would have the effect of not providing any additional short-term forage for livestock.

A much more detailed description of potential impacts, including the cause and effect relationships between grazing, timber harvest activities, vegetation community structure, and forage production is found within the

Spencer Creek Pilot Watershed Analysis, Part II: Terrestrial Ecosystem, "Rangelands" section. Additional information is also found in the Klamath Falls R.A. Resource Management Plan/EIS, Record of Decision and Rangeland Program Summary.

Cultural Resources - Affected Environment

Most of the cultural resources connected to the project area are associated with Spencer Creek and Buck Lake. A brief cultural overview is presented here, for more detail refer to "Spencer Creek Pilot Watershed Analysis" (1995),"Klamath Echoes Vol.1 No. 1" (1964), "Mills Along the Lakeshore: The Lumber Industry On the Winema Lands 1910-1936" (Tonsfeldt 1987), and "Prehistory and History of the Jackson-Klamath Planning Unit: A Cultural Resources Overview" (Follansbee and Pollock et. al. 1978).

Prehistorically (pre-1846), the project area lay within no distinct tribal territory. The area was used by the Takelma, Klamath, and Modoc tribes. Activity was limited to seasonal hunting and gathering. Permanent occupation sites, such as villages, were established at lower elevations. Later, in 1864, the area fell within the territory ceded to the United States by the Klamath Tribes. The Klamath Tribes consist of the Klamath, Modoc, and Yahooskin people. Although treaty rights are no longer federally recognized in the project area, the Klamath Tribes remain concerned about potential disturbance to cultural sites in the area. The KFRA continues to keep the Klamath Tribes informed of proposed BLM activities.

Historically (post-1846), after the establishment of the Applegate Trail, the project area was used for cattle ranching and logging. O.J. Brown was the first to start a cattle ranch in the1860s near the mouth of Spencer Creek. The ranch was later sold to the Spencer family. The Charley family bought land around Buck Lake for ranching in 1942. The lake was subsequently drained and converted into pasture.

Logging began in the1860s with a few small enterprising sawmills. The industry boomed in the early twentieth century both in and around the project area after the introduction of railroads nearby. Weyerhaeuser arrived in 1923 and began constructing logging roads. Today logging and ranching continue to be significant in the area.

Cultural Resources - Environmental Consequences

A review of existing inventory files revealed that 98% of the project area has been previously surveyed (See Table 14). Only one site and one isolate were found. The remaining 2% will be surveyed for cultural resources and submitted to the State Historical Preservation Office (SHPO) for concurrence prior to the initiation of ground disturbing activities. All known sites will be marked in the field and avoided during treatment. In addition, sites will be monitored after timber sale activity.

Previous surveys used BLM Class III surface survey methods and did not incorporate subsurface techniques. Consequently, sites may not have been discovered due to dense forest ground litter. It is preferred, in addition to avoiding the site, that the least ground disturbing methods are undertaken. If additional cultural resources are encountered during treatment activity, then work should be halted and the resource area archaeologist should be called in for further evaluation. Isolates have no scientific value under BLM Regulation 8111.21 (F) and will not be avoided.

Table 14 - Project Area Cultural Survey History

Township	Range	Section	Sites	Isolates	Survey
39S	06E	6	0	0	1990 Shady and Camp Timber Sale
39S	06E	6	0	0	1998 Clover/Saddled/Surveyor Timber Sale Clean-up
39S	06E	7	0	0	1990 Shady and Camp Timber Sale
39S	06E	7	0	0	1995 Silviculture Tree Plantation
39S	06E	7	0	0	1997 West Roam II Salvage
39S	05E	1	0	0	1990 Shady and Camp Timber Sale
39S	05E	1	0	0	1997 West Roam II Salvage
39S	05E	10	0	0	1999 Surveyor Quad (OR014-CRR-FY99-11)
38S	05E	14	0	0	1991 Buck Again Timber Sale
39S	05E	15	0	0	1991 Buck Again Timber Sale
39S	05E	15	0	0	1996 Buck Again Timber Sale
39S	05E	21*	0	0	1991 Saddled Again Timber Sale
39S	05E	21	0	0	1995 Frosty Again Timber Sale (WSU)
39S	05E	23	0	0	1991 Buck Again Timber Sale
39S	05E	23	0	0	1995 Frosty Again Timber Sale (WSU)
39S	05E	23	0	0	1996 Buck Again Timber Sale
39S	05E	23	0	0	1996 West Roam Salvage
39S	05E	25	0	0	1991 Shady and Camp Timber Sale
39S	05E	25	0	0	1999 Surveyor Quad (OR014-CRR-FY99-11)
39S	05E	26	0	0	1996 West Roam Salvage
39S	05E	26	0	0	1997 West Roam II Salvage
39S	05E	26	0	0	1999 Surveyor Quad (OR014-CRR-FY99-11)
39S	05E	27	0	1	1997 West Roam II Salvage
39S	05E	28	0	0	1995 Frosty Again Timber Sale (WSU)
39S	05E	28	0	0	1995 Silviculture Tree Plantation
39S	05E	28	0	0	1997 West Roam II Salvage
39S	05E	35	0	0	1996 West Roam Salvage
39S	05E	36	0	0	1990 Shady and Camp Timber Sale
39S	05E	36	1	0	1996 West Roam Salvage
39S	05E	36	0	0	1999 Surveyor Quad (OR014-CRR-FY99-11)

Recreation Resources - Affected Environment

The analysis area provides opportunities for dispersed recreation such as hunting, fishing, off-highway vehicle driving, camping, sightseeing, mountain biking, snowmobiling, and cross country skiing. Recreation facilities with some level of development include a small campground and a snowmobile trail. Surveyor campground is a small rustic campground with limited facilities set in a grove of old growth conifers. The Surveyor snowmobile trail is a designated, groomed trail that travels over the Keno Access road from the Burton Flat road intersection to the Spencer Creek Hookup road intersection. The analysis area currently receives light dispersed recreation use most times of the year.

For additional information about recreation resources in the analysis area, reference the Spencer Creek Watershed Analysis, pages 4-4 through 4-8.

Recreation Resources - Environmental Consequences

Under alternatives 1and 3, only temporary, minor disruption to recreational uses would occur during treatment activities. Short term disturbances to recreationists from truck traffic, equipment noise, and dust associated with treatment activities would be expected.

Plowing snow off roads for winter logging activities would cause negative impacts to snowmobilers because haul routes conincide with groomed trails that runs over the Keno Access and Spencer Creek Hookup roads. The snow plowing would temporarily decrease the available length of the trail, and may also disrupt some of the commonly used snowmobile parking/staging areas in and adjacent to the analysis area.

The impacts associated with the selective harvesting and road building described in Alternatives 1 and 3, would not exceed those described in the Klamath Falls Resource Area Final RMP (pages 4-104-108).

The KFRA has designed some snow plowing specifications to mitigate and minimize the impacts to snowmobile users. These Project Design Features are described in Appendix B.

Under Alternative 2, no impacts to recreation resources would be expected.

Visual Resources - Affected Environment

The BLM has a basic stewardship responsibility to identify and protect visual values on public lands. This is accomplished through the Visual Resource Management(VRM) program. Through this program, all BLM lands are inventoried and managed in specific VRM classes. BLM lands within the analysis area contain a variety of land forms and scenic/aesthetic qualities. The analysis area contains three Visual Resource Management Classes. The management direction for each class is describe below.

- VRM Class II: BLM lands within 1/4 mile of Surveyor campground, Spencer Creek, and the Pacific Crest National Scenic Trail. VRM Class II management objectives are for low levels of change to the characteristic landscape. Management activities may be seen but should not attract attention.
- VRM Class III: Management objectives for VRM Class III are to manage for moderate levels of change to the characteristic landscape. Management activities may attract attention but should not dominate the view of the casual observer.
- VRM Class IV: Lands are to be managed for moderate levels of change to the characteristic landscape. Management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the effect of these activities through careful location, minimal disturbance, and repeating the basic elements of form, line, color, and texture found in the landscape.

Visual Resources- Environmental Consequences

Under Alternatives 1(proposed action) and 3, proposed treatment activities would have minimal negative impacts to visual resources. The use of five (5) acre patch cuts, road construction, and the treatment of logging slash and road building debris, could potentially negatively impact the visual resources.

Visual resources within the analysis area could be positively impacted by proposed forest treatments, specifically in the area of previous strip clear-cut treatments on Surveyor mountain.

Mitigation and suggested Project Design Features related to visual resources are described in Appendix B of this document.

Under Alternative 2 (no action), no impacts to visual resources would be expected.

Resources Not Impacted

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 known hazardous waste sites in the analysis area.

For all alternatives, no direct or indirect disproportionately high or adverse human health or environmental effects to minority or low income populations are expected to result from implementation of the proposed action or the alternatives.

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Appendix B – Summary Of Mitigating Measures (Best Management Practices & Project Design Features)

Mitigating Measures for the Proposed Action are described in two forms; (1) the standard Best Management Practices (BMPs) described in Appendix D of the KFRA RMP and (2) additional Project Design Features (PDFs) specific to the Proposed Action. Both the BMPs and PDFs are designed to minimize adverse impact to the natural and human environment.

In addition to the BMPs listed in Appendix D of the RMP(pages D1-D46), the following PDFs will be incorporated into the Proposed Action to mitigate impacts:

1. **Upland Forest Vegetation - Harvest Prescription -**
   - 1.1. **Regeneration Harvests** – the following criteria are to be used when designing Regeneration Harvests
     - 1.1.1. Regeneration Harvests will occur on no more than 280 acres of the 1,200 total proposed harvest acres.
     - 1.1.2. Retain at least 16 to 25 large green trees per acre in regeneration harvest units (KFRA RMP – Plan Maintenance FY 1999 – page 23).
     - 1.1.3. 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 (Page E-10 of the KFRA RMP).
     - 1.1.4. 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 (Page E-10 of the KFRA RMP).
     - 1.1.5. Generally, Regeneration Harvests would be used when:
       - 1.1.5.1. Mortality exceeds 40 percent of the canopy
       - 1.1.5.2. Dead and dying trees are producing excessive fuel loads and increasing fire risks.
       - 1.1.5.3. Regeneration of preferred species (pines and Douglas-fir) is necessary.
       - 1.1.5.4. Large disease pockets are preventing the re-establishment of habitat.
       - 1.1.5.5. To meet visual resource management objectives.
   - 1.2. **Density Management Harvests** –
     - 1.2.1. For uneven-aged stands, maintain a multi-strata stand structure.
     - 1.2.2. **Patch Cuts**:
       - 1.2.2.1. Patch Cut Harvest will occur on no more than 50 acres of the 1,200 total proposed harvest acres. This amounts to approximately 4% of the harvest acres. RMP standards allow up to 15% Patch Cuts Harvests in Density Management Units (KFRA RMP- Plan Maintenance FY 1999 page 23). The limit of 50 acres is to mitigate cumulative impacts within the Spencer Creek Watershed.
       - 1.2.2.2. Patch Cut Harvests within density management harvest areas are limited to 5 acres in size. (KFRA RMP- Plan Maintenance FY 1999 page 23).
       - 1.2.2.3. Patch Cuts are designed to create stand openings to allow establishment of shade-intolerant species, mainly ponderosa pine, and also to meet visual resource management objectives.
       - 1.2.2.4. Retain up to 5 large overstory trees in the Patch Cuts. 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.

