LOST ANALYSIS
ENVIRONMENTAL ASSESSMENT
#DOI-BLM-OR-L014-2011-001-EA

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
LAKEVIEW DISTRICT - Klamath Falls Resource Area

ABSTRACT: The following Environmental Assessment addresses the environmental effects associated with a variety of proposed treatments in the Lost Analysis Area, consisting of approximately 13,340 acres in the Spencer Creek Watershed including approximately 6,600 acres of BLM lands located northwest of Keno, Oregon between the Keno Access Road and Clover Creek Road. Proposed treatments include: commercial and non-commercial thinning, density management, road improvements, riparian habitat restoration, OHV recreation site development, and fuels treatments.

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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. Before including your address, phone number, e-mail address, or other personal identifying information in your comment, you should be aware that your entire comment – including your personal identifying information – may be made publicly available at any time. While you can ask us in your comment to withhold your personal identifying information from public review, we cannot guarantee that we will be able to do so. 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.

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CHAPTER 1 – INTRODUCTION

The information provided in this Lost EA is provided to comply with the National Environmental Policy Act of 1969 (NEPA). The NEPA process is intended to help public officials make decisions that are based on understanding of environmental consequences and take actions that protect, restore, and enhance the environment. A glossary of technical terms is available in Appendix E.

Purpose and Need for Action

Purpose

The purpose of these actions is for the Klamath Falls Resource Area (KFRA) to manage this area to meet land use plan objectives identified in the 1995 KFRA Record of Decision (ROD) and Resource Management Plan (RMP) and to implement recommendations from the Spencer Creek Pilot Watershed Analysis. Any action alternative to be given serious consideration as a reasonable alternative must meet the objectives provided in the RMP for projects to be implemented in the planning area. The actions must also address the needs identified in the project area. The purpose of the proposed treatments is to assist in meeting these needs. In addition, the Spencer Creek Pilot Watershed Analysis (completed in 1995) identified resource concerns and management recommendations for the entire watershed including the proposed Lost project area.

Need

Federal Land Policy and Management Act (FLPMA) 1976 – Defines BLM's organization and provides the basic policy guidance for BLM's management of public lands.

Oregon and California Act (O&C) 1937 – Requires the BLM to manage O&C lands for permanent forest production in accordance with sustained-yield principles. Management of O&C lands must also protect watersheds, regulate streamflow, provide for recreational facilities, and contribute to the economic stability of local communities and industries.

The Klamath Falls Resource Area's Record of Decision and Resource Management Plan directs management on BLM lands and is used in identifying the following needs within the project area:

Forest Stand Resiliency and Vigor

There is a need to maintain and improve the vigor and resiliency of forest stands in the planning area. There is a wide distribution and diversity of plant series and seral stages within the project area. Fire exclusion and past selective harvesting has resulted in overcrowded stands and undesirable species composition relative to historical stand conditions. Many stands are approaching or have reached a level of stand density where density-dependent mortality becomes a major influence on stand health. Density-dependent mortality, crown recession, reduced individual tree vigor, conifer shading of aspen, and exclusion of new regeneration are evident in forest stands where tree densities are high. Highly competitive and shade tolerant white fir (*Abies concolor*) stands have begun to dominate forests that have historically been dominated by Douglas-fir (*Pseudotsuga menziesii*), ponderosa pine (*Pinus ponderosa*), and sugar pine (*Pinus lambertiana*) (Leiberg 1900, pgs. 436, 447). In addition to density-dependent mortality, overly dense stands are also more susceptible to mortality as a result of fire, insects and disease. In order to improve stand vigor and resiliency stand density needs to be reduced to more stable levels and stand species composition should be focused on promoting fire resilient species closer to historical levels.

Sustained Yield of Forest Products

One of the primary objectives identified in the RMP is the need to implement the Oregon and California Railroad and Coos Bay Wagon Road Grant Lands Act of 1937 (O&C Act). The Act directs the secretary of Interior to manage lands revested from the Oregon and California Railroad land grants for permanent forest production under the principal of sustained yield (RMP, p. 3). The purpose of the Act is to provide a permanent source of timber supply, protect watersheds, regulate stream flow, and contribute to the economic stability of local communities and industries. The Act established that 50% of the timber revenue generated from these lands be

given to the county governments. To generate revenue, it is important to design an economically viable sale. This means that the products sold are worth more than the logging and transportation costs to the processing facilities. Sufficient quality and quantity of trees need to be harvested to cover logging costs as well as meet other objectives. The need for harvest treatments in the Lost project area is to meet the direction in the ROD/RMP to provide a sustainable supply of timber (RMP, Appendix E, p. 9). There is a need to accomplish harvest on a sustained yield basis to supply timber revenues to support Klamath County's services as well as provide forest products for local businesses that will help maintain stability of local and regional economies.