1.2.2.5. The patch cuts shall 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).

1.3. **Coarse Woody Debris** –

1.3.1. 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.

2. Roads

2.1. The BMPs listed in Appendix D of the RMP provide standard management practices that are to be implemented.

2.2. Seasonally restricting renovation activities is recommended to eliminate sediment transportation to streams.

2.3. Installing drainage dips in accordance with RMP BMP 's to reduce surface and ditchline run-off is recommended.

2.4. Apply mulch and seeding or other methods of soil stabilization to any exposed soil surfaces prior to the wet season to reduce surface erosion.

2.5. Surfacing roads in accordance with RMP BMPs *(Roads C-1-8)* is recommended for all naturally surfaced roads not proposed for decommissioning or closure, to allow use during all seasons and is expected to minimize erosion from the road surfaces.

2.6. Direction from the RMP ROD for Key Watersheds includes reducing road mileage and a no net increase in road mileage. Restoration of forest productivity including full decommissioning of roads within the riparian reserves upon completion of the project is recommended.

2.7. Minimal or no grading of the existing roads will be done to maintain the existing ground cover and vegetation and to decrease sediment movement.

2.8. Re-decommission roads that have been decommissioned but are opened for commercial treatments, non-commercial treatments, or prescribed fire use.

2.9. When obliterating or fully decommissioning roads, remove road drainage features and fill in ditches, place slash and woody material on the road surface subsequent to ripping, and ensure that the road closure is adequate to ensure that vehicle access is eliminated.

2.10. When obliterating or fully decommissioning roads within Riparian Reserves, plant native trees subsequent to road removal.

3. Soil Resources

3.1. 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).

3.2. Permit logging activities during this time period if frozen ground or sufficient snow is present, or as approved by a resource specialist.

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

3.4. Residual slash will be placed upon skid trails upon completion of yarding.

3.5. Avoid placement of skid trails in areas with potential to collect and divert surface runoff (such as the bottom of draws).

4. Hydrology & Riparian Reserve Treatments

4.1. Delineate Riparian Reserve widths as shown in Table A-2.1:

Table A-2.1 Riparian reserve types and widths within the KFRA (KFRA RMP/EIS page F-8 and ROD pages C-30 to 31).

Riparian reserve type	Reserve width
Fish-bearing streams	The height of two site potential trees (320 feet)
Perennial non-fish-bearing streams	The height of one site potential tree (160 feet)
Seasonal non-fish-bearing streams ***and*** wetlands less than 1 acre ***and*** unstable or potentially unstable areas	At a minimum, the reserve will include: ▪The stream channel and the area extending to the top of the inner gorge; ▪The wetland and the area extending to the outer edges of riparian vegetation; ▪The area extending from the stream channel to a distance equal to the height of one site potential tree (160 feet), or 100 feet slope distance, whichever is greatest; and, ▪The extent of stable or potentially unstable areas.
Constructed ponds and reservoirs ***and*** wetlands greater than one acre	At a minimum, the reserve will include: ▪The body of water or wetland and the area to the edges of riparian vegetation; ▪The extent of seasonally saturated soil; ▪The extent of unstable or potentially unstable areas; ▪To a distance equal to the height of one site potential tree (160 feet); and, ▪To 140 feet slope distance from the edge of the wetland or the maximum pool elevation of constructed reservoirs.
Lakes and natural ponds	At a minimum, the reserve will include: ▪The body of water or wetland and the area to the edges of riparian vegetation; ▪The extent of seasonally saturated soil; ▪The extent of unstable or potentially unstable areas; ▪To a distance equal to the height of two site potential trees (320 feet); and, ▪To slope distance equivalent to the height of two site potential trees from the edge of the body of water.
Springs	Reserve widths vary according to the size of the associated wetland (see above).

4.2. Delineate Riparian Reserve widths of one site potential tree (160 feet) around springs, seeps, and ponds less than 1 acre (Spencer Creek WA, page 5-41).

4.3. 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 Spencer Creek Watershed Analysis, the height of a site potential tree was determined to be 160 feet.

4.4. For Riparian Reserve Vegetation Treatments (Including Timber Harvest Operations):

4.4.1. For understory vegetation treatments within older, multi-age stands within Riparian Reserves, delineate "no-cut" buffers along stream channels and wetland areas. No-cut widths would be 20 foot on each side of non-fish bearing stream channels and wetlands and 40 feet on each side of fish bearing streams to protect microclimates adjacent to the streams.

4.4.2. For vegetation treatments within Riparian Reserves, limit the use of mechanical equipment use to the outer one-half of the Riparian Reserve.

4.5. Existing landings and roads within riparian reserves would be used only if replacing them with landings and roads outside the riparian reserves would result in greater overall disturbance to the riparian reserve or water quality.

4.6. Stand manipulation (culturing) in the riparian reserves would occur only in "proper functioning condition" (PFC) rated reaches or would move the stream channel towards PFC as determined by KFART.

4.7. Harvest/treatments methods that would disturb the least amount of soil and vegetation (yarding over snow or frozen ground, limiting activities to the dry season, pulling line to each tree, and minimizing skid trails) would be used in the Riparian Reserves.
4.8. Consider retaining some downed logs for instream structural enhancement projects.
4.9. No new permanent roads will be constructed within Riparian Reserves (except where construction or re-alignment of short road segments allows obliteration of longer road segments within Riparian Reserves).
4.10. Yarding corridors that pass through Riparian Reserves will be designated prior to project implementation, will have a minimum spacing of 300 feet and be oriented perpendicular to streams, and will be revegetated following project implementation (as needed).
4.11. Use of existing roads and landings within Riparian Reserves will be reviewed and approved by the Klamath Falls Resource Area interdisciplinary team.
4.12. Mechanical treatments would be allowed in aspen stands only during periods when detrimental soil impacts would be least likely to occur.

5. Wildlife Terrestrial Species

5.1. Snag Retention

5.1.1. On all Matrix lands, retain a minimum of 2.5 snags per acre, where available, in the following categories:
5.1.1.1. 1 snag >20" dbh; species should be ponderosa pine, sugar pine, or Douglas fir if available;
5.1.1.2. 1.5 snags >12" dbh; species retained should be a mix proportional to the stand composition.
5.1.1.3. Maintain snags according to guidelines in the NFP and leave dead-top green replacement trees in areas void of snags (C-45-46).

5.2. Coarse Woody Debris Maintain

5.2.1. CWD according to standards and guidelines in the NFP (C-40, 41).

5.3. Seasonal Restrictions

5.3.1. Require seasonal restriction
5.3.1.1. In areas seasonal restrictions will be required where the following wildlife species are actively nesting: bald eagle, northern spotted owl, American marten, northern goshawk, survey and manage species, and protection buffer species. Seasonal restrictions for specific species can be found on pages 231-240 of the KFRA FEIS.

5.4. **Nesting Areas** - Protect nesting areas as describe on page 38 of KFRA RMP.

5.5. **For Fuel Treatment Units Adjacent To Or Containing Bald Eagle Nest Sites**:

5.5.1. No treatments will be planned within the core area (as identified by the BLM wildlife biologist) of a bald eagle nest site during the nest season. Nesting season is considered January 1st – August 15th. The wildlife biologist may adjust these dates if the young have fledged prior to Aug. 15th (usually the fledging date plus 2 weeks). The core area will consist of the withdrawn area around the nest and the disturbance area around the nest. Generally the disturbance area is considered ¼-mile or ½ mile line-of sight. This distance may vary depending on topography and site-specific information.
5.5.2. Smoke management will be planned in such a way to avoid adverse effects of residual smoke on nest sites adjacent to burn units.
5.5.3. A BLM wildlife biologist will be consulted about eagle use of the area before the fuel treatments are initiated to ensure the eagle situation is closely monitored.
5.5.4. A biologist/designee will monitor the nest area during the burns to ensure that objectives and PDF's are met (smoke management, fire intensity, etc).
5.5.5. In areas where prescribed fire activities are being planned, remove the brush, ladder fuels and large down woody debris within the dripline (approximately 30+ ft.) of the eagle nest trees and potential or identified perch/roost trees to reduce ladder fuel. The brush would be piled away from the nest and burned.
5.5.6. So fire activity will be reduced immediately adjacent to the nest trees during the broadcast burning of the area, personnel will be required to complete one or more of the following:
5.5.6.1. Pull back of 10 and 100 hour fuels 30' from the base of the nest trees/ perch trees
5.5.6.2. Construct fire line around the nest trees/perch trees

5.5.6.3. Use foam, water, or other retardants to protect the nest tree (foam would not be allowed if the nest tree is in a riparian zone).

5.5.6.4. Ladder fuels would be removed from the dripline (30ft.)

5.5.6.5. If the nest is occupied or spring burning is preferred because of excess fuel loading or to meet other resource objectives, then spring burning will not be allowed until site-specific discussions/consultations are completed with USFWS on this matter.

5.5.7. Aircraft used during prescribed fire operations would maintain a buffer >1/2 mile distance from the nest during the nesting season (this distance may vary if topographical features allow). No buffer would be necessary outside the nesting season.

5.5.8. In instances when verifying nesting status is necessary prior to activities taking place, survey protocols used by Oregon Eagle Foundation annual bald eagle survey flights would be followed.

5.5.9. Fuel treatments can proceed in the core area, if no nesting has occurred by May 6 (last date documented for initiation of incubation, Frank Isaacs, personal communication)

5.5.10. **For units adjacent to or containing spotted owls, NRF habitat, or in areas of designated critical habitat***:*

5.5.10.1. No fuels treatments will be planned within the core area (as identified by the BLM biologist) of a nesting spotted owl during the nest season. The core area will normally be the 100-acre reserve as required under the Northwest Forest Plan (NFP) but may be expanded due to potential disturbance to the nest.

5.5.10.2. Smoke management will be considered during prescribed fire activities to try to reduce the effects of residual smoke on nest sites adjacent to burn units

5.5.10.3. In areas containing spotted owls, a BLM biologist will monitor spotted owl use of the area before the fuel treatment is initiated to ensure that the owl situation is closely monitored.

5.5.10.4. A biologist/designee will monitor the nest area during the burns to ensure objectives and PDF's are met (smoke management, fire intensity, etc).

5.5.10.5. Burn prescriptions will require proper fuel moisture and atmospheric conditions so adequate large woody debris will be retained for prey habitat.

5.5.10.6. General objective for burn would be to create a mosaic of burned and unburned habitat in the unit to maintain some habitat for prey production.

5.5.10.7. No more than 50% of the core would be treated during a single season (i.e. spring 2000, fall 2001).

5.5.10.8. In NRF habitat maintain a diversity of understory brush (islands of undisturbed brush), while still reducing the continuity of the fuel.

5.5.10.9. In NRF habitat maintain visual screening along open roadways to minimize disturbance. In northern spotted owl NRF habitat, maintain the understory structure by retaining a diversity of the sub-merchantable understory conifer trees (Douglas -fir, white-fir, sugar pine, cedar, ponderosa pine). In mechanical treatment areas this would be done by site-specific designs described in the individual task orders. During prescribed fire activities the overall objective is to create a mosaic of burned and unburned areas. Ignition techniques and pull back on smaller trees may also be used to maintain the understory structure.

5.6. Retain untreated areas ranging from ¼ acre to 5 acres (thermal clumps) within the treatment units to provide diversity for wildlife.

5.7. During prescribed fire activities create a mosaic of burned and unburned areas to maintain a diversity of species and age classes of understory vegetation.

5.8. Maintain habitat connectivity and corridors as described in the Spencer Creek Watershed Analysis (page 5-35).

6. Noxious Weeds

6.1. 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.

6.2. Mow noxious weeds in the immediate area of yarding operations to ground level prior to seed development.
6.3. Conduct monitoring activities related to proposed treatments as described in the Klamath Falls ROD
6.4. Road graders used for road construction or maintenance would grade towards any known noxious weed infestations. If no good turn around area exists within one half mile that would allow the operator to grade towards the noxious weed infestation, then the operator would leave the material that is being moved within the boundaries of the noxious weed infestation.

7. **Special Status Plant Species**
   7.1. Winter harvesting on at least 20" of snow in timber sales areas within T.38S., R.5E., Section 15 & 21 to reduce impacts to green-flowered ginger (*Asarum wagneri*).

8. Survey and Manage Species (Mollusks, Fungi, and Vetebrate)
   8.1. Any remaining pre-disturbance surveys will be completed to protocol before ground disturbing activities take place.
   8.2. Known sites will be marked on the ground and the UTMs and site information recorded in ISMS.
   8.3. Any known sites will be buffered according to Management Recommendations and the KFRA Buffer Management Team.
   8.4. The currently listed buffer sizes and management plan shown in Table 2 will be used for commercial and non-commercial projects.
   8.5. Slashbusting and prescribed fire projects will use Management Recommendations from "Amendments to Survey and Manage Management Recommendations in relation to fuels reduction treatments" released in August of 2002 in BLM Instruction memorandum No.OR-2002-080, Attachment 1. These recommendations give a partial list of species specific and general Management Recommendations for fungi species in relation to fuels reduction treatments. These recommendations were released specifically to address management of sites found around communities "at risk." The analysis area does not fall in this category but species information found here is useful in determining buffer sizes and treatment within the buffers.
   8.6. When possible, Known Sites will be combined to provide for connectivity in the landscape.
   8.7. Cable logging will be used on the steeper slopes to reduce soil disturbance (Applicable to Alternative 1 only).
   8.8. Logging over snow (see soils discussion) (Applicable to Alternative 1 only).
   8.9. Provide snag mitigation measures (100 percent population potential) for White-headed Woodpecker, Black-backed Woodpecker, Pygmy Nuthatch, and Flammulated Owl. Interim Management Recommendations in the *Final Supplemental Environmental Impact Statement For Amendment to the Survey & Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines* - November 2000 state: " Specifically, snags over 20 inches dbh are particularly valuable for these species. Snags over 20 inches dbh may be marked for cutting only after retaining the best available snags (considering size, longevity, etc.) in sufficient numbers to meet 100 percent of potential population levels of these four species." Increase snag retention requirements from 1.9 to 2.5 snags per acre.
   8.10. Great Gray Owls - 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 Management Recommendations for treatment around the nest site area. Management Recommendations will be subject to review by the Regional Ecosystem Office. (See *Final Supplemental Environmental Impact Statement For Amendment to the Survey & Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines* - November 2000).

9. Cultural ResourcesCultural ResourcesCultural ResourcesCultural ResourcesCultural Resources
   9.1. Follow procedures for cultural protection and management outlined in the KFRA ROD/RMP (page 43), and protect identified sites by buffering.
   9.2. 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

10. Visual ResourcesVisual ResourcesVisual ResourcesVisual ResourcesVisual Resources
   10.1. Where possible, maintain visual screening along roadways.
   10.2. Within recreation sites, concentrated recreation use areas, or Special Areas, implement the following design features to reduce visual impacts from harvesting:
      10.2.1. Cut stumps close to ground (less than 4 inches).

10.2.2. Disperse small (hand) piles of slash for firewood use.
10.2.3. Minimize use of tree marking paint on trees identified for harvest.
10.2.4. Do not create large landings.
10.2.5. Minimize number of skid trails and amount of ground disturbance
10.2.6. Minimize damage to residual trees through careful timber falling.

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

11. Recreation Resources

11.1.1. Coordination between snowmobile operations and winter time harvesting operations will be done annually.

11.1.2. The Purchaser shall comply with the following provisions during snow plowing operations:

11.1.2.1. Due to frequent use of snowmobiles on the Keno Access Road (Rd. No. 39-7E-31.0) and the Spencer Hook-up Road (Rd. No.39-6E-5.0) a berm of snow shall **only** be permitted on **one** side of the roadway.

11.1.2.2. In addition, the haul route shall be signed to caution users that log truck traffic is occurring along the road. All subcontractors working in the Contract Area shall be advised of snowmobile traffic.

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Appendix C – Supporting Analysis Section

Upland Vegetation

Roads

The following descriptions define the scope of the proposed road restoration treatments. These descriptions are based on those in the Western Oregon Transportation Management Plan (BLM 1996).

"Decommission" means that the road would be closed to motor vehicles on a long-term basis, but may be used again in the future. The road would be prepared to avoid future maintenance needs and would be left in an "erosion-resistant" condition by establishing cross drains, and removing road fill from stream channels and potentially unstable areas. Ditch-relief culverts would generally not be removed. The road would be barricaded and slash would be placed on the road surface or small diameter trees would be felled onto the road. Although the roadbed would not be ripped and conifers would not be planted, some seeding of herbaceous species could occur.

"Obliteration" means that the road would not be open to motor vehicles in the future. The road would be barricaded and slash would be placed on the road surface or small diameter trees would be felled onto the road. The road surface would be ripped in places and recontouring would occur where needed. Ditch-relief culverts would be removed and trees, shrubs, or grass would be planted on the road surface. This term includes both "Full Decommissioning" and "Obliteration" as defined in the Western Oregon Transportation Management Plan.

"Improvement" may include raising the road surface to prevent water ponding, providing roadside and leadout drainage ditches, and surfacing with materials to harden the road surface and minimize the potential for rutting from use during wet conditions.

Soils

The total acreage of all detrimental soil conditions should not exceed 20% of the total acreage within the activity area (e.g. timber sale area), including landings and system roads. Detrimental soil conditions includes

- Compaction – A 15% or more increase in soil bulk density over the undisturbed level
- Puddling – Depth of rutting 6 inches or more from shearing forces that destroy soil structure and reduce porosity (e.g. vehicle tracks).
- Displacement – Removal of more than 50% of topsoil or humus from an area of 100 square feet or more which is at least 5 feet in width.
- Severely Burned – Top layer of mineral soil changes significantly in color (usually to red) and the next one-half inch is blackened from charring by heat.
- Erosion
    - Surface – hazard rating sytem based on percent of ground cover 1st and 2nd years following disturbance
    - Soil Mass Wasting (landslide, debris flows)

Table C 1. Possible Mitigating Measures to Reduce Soil Impacts

Mitigating Measure	Advantages	Disadvantages
1- Use existing skid trails, marked in advance for the operators to confine soil disturbance.	Confine soil disturbance to existing skid trails	
2 - Allow operations only when soil conditions.	Reduces susceptibility of soils to detrimental compaction, erosion, and puddling.	Limits the operating season to about 4 months per year.
3 - Cable logging, when feasible with the topography, as much as possible to provide one-end suspension of logs	Minimizes soil disturbance and use of ground based equipment.	Higher cost to Purchaser. Cable logging costs are generally 20-40% higher that standard ground based operations.
4 - Snow logging required on a minimum of 20" of snow.	Minimal soil disturbance.	Higher cost to Purchaser. Snow levels may get too high in this area.
* 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).		

Hydrology

1 SUPPORTING ANALYSIS - HYDROLOGY AFFECTED ENVIRONMENT SECTION

1.1 Hydrology

The proposed treatments are located in the upper part of the Spencer Creek and Jenny Creek watersheds, which are both Tier 1 Key Watersheds. The Spencer Creek watershed is approximately 54,160 acres in size, of which 56 percent is in federal ownership, and of which 16 percent is BLM-administered. The Jenny Creek watershed is approximately 134,300 acres in size, of which 44 percent is in federal ownership, and of which 42 percent is BLM administered.

Spencer Creek and Jenny Creek are the major perennial streams in the area. Perennial streams in or near the analysis area include Spencer Creek (as it flows through Buck Lake), Tunnel Creek, Miners Creek, and Johnson Creek. Streams in the analysis area either drain east into Spencer Creek, via Buck Lake or Miners Creek, or west into the headwaters of Jenny Creek, via Johnson Creek or Cold Creek. Except for those streams that receive inflow from springs, tributaries to these streams typically flow only intermittently or ephemerally. Because of the high infiltration capacity of soils within these watersheds, it is common for water to be routed to streams via subsurface translatory flow, rather than overland flow, even on highly disturbed slopes.

The hydrology of the Spencer Creek and Jenny Creek watersheds is driven by snow melt and springs. Snow accumulation and melt dynamics are affected by vegetation treatments. Vegetation also strongly influences evaporation, which can withdraw water from soils. Because of these interactions, the influence of management actions on vegetation and hydrology will be closely examined in this analysis.

Land management actions can affect numerous aspects of the watershed hydrologic cycle, including evapotranspiration (ET), interception, snow melt patterns, and infiltration (Harr, 1976;

Berris and Harr, 1987). Effects of timber harvest on streamflow can include higher water yields, higher peak flows, earlier peak flows, and higher baseflows. These effects can persist until harvested areas are "hydrologically recovered" - that is, until the effects of timber harvest on ET, interception, and snow dynamics are no longer evident. Research suggests that hydrologic recovery requires between around 10 to greater than 30 years following timber harvest (Ziemer 1964; Troendle and King 1985; Jones and Grant 1996).

The approximate extent of hydrologically unrecovered conditions can be expressed as Equivalent Clearcut Area ("ECA"), which is quantified by multiplying the areal extent of management activities by a factor which accounts for the degree of canopy removal. For instance, roads have an ECA factor of 1.0 (full removal of canopy) while density management treatments have an ECA factor of 0.25 (partial canopy removal). The ECA analysis provides a coarse assessment of watershed condition and does not account for other cumulative effects that may interact to affect watershed processes (Berg et al. 1996). The ECA analysis presented here is somewhat incomplete, as no long-term streamflow records are available to calibrate the relationship between equivalent clearcut acreage and water yield. The ECA analysis assumes that increases in peak flows are proportional to increases in water yield. The ECA index may be useful for assessing both types of changes in streamflow patterns, but the underlying mechanisms of change are different (Berg et al. 1996).