Recovery Action (RA) 16 from the 2011 Revised Recovery Plan for the Northern Spotted Owl states that "Federal, State and local managers should consider long-term maintenance of local forest management infrastructure as a priority in planning and land management decisions." (RRP III-53, USDI FWS 2011). This statement means that the KFRA needs to work to maintain a stable and predictable flow of forest products. RA 16 also discusses the need to meet long-term ecological goals through active forest management.

Fuel Hazard Reduction

There is a need within the planning area to reduce fuels hazards using a combination of treatments including; prescribed burning and modifying ladder and ground fuels arrangement through thinning and biomass utilization where feasible. The RMP (p. 76) directs the BLM to modify fuel profiles to reduce potential fire ignition and spread and to reduce the risk of high intensity, stand replacing fire. Seventy-four percent of the analysis area classifies as high or very high fire hazard rating. The project area contains suitable habitat for the federally listed (Threatened) spotted owl. There is a need to reduce the potential loss of suitable spotted owl habitat to stand replacing wildfire.

The Keno Community Wildfire Protection Plan (CWPP) boundary surrounding Lakewoods Village is adjacent to the Spencer Creek Watershed. Lakewoods Village is a separate community outside of the Keno Rural Fire Protection District (RFPD) but is annexed to the fire district and is considered to be a Wildland Urban Interface (WUI) community. This WUI boundary was identified as a priority in the Keno CWPP (http://www.lcd.state.or.us/ODF/FIRE/KenoCWPP.pdf). WUI areas are located where homes and other structures are adjacent to natural or undeveloped areas.

Riparian Areas

There is a need within the planning area to maintain and improve riparian habitat. The 1995 BLM RMP, through the Aquatic Conservation Strategy (RMP, p. 7), requires the maintenance and restoration of aquatic ecosystems. Management directions include applying silvicultural treatments to restore large conifers in riparian reserves (RMP, p. 9) and to restore channel complexity. Spencer Creek is a Tier 1 key watershed in the 1995 RMP, and opportunities were identified in the watershed analysis to implement restoration treatment that would contribute directly to conservation of at-risk fish species (e.g., salmonids) (RMP, p. 8). Over the last century, many streams with high aquatic habitat potential have become simplified, and therefore, have a reduced capacity to provide quality habitat. Dense riparian stands have decreased health and vigor, resulting in increased time to develop large tree structure for wildlife, stream shade, and future instream wood. These conditions are compounded by an increase of fuel loading, reducing available resources to trees and increasing risk of a stand-replacing fire. Some natural surface roads have poor drainage that can lead to erosion and increased sediment in nearby streams. Road maintenance and improvements are needed to enhance road drainage and to reduce chronic sediment input to the stream systems.

Forest Connectivity, District Designated Reserves and Late Successional Habitat

There is a need to provide and maintain connectivity across the landscape in support of a variety of organisms. The 15% guide and assessment is used to determine the status of the landscape (1995 RMP, p. 56) East Miners Creek District Designated Reserve (DDR) and Lower Spencer Creek DDR as designated in the 1995 BLM RMP are located within the BLM administered land in the project area. The DDR is composed of a high percentage of late-successional habitat. There is a need to maintain and improve the vigor and resiliency of many of the larger trees, particularly under-represented species (pines and Douglas-fir) through thinning in existing late-successional habitat. Stem density is typically high in these stands, reducing large tree vigor and in some instances, inhibiting

progression toward late-successional forest conditions and desired species composition. Past management (fire suppression, timber harvest, grazing) and the resulting high fuel loading have further altered the late-successional stands from their historical condition.

Northern Spotted Owl Habitat

There is a need to comply with the 2011 Revised Spotted Owl Recovery plan (RRP; USDI FWS 2011). This plan utilizes the habitat reserve network (Late Successional Reserves (LSRs) etc.) from the Northwest Forest Plan (NWFP) as the basis for a habitat conservation network for the spotted owl. This adoption of the LSRs includes the geographic extent of the LSRs as well as the direction for management of LSRs as described in the NWFP, as amended. The Recovery Plan also establishes the physiographic provinces as the recovery units. There are three LSRs (identified as Un-Mapped LSRs in the 1995 RMP) in the project area (approximately 100 acres each), and the project falls within the East Cascades Province/Recovery Unit. (Refer to Table 7 in the Terrestrial Wildlife section of Chapter 3.)

Recovery Actions within the 2011 Northern Spotted Owl Revised Recovery Plan describe the need to maintain more suitable habitat for the northern spotted owl across the landscape, as well as the need to avoid actions which may displace spotted owls from known sites. The recovery plan also describes the need for, and encourages, active management of federal forested areas that are not close to spotted owl sites in order to make stands less vulnerable to loss or degradation due to insect outbreaks and high intensity fires, as well as to set younger stands on a trajectory to develop late successional habitat structure (RRP.III-53, USDI FWS 2011).

Recovery Action (RA) 10 states: "*Conserve spotted owl sites and high value spotted owl habitat to provide additional demographic support to the spotted owl population*." (pg III-43, USDI FWS 2011). Further elaboration of this RA states that the FWS believes that within the core use area and within the provincial home range land managers should retain and, where necessary, improve a sufficient quality and quantity of suitable spotted owl habitat to support all life history functions. There are four spotted owl home ranges that overlap the proposed projects identified in this environmental assessment (EA). The Plan provides interim guidance on how to achieve the objectives of RA 10. This includes a process through which action agencies, in cooperation with local U.S. Fish and Wildlife Service (USFWS) offices, prioritize their known spotted owl sites for conservation purposes. These prioritization criteria include recent history of successful reproduction, and amount of suitable habitat around the nest. As a result of this process, some sites are to be designated as "High Priority" sites, and others are designated as "Non-High Priority" sites. Per the Recovery Plan, management of habitat at and around High Priority sites is focused on protecting the integrity of the sites and maintaining or increasing the likelihood that spotted owls will occupy the site and successfully reproduce there. The USFWS will consider the prioritization status of affected sites when assessing impacts of, and developing Biological Opinions on, projects that may affect spotted owls. For a complete discussion of the RA 10 interim guidance and prioritization methodology see the 2011 Revised Spotted Owl Recovery plan section on RA 10. The KFRA has completed the prioritization process and has designated 9 of its 18 known spotted owl sites as High Priority sites (see meeting notes, Level 1 meeting with USFWS on Oct. 11, 2011). One of these High Priority sites (Miners Creek) is within the Lost analysis area. Constraints on management of suitable habitat associated with this site, and how they apply to the action alternatives are discussed in the wildlife section.

Recovery Action 32 states: "*Because spotted owl recovery requires well distributed, older, and more structurally complex multi-layered conifer forests on Federal and non-federal lands across its range, land managers should work with the Service as described below to maintain and restore such habitat while allowing for other threats such as fire and insects to be addressed by restoration management actions. These high-quality spotted owl habitat stands are characterized as having large diameter trees, high canopy cover, and decadence such as broken-topped live trees, mistletoe, cavities, large snags, and fallen trees.*" No RA 32 stands have been identified at this time on the Klamath Falls Resource Area. It is the KFRA's understanding of the 2011 Revised Recovery Plan that the USFWS is working with an interagency team to model habitat quality and proximity to spotted owl sites across the range of the spotted owl and that High Quality habitat pursuant to RA 32 will be designated or identified through that modeling process. This understanding is shared by the Klamath Falls office of the USFWS (Meeting notes, Level 1 meeting with USFWS on Oct. 11, 2011). Due to the absence of designated RA 32 stands in the project area, RA 32 will not be discussed further in this analysis.

Eagle Management

There is a need to comply with Bald and Golden Eagle Protection Act and the current USFWS guidelines on eagle management. There is a known Bald Eagle nest in the project area (see wildlife section).

Enhancing Recreation Opportunities

Several potential recreation projects in the Spencer Creek area were identified in the RMP (p. 51). They included among other projects, an off-highway vehicle (OHV) use area in an abandoned rock quarry near the intersection of Clover Creek and Spencer Hookup Roads. Local OHV clubs and individual rock crawlers have expressed interest to the BLM in regards to development of this rock quarry into a designated rock crawling recreation site. The relatively new sport of rock crawling involves slowly driving highly modified and specialized OHVs over steep, rocky, boulder terrain as a challenge to the driver's skill and the capability of their vehicle. Local enthusiasts believe that the abandoned quarry within the analysis area would provide a suitable and desirable setting for the activity.