1.1.A Assessment of Current Condition for the Spencer Creek and Jenny Creek Watersheds

At present, approximately 31 percent of the Spencer Creek watershed is in a hydrologically unrecovered condition (Table C 2). Public land survey data indicates that approximately 17 percent of the watershed was in ECA in 1899, primarily as a result of natural fires (Spencer Creek Watershed Analysis, page 4-41). Although both of these values are approximations based on assumptions, the magnitude of difference between the historic and current conditions suggests that past and recent management actions have potentially affected hydrologic processes in the watershed (Spence et al. 1996).

Table C 2. Estimated current Equivalent Clearcut Acreage for the Spencer Creek Watershed		
Action	**Area**	**Percent of Watershed**
Total Watershed Area	54,160 acres	
ECA at time of WA[1]	16,874 acres	31%
Estimated hydrologic recovery between 1995 and present[2]	3,165 acres	(6%)
ECA upon implementation of USFS and BLM EAs between 1995 and present[3,4]	1,586 acres	3%
ECA from recent private lands activity[5]	1,470 acres	3%
Estimated Current ECA	**16,765 acres**	**31%**
Notes: (1) Refer to Appendices 6-2 and 6-3 in the Spencer Creek Watershed Analysis; (2) Assume 20% of the vegetated area have recovered since 1995; (3) Roaming Salvage, Lower Spencer, and USFS Upper Spencer/Surveyor; (4) It is unclear whether the ECA analysis in the Spencer Creek watershed analysis accounted for the estimated 312 acres from the Shady and Camp timber sales. For this analysis, it is assumed that they were accounted for; (5) Assume that 85% (1,960 acres) of the 2,306 acres of private mid and late seral forest identified in the WA is now early seral forest. Assume an ECA factor of 0.75 for this land.		

Given that land ownership and vegetation patterns in the upper portion of the Jenny Creek watershed are roughly similar to those in the Spencer Creek watershed, it can be assumed that the overall condition of the watersheds are roughly similar.

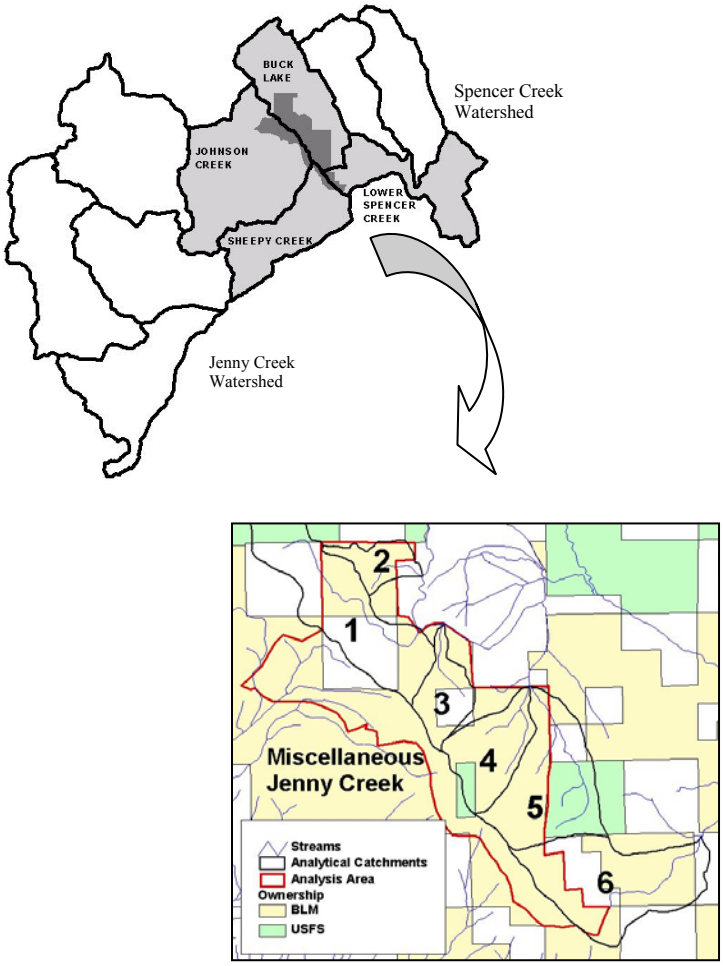
Hydrologic impacts associated with roads are important components of the cumulative effects analysis, but are not considered in the ECA procedure. As discussed in the Spencer Creek Watershed Analysis (pages 4-146 to 4-148) and the KFRA RMP (Appendix P), road surfaces have low infiltration rates, can intercept subsurface flows (which are an important aspect of the hillslope hydrologic cycle) and can reroute surface flow and act as extensions of the drainage network. The 2001 BLM/USFS road inventory assessed 291 miles of roads in the watershed, 65 miles of which are on BLM land. Although comprehensive road inventory data is not available, GIS analysis suggests that about 820 miles of road are located within the Jenny Creek watershed.

The assessment of watershed-scale impacts suggests that the magnitude of management impacts has likely been sufficient to affect hydrologic processes in both the Spencer Creek and Jenny Creek watersheds. Reduced canopy closure and the increased extent of large openings are likely causing peak streamflows and baseflows in these watersheds to be higher that they were historically.

1.1.B Assessment of Current Condition for the Analysis Area

At this time it is not possible to estimate ECA for the analysis area. It is possible, however, to determine the approximate extent of stands less than 25 years old (assumed to be hydrologically unrecovered) and the road density within individual catchments (7th field hydrologic units) of the analysis area (Map C 1, Table C 3). Most, but not all, of the analysis area is within six

catchments within the Spencer Creek watershed (Buck Lake and Lower Spencer Creek subwatersheds). The remainder is within the Buck Lake, Johnson Creek, and Sheepy Creek subwatersheds.



Map C 1. Watersheds, subwatersheds, and analytical catchments.

The proportion of area within each catchment that is currently hydrologically unrecovered ranges from 10 to 45 percent. This was estimated by analyzing BLM forest operations index data and USFS activity data to determine the area of federal lands that have been clearcut since 1969. Because this analysis does not account for hydrologic effects of shelterwood cuts, overstory removals, seed tree cuts, commercial thins, and other forest management activities, it is likely a conservative estimate of the extent of forested areas

that are hydrologically unrecovered. For private lands in the analysis area, it was assumed that 85% of forested lands were in early seral condition.

Table C 3. Catchment-level analysis of road density and early seral forest

Catchment	Area	BLM Ownership		Road Density[1]	BLM Forest <30 Years Old[2]		All Forest <30 Years Old[3, 4]	
	(Acres)	(Acres)	(%)	(mi / mi^2)	(Acres)	(%)	(Acres)	(%)
1	1589	574	36	3.3	63	11	712	45
2	311	260	84	6.2	65	25	108	35
3	453	309	68	4.9	14	5	136	30
4	731	652	89	4.3	71	11	74	10
5	1307	697	53	4.4	34	5	171	13
6	1523	1062	70	3.7	62	6	451	26
Misc. Jenny Creek	1772	1490	84	4.4	83	6	253	14

Notes: (1) Calculated using information from the 2001 BLM/USFS road inventory; (2) Includes only that acreage identified in the Forest Operations Index as having been clearcut since 1969; (3) Assumes that 85% of the private land within each catchment has been converted to early seral condition since 1969; (4) Although National Forest system land within these catchments has been harvested since 1969, no cleacuts have occurred in the area and thus no early seral forest is assumed.

Road densities in analytical catchments range from 3.2 to 6.2 miles per square mile. Due to the combination of existing road networks and past forest treatments, each of the analytical catchments is likely experiencing elevated peak flows and elevated water yields (Jones and Grant 1996). Compared to outsloped roads with diffuse drainage, roads with ditches or areas where runoff flows down the road are more likely to intercept and reroute surface runoff when it occurs. Catchments with higher proportions of these flow path types are more likely to be concentrating and enhancing peak flows (see Figure D-1), especially when flow paths discharge into streams (rather than onto hillslopes).

Catchments 4, 5, and 6, as well as the portion of the analysis area in the Jenny Creek watershed, have the relatively low road densities and the lowest extent of unrecovered forest. Catchments 4 and 5 are tributary to the southeastern portion of Buck Lake, while catchment 6 is the headwaters of Miners Creek. Due to the their relatively intact condition and extensive federal ownership, these catchments have a high potential for maintenance and restoration of hydrologic characteristics. The remaining catchments generally have higher road densities and more extensive areas that have not recovered from previous timber harvest.

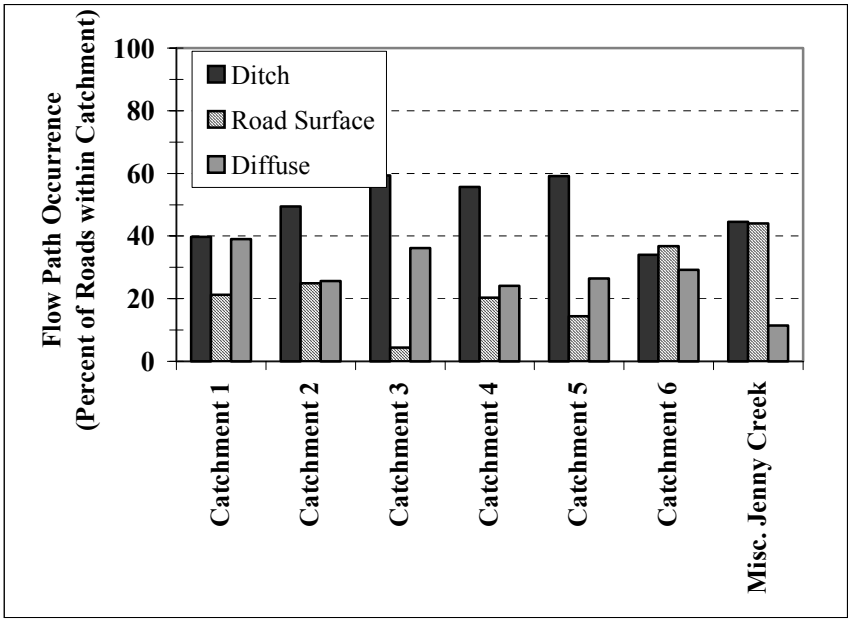


Figure C 1. Road flow paths occurring within analytical catchments. Estimated from 2001 BLM/USFS road inventory data.

1.2 Water Quality

The primary water quality concerns in the Spencer Creek and Jenny Creek watersheds are temperature and sediment (Table C 4). Throughout the mainstem of Spencer Creek and Jenny Creek, as well as in Johnson Creek, summer water temperatures exceed State of Oregon water quality standards. This is due primarily to a lack of stream shading and and reduced summer low flows (Spencer Creek Watershed Analysis, page 4-158). Excessive fine sediment, primarily associated with extensive road networks, is detrimentally affecting aquatic habitat complexity and integrity (as discussed in the Spencer Creek Watershed Analysis on page 4-153, and in Weyerhauser, 1994). BLM is working with Oregon DEQ and other partners to develop Total Maximum Daily Loads and Water Quality Restoration Plans for these streams. These documents will identify sources of non-point source pollution and describe projects that can address water quality problems.

Table C 4.Water quality concerns in the Spencer Creek and Jenny Creek watersheds.