Location

Table 1: Location of BLM-administered Lands within the Analysis Area

Proposed Treatment Area	Location		
	Township	Range	Sections
Lost Project Area	T38S	R05E	15,24,25,36
	T38S	R06E	1920,21,22,23,26,27,28,29,30,33,34,35
	T39S	R06E	4,5,6

Figure 1: Location of project area on a state wide scale

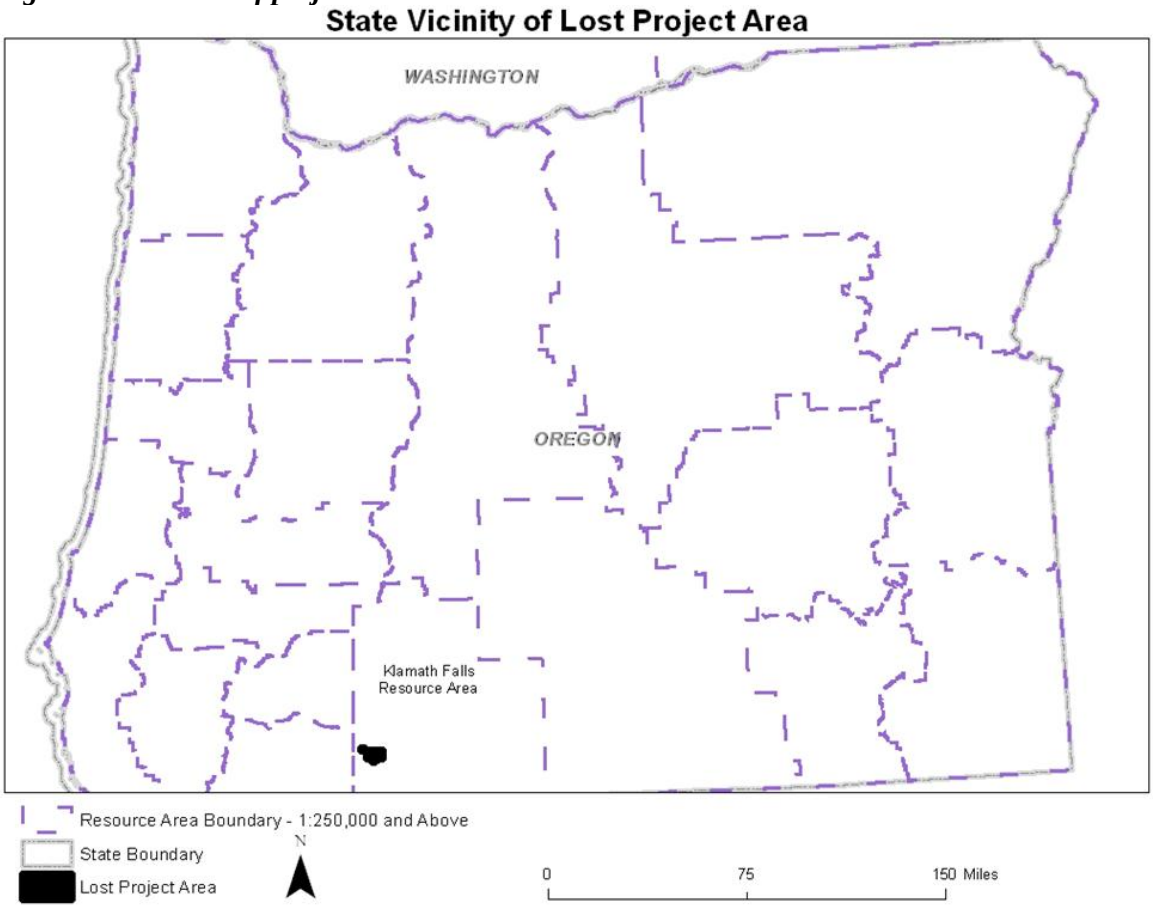
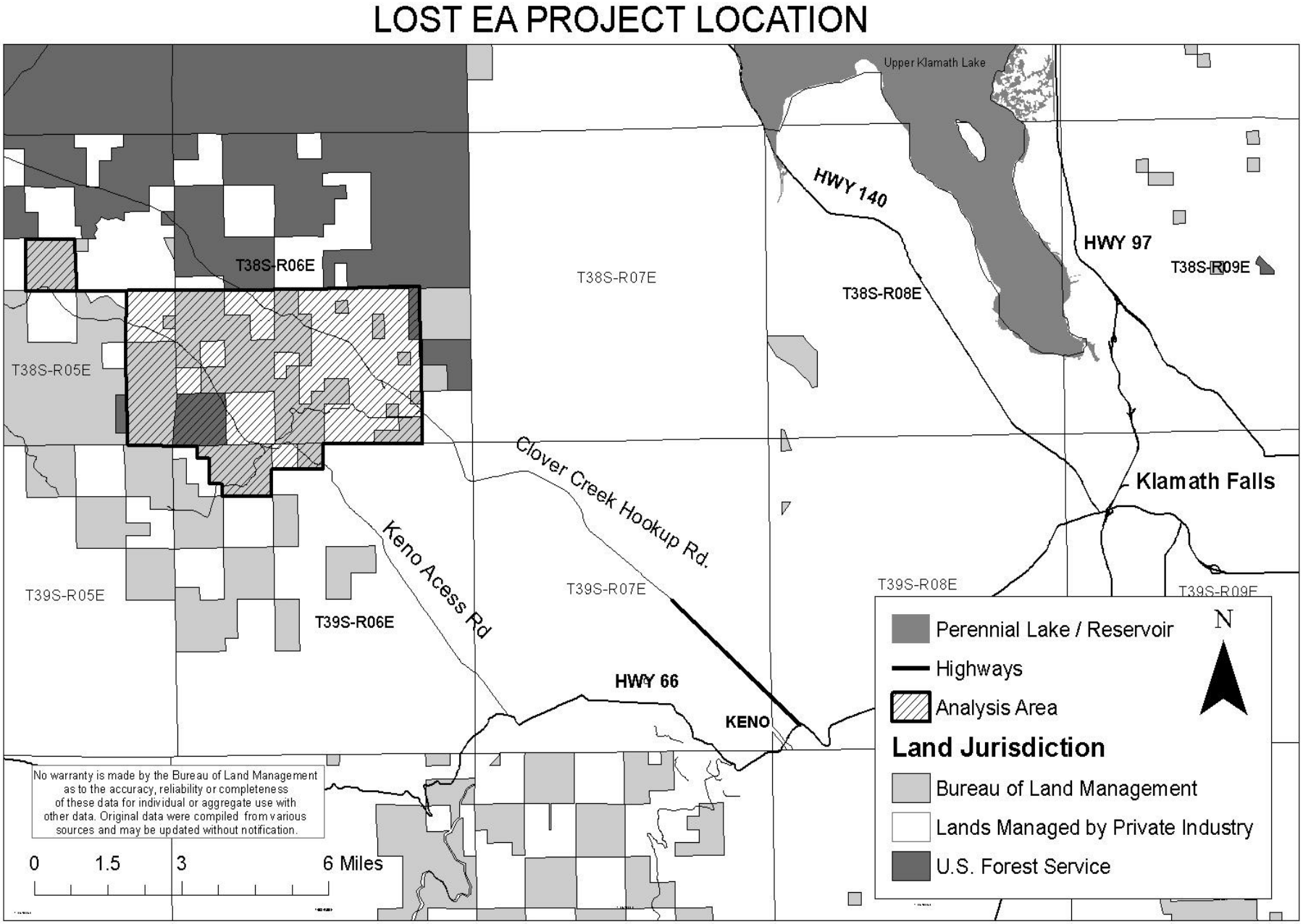


Figure 2: General Location Map of the Project Area



Management Direction and Conformance with Existing Plans

The scoping for this project began March 18, 2011 when the KFRA was managing under the direction of the 1995 Klamath Falls Resource Area Resource Management Plan (1995 KFRA RMP). The project design and recommendations for implementation are contained in the 1995 ROD/RMP and a number of other related or supporting documents including:

- Klamath Falls Resource Area Integrated Weed Control Plan EA (July 21, 1993).
- Range Reform FEIS (August 1995).
- Final Environmental Impact Statement, Vegetation Treatment on BLM Lands in Thirteen Western States (1991).
- Standards for Land Health for Lands Administered by the Bureau of Land Management in the States of Oregon and Washington (1998)
- Migratory Bird Policy
- Range Reform FEIS (August 1995).
- Record of Decision and Standard and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (2001)
- Survey and Manage Settlement Agreement, July 6, 2011, *Conservation Northwest et al. v. Sherman et al.*, Case No. 08-1067-JCC (W.D.Wash).
- Revised Recovery Plan for the Northern Spotted Owl (USDI FWS 2011)
- Proposed Rule for Designation of Critical Habitat for Northern Spotted Owl (USDI FWS 2012)

Public Input Summary and Issue Development

A variety of issues and concerns were raised during project scoping by interested individuals, groups, and BLM's interdisciplinary team. Comments were also received during and following two public tours of the project area in April of 2011. In this EA, an issue is something unique to the project area that may need particular consideration and may contribute to defining a particular action alternative. Issues and concerns raised were considered in the formulation of alternatives, project design features, or estimation of environmental effects. In some cases, an issue was initially considered by the planning team and then eliminated from further analysis because it was not within the scope of the project or did not meet the purpose and need. More information on scoping input and issues, and how they were addressed in the analysis can be attained from the KFRA office.

CHAPTER 2 – ALTERNATIVES

An Interdisciplinary Team (IDT) developed three action alternatives to meet the purpose and needs identified in Chapter 1. In addition, a "No Action" Alternative is presented to represent current conditions and trends and form a baseline for analysis. The No Action Alternative also serves as a reference point in discussing project activity effects. All project activities incorporate Project Design Features (PDFs) designed to reduce or eliminate potential project effects (Appendix B).

The interdisciplinary team developed the range of alternatives based on the purpose and need of the project, existing environmental conditions, existing RMP direction and guidance, other guidance and direction including the 2011 Northern Spotted Owl Recovery Plan and input gathered during the scoping process. During scoping, the public provided comments that have been considered by the interdisciplinary team and incorporated into alternative development.

Alternatives are presented and organized by "types of action" (*e.g.*, vegetation treatments, road actions, riparian treatments, etc.). The action alternatives under each resource differ with regard to their specific objective or emphasis. The actions listed in Table 2 are based on what is foreseeable during the next ten years.

Table 2: Treatment Acres by Alternative

Treatment	Alternative 1 (Acres)	Alternative 2 (Acres)	Alternative 3 (Acres)
Aspen Restoration-Mechanical	38	8	38
Aspen Restoration-Manual	0	41	0
Density Management	512	677	0
Diameter Limit Density Management	0	0	512
Density Management/Underburn	146	150	0
Diameter Limit Density Management/Underburn	0	0	146
Density Management NRF	78	0	0
Diameter Limit Density Management NRF	0	0	78
District Designated Reserve (DDR) Density Management	60	0	0
Diameter Limit DDR Density Management	0	0	60
Patch Cuts	78	21	0
Diameter Limit Patch Cuts	0	0	78
Primitive Off-Highway Vehicle (OHV) Recreation Site	2	0	0
Developed OHV Recreation site	0	2	0
Thin From Below-Manual	35	44	35
Thin From Below-Mechanical	102	107	102
Riparian Treatment-Mechanical*	54	0	54
Riparian Treatment-Manual*	46	16	46
Total Treated Acres	1,151	1,066	1,149
*Riparian treatments include different prescriptions (density management, aspen restoration, thin from below, underburn, etc.). The exact treatments are listed in the Unit Treatments Table below.			

The BLM typically collects and stores resource data by individual land units. For the purposes of planning, treatments are identified for individual units. Those treatments may vary based on the theme of a particular alternative. Refer to Table 3 for a listing of treatment types and the unit under each alternative to which the treatment applies.