	Parameter		
Waterbody	Temperature	Sediment	Biological Criteria
Spencer Creek	303(d) List	303(d) List	303(d) List
Jenny Creek	303(d) List		
Johnson Creek	303(d) List		
Note: All data from the 2002 Oregon DEQ 303(d) list.			

Detailed information regarding the quality and quantity of water resources in the analysis area can be found on pages 4-139 to 4-153 in the Spencer Creek Watershed Analysis and pages 10 to17 and 77 to 82 in the Jenny Creek Watershed Analysis.

2 SUPPORTING ANALYSIS - HYDROLOGY ENVIRONMENTAL CONSEQUENCES SECTION

2.1 Alternative 1

2.1.A Hydrology

2.1.A.1 Effects of Timber Harvest and Non-Commercial Treatments

The extent of canopy closure reductions resulting from timber harvest and road construction can be expressed as Equivalent Clearcut Area (ECA). At present, approximately 20,000 acres, or 31 percent, of the Spencer Creek watershed are in ECA (as discussed in the affected environment chapter). Commercial timber harvest and road treatments proposed in Alternative 1 would create a maximum of approximately 370 additional ECA acres Table C 5. It is assumed that sufficient canopy closure and basal area would be retained in non-commercial treatment units and non-Matrix treatment areas (riparian reserves and DDRs) to prevent or minimize effects to streamflow.

A more detailed analysis of the extent and location of ECA effects is presented in Table C 6.

Table C 5. Estimated equivalent clearcut area (ECA) in the analysis area resulting from implementing Alternative 1.

Treatment	Affected Area	ECA Factor	ECA
Density Management	870 acres	0.25	218 acres
Patch Cuts[1]	50 acres	0.80	26 acres
Regeneration Harvest	280 acres	0.45	126 acres
Timber Harvest	**1,200 acres**	**----**	**370 acres**
Road Construction[2]	0 to 2 miles	1.0	3 acres
Road Obliteration[2, 3]	2 to 7 miles	1.0	(4 to 18 acres)
Road Treatments	**(0 to 7 miles)**	**----**	**(0 to 13 acres)**
Total			**357 to 370 acres**

Notes: (1) The ECA calculation for patch cut units assumes that only 2/3 of the unit will be included within actual patch cuts; (2) Assume road width of 15 feet; (3) The extent of road obliteration has not been firmly determined, but will range between 2 and 7 miles.

Generally, reduced canopy closure can lead to decreased evapotranspiration ("ET"), increased runoff and discharge from springs, and increased peak flows, especially in early winter (Chamberlain et al., 1991). Effects of timber harvest may persist for more than 25 years following treatment (Harr, 1976; Jones and Grant, 1996; Jones, 2000).

Effects of Density Management

Proposed matrix density management treatments account for approximately 60 percent of the ECA acreage created by the proposed action (Table C 5). These treatments would, in the long term, generally maintain forest composition and canopy closure. In the short term, these treatments would reduce canopy closure. In the short term (until forest canopy recovery occurs, typically within a decade after harvest), decreased ET will make more soil water available for streamflow, and may cause slightly increased early winter water availability. Due to the porous soils and generally high elevations within the analysis area (above the transient snow zone), it is not likely that increased early winter water availability will cause increased peak flows.

Effects of Patch Cuts and Regeneration Harvest

Timber harvest of any type can affect ET rates, and consequently soil water storage and the timing and magnitude of runoff events. Additionally, proposed patch cuts and regeneration units could affect snow accumulation and snowmelt processes.

Removing trees and creating openings affects snow dynamics in various ways, depending on the size of openings. Small openings (about two to four acres in size, or about one to three tree heights across) can increase snow accumulation (by reducing canopy interception and influencing local wind patterns) and reduce rates of snow melt (by affecting radiation gains and losses) (Troendle 1982; Baker 1988). Larger openings do not induce increased snow accumulation and can result in more rapid snowmelt due to increased solar radiation and increased rain-on-snow potential (Kettleman et al. 1983). Thinning has the same general effect as small openings, though the magnitude of potential increases in water yield are directly related to the amount of basal area removed (Troendle and King 1987). Proposed patch cuts and smaller regeneration units would cause increased snow accumulation. This could result in delayed snow melt (depending on spring weather conditions) that would make more water available for streamflow during the later spring and early summer. This effect is likely to occur as a result of patch cuts at higher elevations within catchments 3, 4, 5, and 6.

Because they would cause greater reductions in canopy closure, patch cuts and regeneration units account for a relatively high proportion of the ECA increases caused by the proposed action (Table C 5). Reductions in canopy closure, and thus potential hydrologic impacts, would be greater in patch cut unit than in regeneration units. Patch cuts and regeneration units are proposed in all catchments, though there no such units proposed within the Jenny Creek watershed. These units would occur above the transient snow zone and on predominantly northeast aspects, however, thereby lessening increases to rain-on-snow potential.

Effects of Riparian Reserve and DDR Treatments

Treatments within reserves would be designed to maintain and restore forest composition, canopy closure, and old-growth characteristics. These treatments would cause immediate reductions in canopy closure but would favor the long-term maintenance or restoration of hydrologic processes.

Effects of Prescribed Fire and Non-Commercial Treatments

Proposed noncommercial treatments and prescribed burns would reduce fuel loads, thereby reducing the potential for extensive high intensity wildfires. Were they to occur, large wildfires would likely have a greater and longer lasting impact on hydrologic processes than would the proposed action (DeBano et al., 1996).

Table C 6. Estimated distribution of commercial treatments proposed in Alternative 1 and their ECA consequences (in parentheses).

Catchment ID	Density Management	Patch Cuts[2]	Regeneration Harvest	Total Affected Area	Percent of Catchment Area
1	264 acres (66 acres)	13 acres (7 acres)	66 acres (30 acres)	343 acres (103 acres)	21% (6%)
2	136 (34)	7 (4)	36 (16)	179 (54)	58 (17)
3	106 (27)	4 (2)	19 (9)	129 (37)	28 (8)
4	82 (21)	3 (2)	50 (23)	135 (45)	18 (6)
5	137 (34)	11 (6)	38 (17)	186 (57)	14 (4)
6	46 (12)	8 (4)	21 (10)	75 (25)	5 (2)
Misc. Spencer Cr.	128 (32)	7 (3.7)	34 (15)	169 (51)	
Misc. Jenny Cr.	102 (25.5)	0	0	102 (26)	
Total[4, 5]	**1,001 (250)**	**53 (28)**	**264 (119)**	**1,318 (397)**	

Notes: (1) The proportional distribution of silvicultural prescriptions for the Buck Again timber sale is based on the distribution of prescriptions in the Surveyor timber sale area, and, as such, catchment-level ECA analysis for this sale is an approximation; (2) The ECA calculation for patch cut units assumes that only 2/3 of the unit will be included within actual patch cuts; (3) These calculations do not account for the fact that treatments will be "lighter" or excluded in riparian areas and survey and manage areas, and are thus a slight overestimate of ECA created by the proposed action; (4) Calculation of totals results in minor rounding errors; (5) This table is based on timber harvest unit GIS files that do not account for riparian reserves and other areas excluded from harvest, and as such overestimate treatment acreage.

In the short-term, noncommercial treatments and prescribed fire will reduce ET, interception, and infiltration, thereby increasing the potential for runoff generation and hillslope erosion (DeBano et al., 1996). Ground disturbance associated with mechanical noncommercial treatments could cause additional detrimental impacts to infiltration and runoff routing. Implementing appropriate BMPs (see KFRA ROD/RMP pages F-26 to F-31) and PDFs would minimize detrimental hydrologic effects of noncommercial treatments and prescribed burning.

The effects of noncommercial treatments and prescribed burns are not likely to directly compound the effects of timber harvest on hydrologic processes. Noncommercial treatments would not occur within timber sale units. The use of prescribed fire in harvested areas could cause additional mortality (and loss of ET), but this would not be expected to occur over large

areas. Prescribed fire in patch cut and regeneration units is likely to be of low intensity and severity.

2.1.A.2 Effects of Road Networks and Road Treatments

No net increase in open road mileage in either the Spencer Creek or Jenny Creek watersheds would occur see Table C 7. Road obliteration, resurfacing/renovation, and closure would reduce road-related runoff and peak flows, and would help attain ACS objectives and goals identified in the Spencer Creek Watershed Analysis (page 5-43). Reduction in total road miles and open road miles in the analysis area would reduce the potential to adversely affect groundwater recharge and aquifer function.

Table C 7. Distribution of currently identified road treatment actions[1].

Catchment ID	Construction (Permanent and Temporary Roads)	Obliteration	Decommissioning	
			Existing Roads	New Temporary Roads
1	0.3	1.3		0.2
2		0.3	0.1	
3	0.6	0.6	0.1	
4	0.1			
5				
6		0.7	0.2	
Misc. Spencer Cr.	0.1	0.3		0.1
Misc. Jenny Cr.	0.1			
Total	**1.2**	**3.2**	**0.4**	**0.3**

Notes: (1) The actions presented in this table include only those agreed upon by the KFRA interdisciplinary team. Additional road treatments may occur up to the threshold values described in Chapter 2 of this EA.

Road Construction and Realignment

Construction of new permanent roads is proposed on the shoulder of the Jenny-Spencer watershed divide. New roads would be constructed in 38S-5E-23 and 38S-5E-15 to facilitate obliteration of roads within riparian reserves or other, longer road segments.

Ridge top roads (such as that proposed in 38S-5E-26) are typically the least impacting, in terms of runoff generation, mass wasting potential, and sediment delivery to streams (Furniss et al., 1991), but may still contribute to channel initiation at road drainage points (Montgomery, 1994). Implementation of appropriate road construction BMPs (see KFRA ROD/RMP pages F-13 to F-21) and soil characteristics in that portion of the watershed would reduce the likelihood of channel initiation.

Realignment of roads near riparian reserves and construction of "replacement" would create permanent canopy openings. Constructing these roads, however, would reduce delivery of road runoff to streams and would facilitate reducing overall road densities in the analysis area.

Road Improvement

Road improvements would include installing or retrofitting road drainage features to reduce the delivery of runoff from roadside ditches directly into stream channels. These actions would reduce the connectivity of roads and streams, thereby reducing human-caused effects on peak flows.

Road resurfacing, in some instances, would be done in order to allow obliteration of other roads, including roads within riparian reserves. Actions of this type would reduce overall road densities and delivery of road runoff into streams. Surfacing of dirt roads would reduce the likelihood of wheel ruts forming, thereby ensuring that roadside ditches and road drainage features function as intended (and thereby reducing excessive diversion of natural flow paths).

Road Closures, Road Decommissioning, and Obliteration

Implementing road closures and decommissioning roads would reduce road runoff and diversion of flow paths by allowing increased establishment of herbaceous plants and maintaining road surface conditions. The magnitude of these effects cannot be quantified, since the number and location of road closures has not been determined.

Road obliteration would reduce road runoff and diversion of flow paths. The magnitude of this effect would be greatest in this alternative. Establishment of shrubs and trees would eventually restore the hydrologic function of obliterated roads. Outsloping of roads would effectively eliminate diversion and concentration of runoff and subsurface flow. Delivery of runoff to streams would be reduced, especially in 38S-5E-23.

2.1.A.3 Effects of Other Restoration Projects

Skid trail rehabilitation work would reduce the probability that runoff would be routed directly to streams. The extent of such work will be limited, since most skid trails in the analysis area do not generate runoff.

2.1.A.4 Cumulative Effects

Vegetation Treatments

Proposed vegetation treatments would reduce fuel loads, thereby reducing the potential for extensive high intensity wildfires. Were they to occur, large wildfires would likely have a greater

and longer lasting impact on hydrologic processes than would the proposed action (DeBano et al., 1996).

The 25 year period assumed necessary for "hydrologic recovery" will have elapsed for some previously harvested stands during the life of this analysis (typically five years, or 2008). On public lands, the activities that occurred between 1978 and 1983 included clearcuts, selective cuts, shelterwood cuts, and salvage. It is assumed that the 14 acres of BLM-administered land that were clearcut between 1978 and 1983 will be hydrologically recovered by 2008 (the other types of harvest were not included in the catchment-level analysis of current conditions, presented in Chapter 3). Overall, forest conditions on public land will very likely move towards hydrologic recovery over the next five years (with the exception of the proposed treatment units). It is uncertain what the trends in canopy conditions on private land will be in the next five years, so no recovery will be assumed.

Interactions between Treatment Units and the Road Network

Portions of the road network intercept natural flow paths and route water quickly to streams, thereby increasing peak flows and decreasing base flows (Wemple, 1994; Jones and Grant, 1996). If treatment units upslope from such roads cause increased water availability, some water could be intercepted and transported by roads. The magnitude and extent of this effect would be minor. The proposed road obliteration and improvement would further reduce the likelihood of this occurring.

The use of skid trails and roads could channelize some runoff, especially on steep slopes or in riparian zones, or where ruts develop. Implementing BMPs (see KFRA ROD/RMP pages F-23 and F-24) and PDFs would mitigate these effects.

Watershed- and Catchment-Scale Analyses

On the scale of the entire Spencer Creek watershed, the effects of previous timber harvest activities (including road construction) on stream flow increases or changes in the timing of peak flows have already been realized (Spencer Creek Watershed Analysis, pages 4-146 to 4-148). Because of this and the type of activity proposed in the alternatives (small regeneration and patch cuts, and thinning of the matrix to retain 16 to 25 large trees per acre), there would be little potential for the Proposed Action to cause further detectable increases in annual water yields or peak flows above current levels. The creation of additional ECA acres in the watershed may slow recovery of ET rates and snow processes from past timber harvest, but proposed road treatments and other restoration measures will accelerate restoration of hydrologic processes and reduce human-caused effects to peak flows.

At the scale of individual catchments (7^{th}-field hydrologic units, ranging in size from 300 to 1,600 acres), the effects of management actions may be realized more strongly, since a higher proportion of individual catchment areas will be affected.

The proposed treatments could lead to increased early winter peak flows, especially in catchments 4 and 5 (these catchments have relatively small areas of hydrologically unrecovered forest at present), as well as in catchment 2, which would have the greatest proportional increase in ECA (Table C 6). As with the entire watershed, large portions of these catchments have been affected by timber harvest and road construction, and additional impacts may not be noticeable. The type of proposed treatments and lack of a well-developed stream system within catchment 2 make it

unlikely that detrimental impacts would occur. Mitigation measures such as road obliteration or improvement should be considered for these three catchments.

Hydrologic regimes in catchments 1, 3, and 6 would be restored as a result of the proportionally high magnitude of road treatments and the proportionally low magnitude of commercial timber harvest proposed. Human-caused effects on peak flows would be reduced.

2.1.B Effects on Water Quality

Direct and indirect impacts to water quality would likely be relatively minor. The Spencer Creek Watershed Analysis (maps 17 and 18) identified moderate and high erosion susceptibility and compaction susceptibility in the steeper portions of the analysis area. The greatest erosion potential is on steep slopes, which typically are somewhat removed from stream channels. There is some potential for rill and gully formation on these slopes. Implementing appropriate BMPs (see KFRA ROD/RMP pages F-11 to F-13) and PDFs would reduce the likelihood of adverse impacts (see Table C 8).

Table C 8 - Potential Effects On Water Quality And Proposed Mitigation Measures

Management Action	Potential Effect	Mitigation
- Haul traffic on roads that cross or are in close proximity to streams - Yarding across streams or Riparian Reserves	- Soil disturbance - Sediment could directly enter streams	- Delineate riparian reserves - Avoid hauling during wet weather - Maintain or improve haul roads - Implement riparian reserve, timber harvest, and soil protection BMPs
- Road maintenance, renovation and obliteration activities, and hauling activities	- Soil disturbance - Indirect sedimentation to streams	- Implement riparian reserve, timber harvest, soil protection, and road management BMPs - Avoid hauling during wet weather - Maintain or improve haul roads - Place slash on skid trails subsequent to timber harvest
- Mechanical vegetation treatments	- Soil disturbance - Indirect sedimentation to streams	- Implement riparian reserve, timber harvest, soil protection, and road management BMPs
- Prescribed burning	- Increased bare ground - Nutrient volatization and increased supply of nutrients to streams	- Implement riparian reserve and prescribed fire BMPs
- Timber harvest near or within riparian reserves Yarding within riparian reserves Non-commercial treatments within riparian reserves	- Reduced stream shading as a result of reduced canopy closure	- Delineate riparian reserves Establish “no-cut” areas adjacent to streams Implement riparian reserve BMPs

Vegetation treatments, road use, and road treatments could cause sediment and nutrients to be mobilized and delivered to stream channels. The likelihood of sediment delivery from vegetation treatment units is low, due to the nature of soils in the analysis area and the implementation of appropriate BMPs and PDFs (see Table C 8). Prescribed burning may cause some small increases in sediment and nutrient delivery to stream channels, although riparian buffers should

limit this impact. Such increases are usually short-lived, with water quality soon returning to pre-fire levels (Gottfried and Debano, 1990).

Measurements from sediment traps installed and maintained by the BLM and USFS indicate that sediment production from roads in the Spencer Creek watershed is generally low, with the exception of dirt roads. Most roads in the analysis area do not have direct hydrological connections with stream channels. Proposed road treatments would reduce overall road densities, riparian road mileage, and road-stream connections. Ensuring that haul roads are in good condition will mitigate detrimental impacts of road use associated with timber harvest.

The width of riparian reserves would be sufficient to protect stream channels and wetlands from direct adverse changes to water temperature regimes (i.e., warming in streams, warming and freezing in wetlands) caused by canopy openings or skid trail use. Treatments within riparian reserves may reduce stream shading, although such treatments generally will occur along intermittent streams that do not flow during the period when water temperature is a concern.

The proposed actions will decrease ET rates throughout the year, thus altering the water balance in favor in soil recharge and streamflow. High elevation patch cuts may lead to increase late spring and early summer flow. Increased low flows would benefit water quality by reducing the warming rate of small streams.

2.2 Alternative 2 – No Action

2.2.A Hydrology

This alternative would have no direct effect on ET rates and water yield, except those caused by implementation of the KFRA "Random Fire" EA or the "Roaming Salvage" EA. Road runoff contributed to stream channels would continue unabated, and human-caused impacts to peak flows would not be addressed. Were a wildland fire to burn through the analysis area, fuel loading might be such that fire intensity would be higher under this alternative than the others analyzed, with subsequent large increases in runoff.

2.2.B Water Quality

Soil disturbance under this alternative would be limited to that caused by prescribed burns or salvage activities. Prescribed burning carried out under the KFRA Random Fire EA may cause some small increases in sediment and nutrient delivery to stream channels. Such increases are usually short-lived, with water quality soon returning to pre-fire levels (Gottfried and Debano, 1990). Due to the more limited extent of fuels treatments under this alternative in comparison to the other alternatives, the relative magnitude of such increases would likely be lowest under this alternative. Implementing appropriate BMPs would mitigate potential detrimental impacts associated with salvage harvest, yarding, and hauling see (Table C 8).

2.3 Alternative 3

2.3.A Hydrology

Proposed noncommercial treatments and prescribed burns would reduce fuel loads, thereby reducing the potential for extensive high intensity wildfires. Were they to occur, large wildfires

would likely have a greater and longer lasting impact on hydrologic processes than would the proposed action (DeBano et al., 1996). In the short-term, noncommercial treatments and prescribed fire will reduce evapotranspiration, interception, and infiltration, thereby increasing the potential for runoff generation and hillslope erosion (DeBano et al., 1996). Ground disturbance associated with mechanical noncommercial treatments could cause additional detrimental impacts to infiltration and runoff routing. The detrimental hydrologic effects of noncommercial treatments and prescribed burning would be minimized if all appropriate BMPs and PDFs are implemented.

Implementing road closures and decommissioning roads would reduce road runoff and diversion of flow paths by allowing increased establishment of herbaceous plants and maintaining road surface conditions. The magnitude of these effects cannot be quantified, since the number and location of road closures has not been determined (see Chapter 2 and Table C 7).

Road obliteration would reduce road runoff and diversion of flow paths. Establishment of shrubs and trees would eventually restore the hydrologic function of obliterated roads. Outsloping of roads would effectively eliminate diversion and concentration of runoff and subsurface flow. Delivery of runoff to streams would be reduced, especially in 38S-5E-23.

2.3.B Water Quality

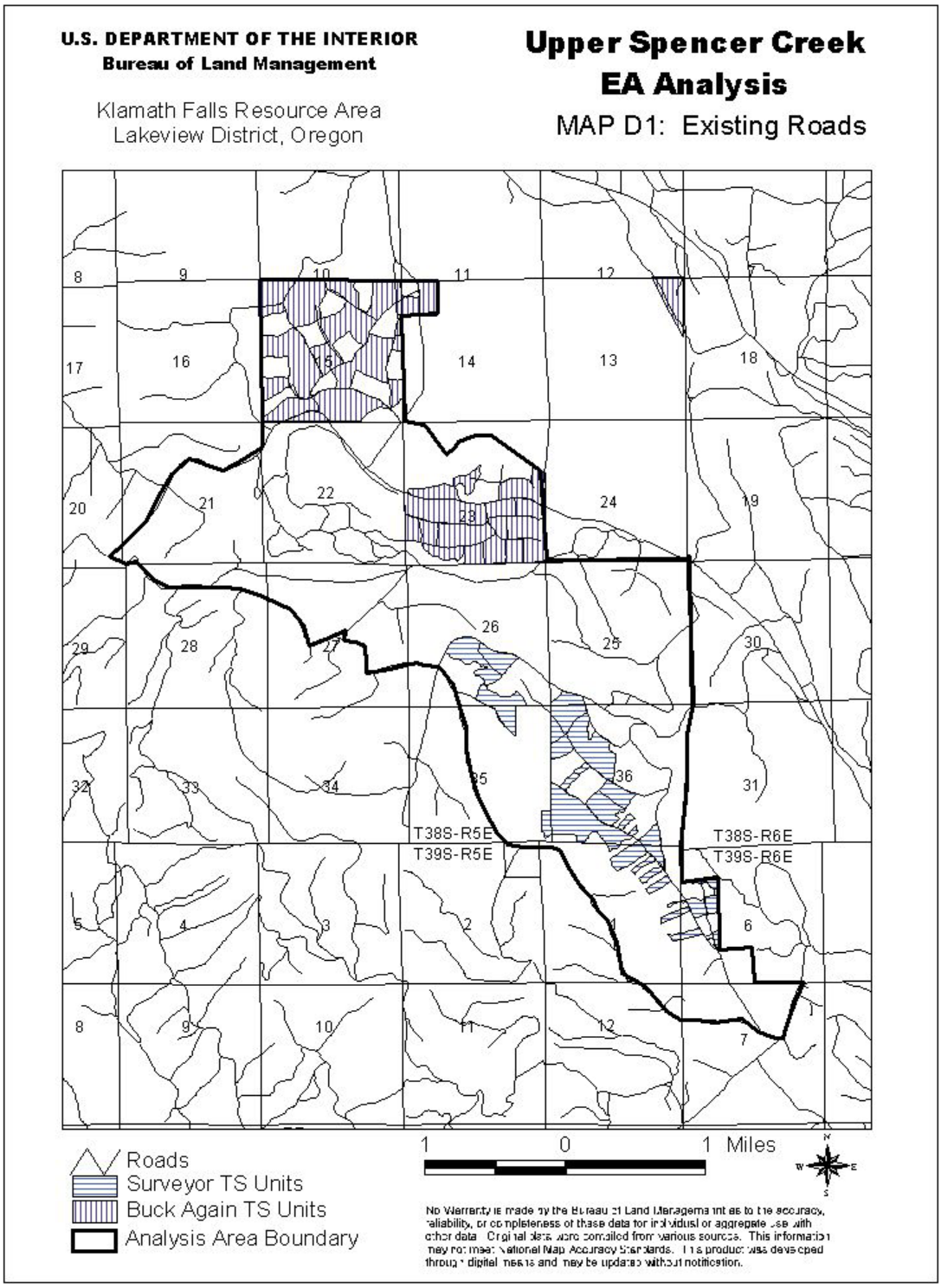
Prescribed burning may cause some small increases in sediment and nutrient delivery to stream channels. Such increases are usually short-lived, with water quality soon returning to pre-fire levels (Gottfried and Debano, 1990). In comparison to the other alternatives, the relative magnitude of fire-related increases would likely be highest under this alternative.

The Spencer Creek Watershed Analysis (maps 17 and 18) identified moderate and high erosion susceptibility and compaction susceptibility in the steeper portions of the analysis area. The greatest erosion potential is on steep slopes, which typically are somewhat removed from stream channels. There is some potential for rill and gully formation on these slopes; implementation of BMPs and PDFs will reduce the likelihood of this adverse impact occurring (see Table C 8).

Proposed road treatments would reduce overall road densities, riparian road mileage, and road-stream connections. The extent of road treatments would be less than in Alternative 1. Treatments would focus on high-priority roads within riparian reserves, and sediment delivery to streams would be reduced. Stream shading would increase as a result of road obliteration within riparian reserves.

Treatments within riparian reserves may reduce stream shading, although such treatments generally will occur along intermittent streams that do not flow during the period when water temperature is a concern.

Appendix D – Maps –



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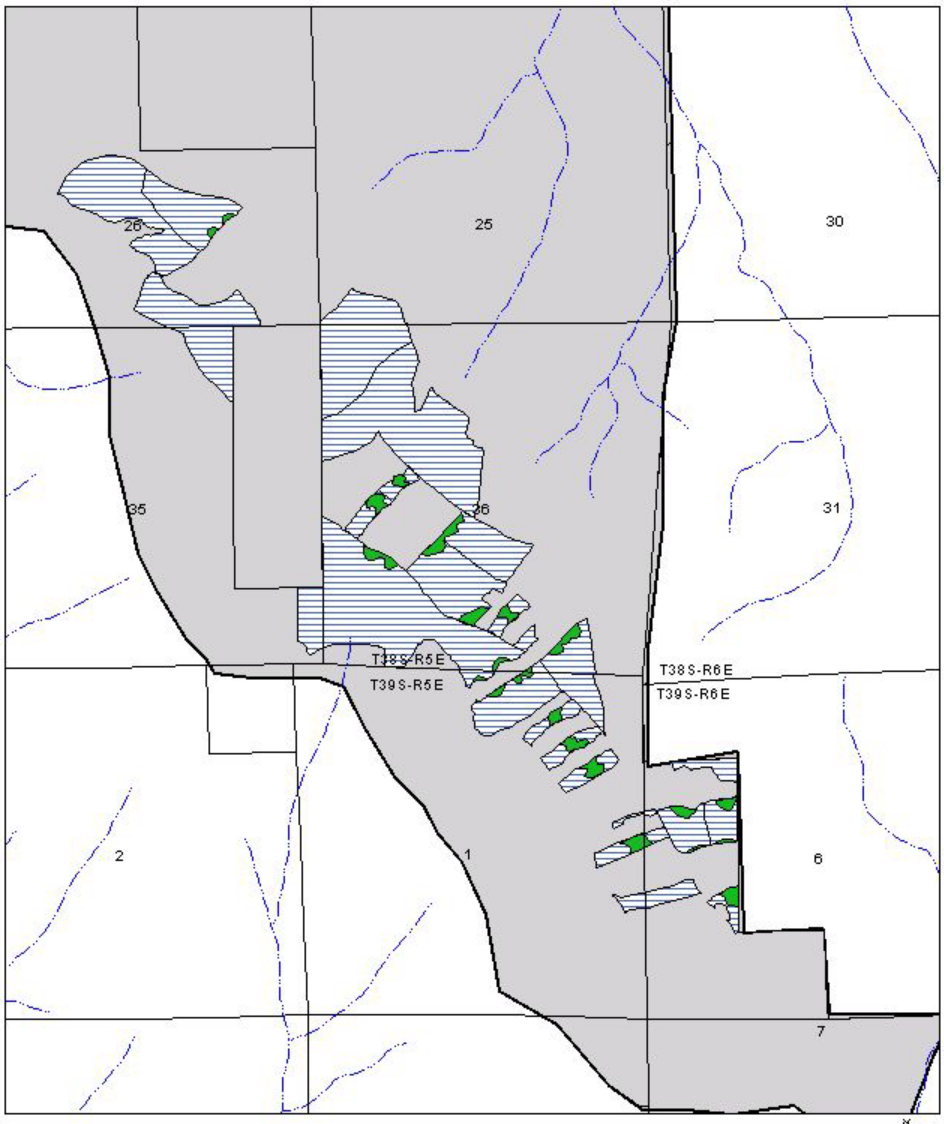
Klamath Falls Resource Area
Lakeview District, Oregon

Upper Spencer Creek EA Analysis

MAP D2: Patch Cuts Visual Modification Areas



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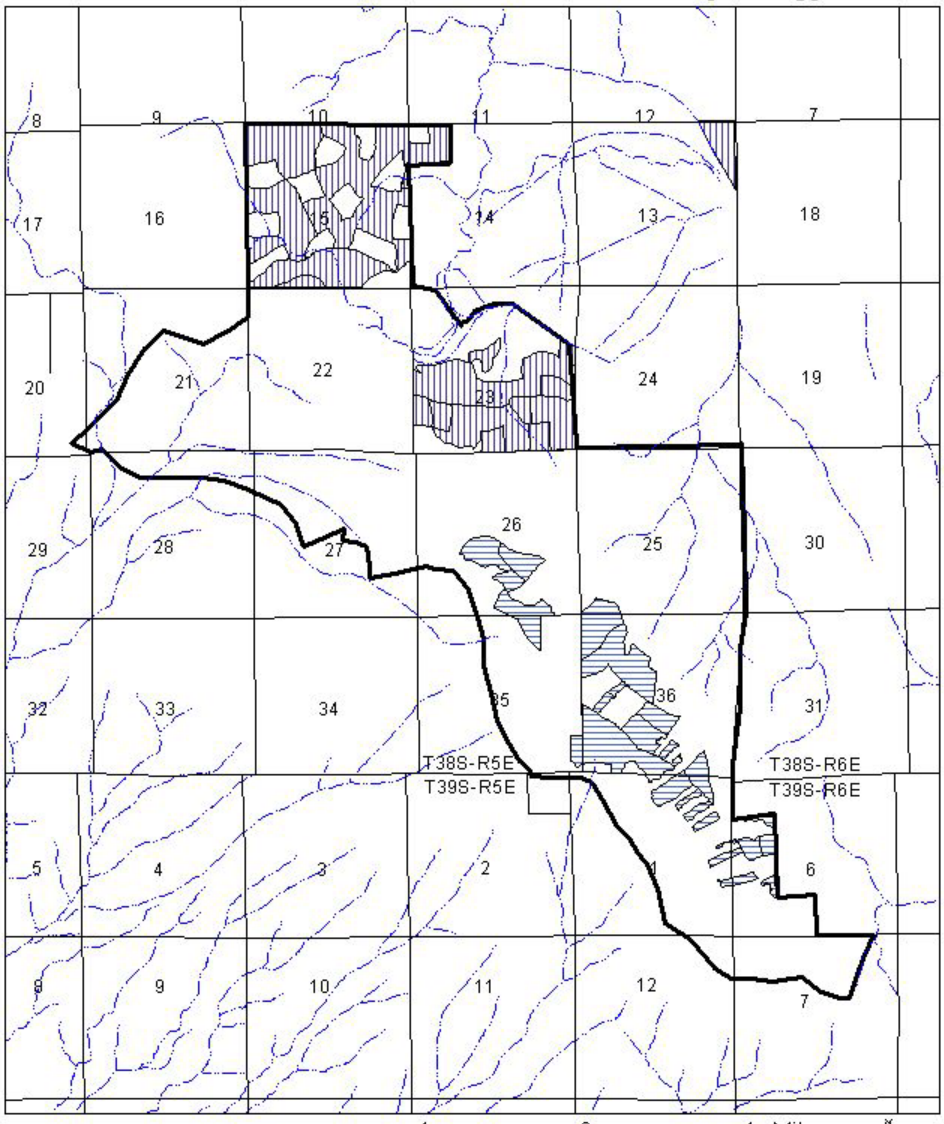
Klamath Falls Resource Area
Lakeview District, Oregon

Upper Spencer Creek EA Analysis

MAP D3: Proposed Harvest Units & Hydrology



Hyd
Surveyor TS Units
Buck Again TS Units
Analysis Area Boundary

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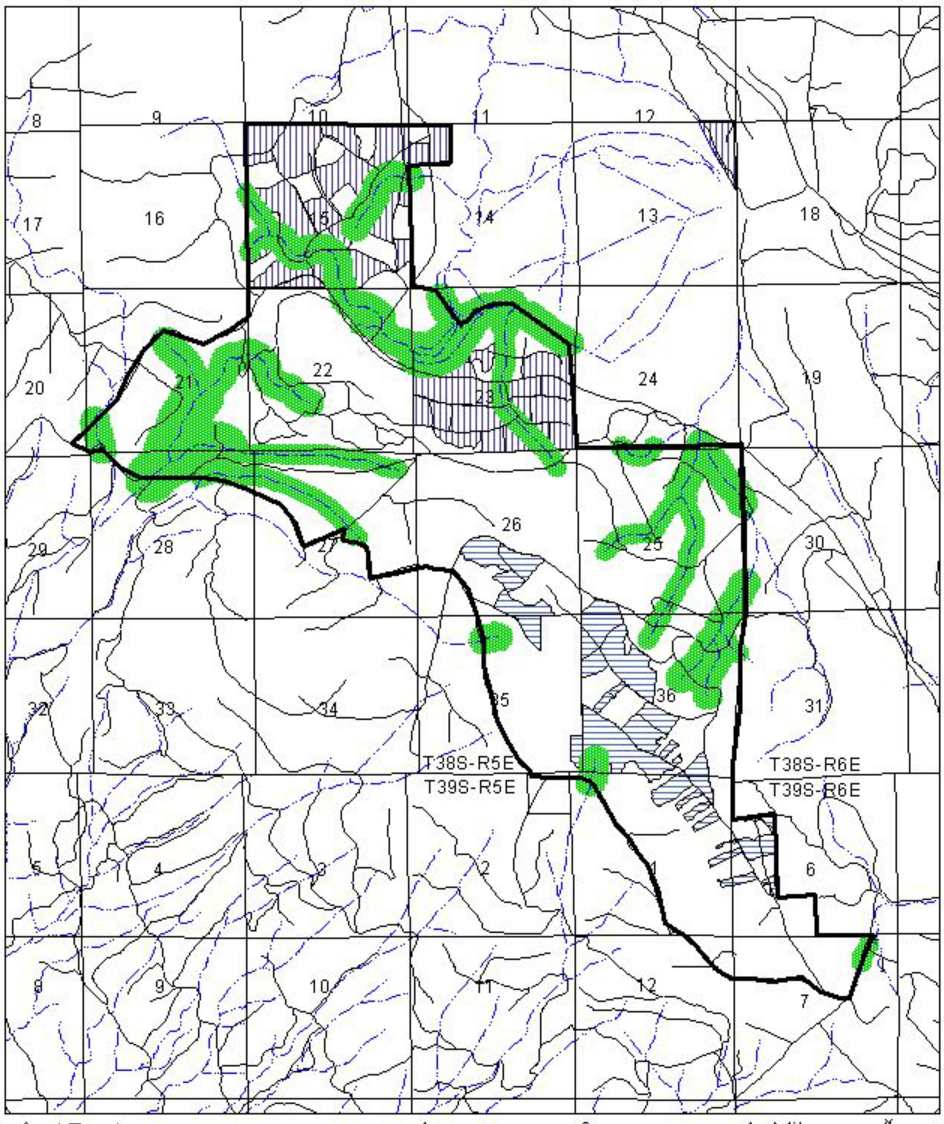
Klamath Falls Resource Area
Lakeview District, Oregon

Upper Spencer Creek EA Analysis

MAP D4: Riparian Reserve Buffers



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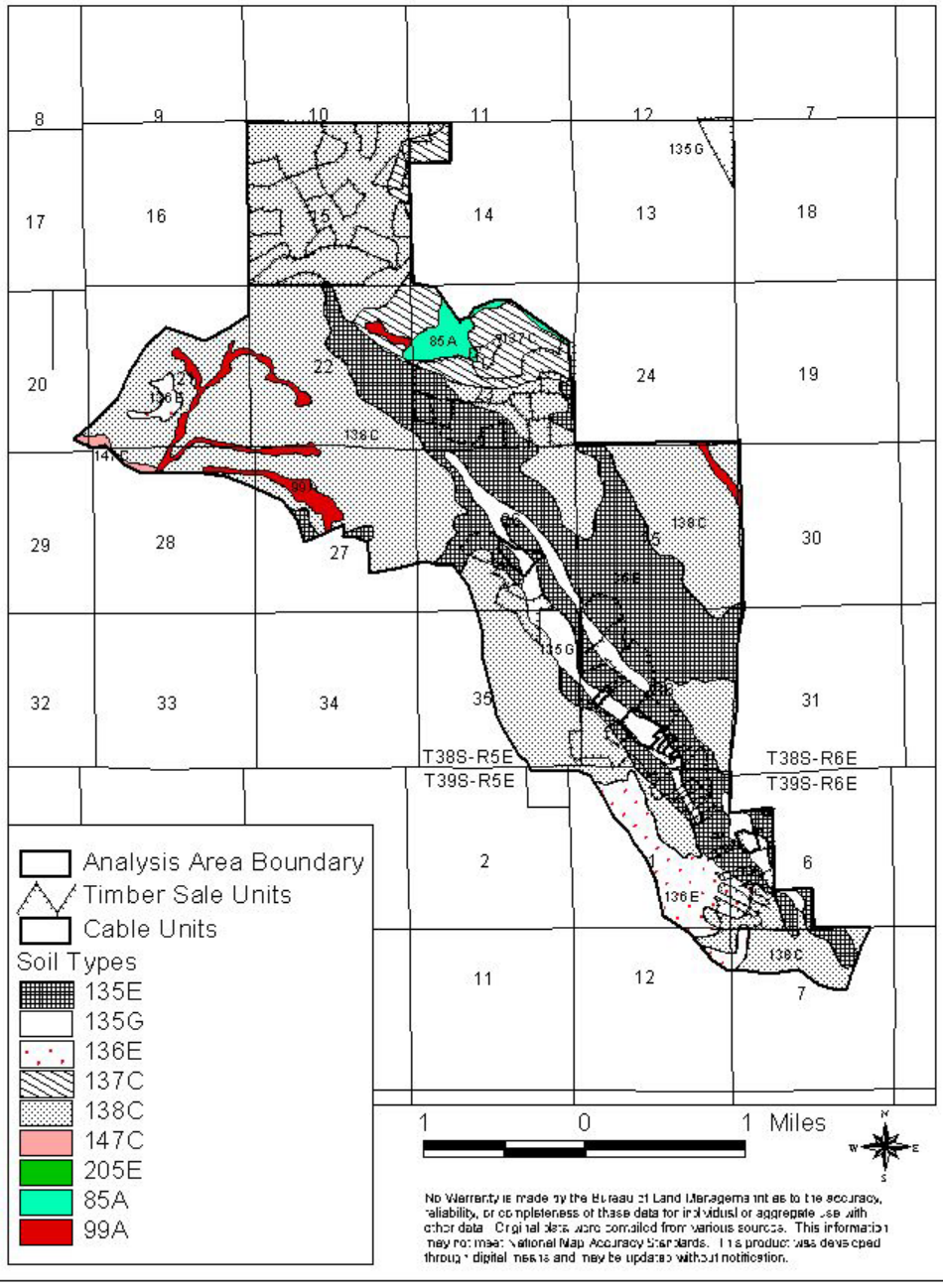
Klamath Falls Resource Area
Lakeview District, Oregon

Upper Spencer Creek EA Analysis

MAP D5: Soils Data



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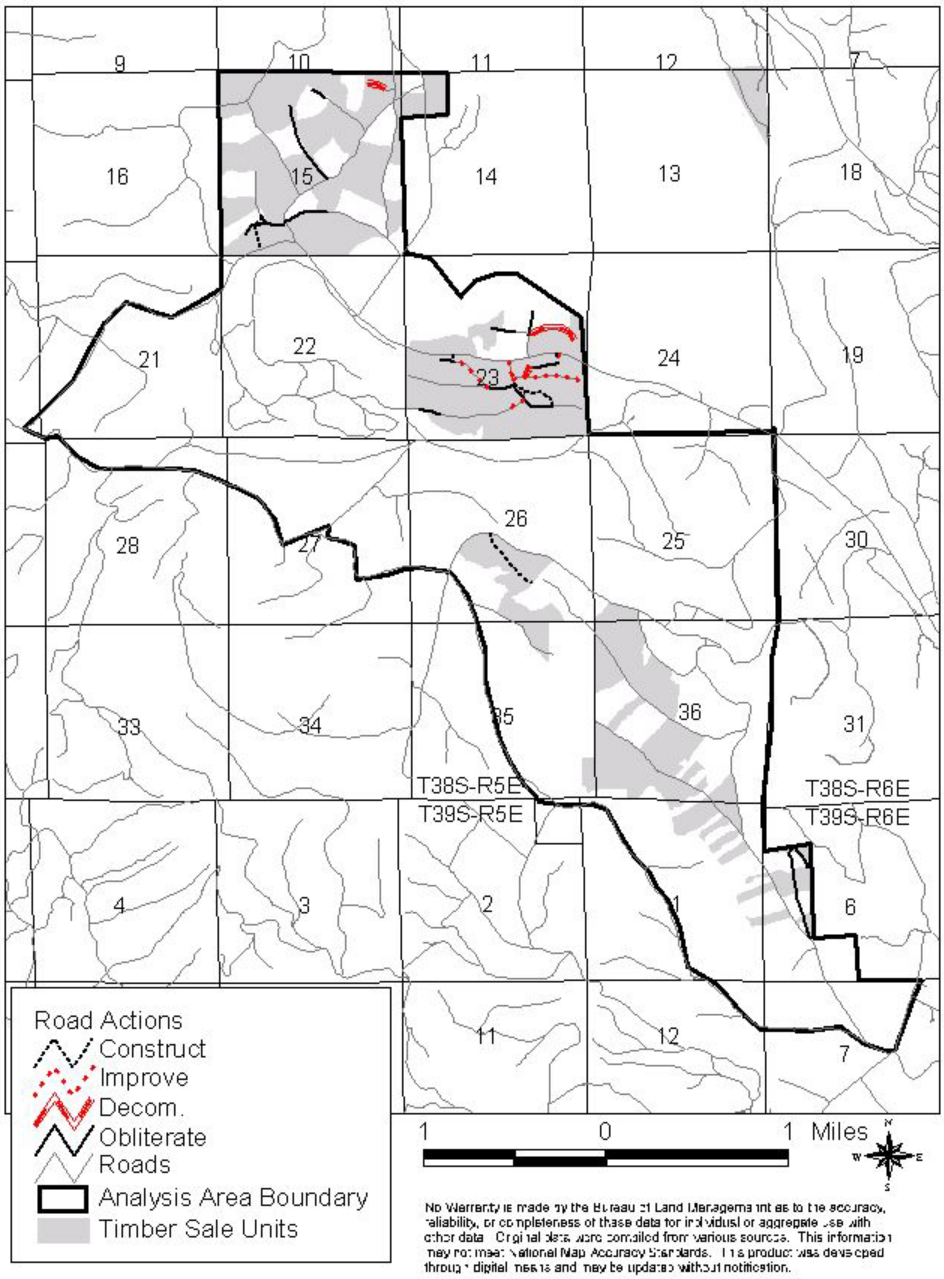
Klamath Falls Resource Area
Lakeview District, Oregon

Upper Spencer Creek EA Analysis

MAP D6: Road Actions



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