Table 3: Unit Number by Treatment and Alternative

Treatment	Units – Alternative 1	Units – Alternative 2	Units – Alternative 3
Aspen Restoration -Mechanical	19-1, 19-1R, 6-3	6-3	19-1, 19-1R, 6-3
Aspen Restoration -Manual	19-1IR	19-1, 19-1R, 19-1IR	19-1IR
Density Management	21-1, 21-2, 23-1, 26-1, 4-2, 6-2	21-1, 21-1R, 21-2, 21-2R, 23-1, 26-1, 33-2, 4-1, 4-1R, 4-2, 6-2	NA
Diameter Limit Density Management	21-2R	NA	21-1, 21-2, 21-2R, 23-1, 26-1, 33-2, 4-2, 6-2
Density Management Under Burn	35-1, 35-2, 35-3, 35-3R	35-1, 35-2, 35-3, 35-3R	NA
Diameter Limit Density Management Under Burn	NA	NA	35-1, 35-2, 35-3, 35-3R
Density Management NRF (in Nesting, Roosting, Foraging habitat	33-2, 33-2R, 4-1, 4-1R	NA	NA
Diameter Limit Density Management NRF	NA	NA	33-2, 4-1, 4-1R
DDR Density Management	27-1, 27-1R	27-1, 27-1R	NA
Diameter Limit DDR Density Mgmt	NA	NA	27-1, 27-1R
Patch Cuts	6-1	6-1	NA
Diameter Limit Patch Cuts	NA	NA	6-1
Primitive OHV	35-4	NA	NA
Developed OHV	NA	35-4	NA
Thin From Below – Manual	25-1, 25-1R, 25-2, 25-2R, 27-1IR, 27-2, 27-2IR, 27-2R	25-1, 25-1R, 25-2, 25-2R, 27-1IR, 27-2, 27-2IR, 27-2R	25-1, 25-1R, 25-2, 25-2R, 27-1IR, 27-2, 27-2IR, 27-2R
Thin From Below – Mechanical	15-1, 21-1R, 22-1, 22-1R, 25-3, 30-1,33-1, 33-1R	15-1, 22-1, 22-1R, 25-3, 30-1, 33-1, 33-1R	15-1, 21-1R, 22-1, 22-1R, 25-3, 30-1, 33-1, 33-1R

Common to All Action Alternatives

Most of the actions in Table 2 will occur in some form in all three alternatives. The main difference is in the acres, location and the specifics of the treatments which are detailed under the following alternative descriptions. More detailed descriptions of proposed unit treatments can be found in the project record. (See also Appendix D.)

The following actions will occur in all three alternatives:

- In all the treatment units, residual fuels (slash) would be treated either by removal as biomass or by piling and burning.
- Approximately 150 acres would be treated with prescribed fire in an under burn.
- Planting trees of mixed species in patch cuts, openings and under stocked areas. This would include brushing around planted trees in order to promote seedling survival.
- There are approximately six miles of road to be reclosed that were closed or decommissioned during past projects, but the closures are no longer effective.
- A number of closed roads would be temporarily re-opened to provide access into proposed treatment units and would be re-closed when operations are complete.
- Approximately 300 feet of temporary new road construction is planned for access into timber sale units and would be obliterated when operations cease.
- Regular road maintenance would occur throughout the project area. This includes grading, ditching, culvert cleaning, brushing, rocking, etc.
- A seasonal restriction on disturbing activities would apply to portions of units in Section 27 in order to prevent disturbance to a Bald Eagle nest (see wildlife section).

Alternative 1

Objective

Alternative 1 harvests timber and increases stand growth by reducing stem densities from all canopy layers and tree size classes. Project area and stand level diversity would be maintained or improved through promotion of an uneven-aged stand structure with variable densities. In addition, an assortment of 1995 RMP prescribed reserves within the project area would be managed to retain and/or develop structural diversity (e.g., Riparian Reserves, DDRs, and species buffers). This alternative was designed to meet the Objectives and Management Actions/Directions for the associated 1995 RMP Land Use Allocations. The following actions, in addition to actions common to all alternatives, have been identified as part of Alternative 1 for this EA:

Aspen Restoration: Manual/Mechanical

Aspen restoration treatments would occur in both riparian and non-riparian areas. There would be mechanical cutting and removal of encroaching conifers from aspen stands outside of riparian areas and in the outer 80 feet of the riparian area in unit 19-1. All ponderosa pine, lodge pole pine, Shasta red fir, incense cedar and Douglas-fir up to 20” in diameter at breast height would be cut and removed. There would be no diameter restrictions on white fir. The inner 80 feet of the aspen stand in the riparian reserve would receive manual treatment of the above listed species and would be cut and removed up to a diameter of 12” at breast height. The cut trees may then be piled and burned at an appropriate time. The area may also be fenced to exclude livestock grazing.

Density Management

Density management treatment would include understory thinning, commercial thinning and biomass utilization on Matrix lands. Generally, a variable density prescription would be applied, retaining 40 to 180 square feet of basal area per acre in the Density Management Units. The density management harvest prescription is designed to maintain an uneven-aged, multistoried stand structure, increase stand resiliency by reducing competition and stress to remaining trees, and address fuel hazards (RMP, Page 56). The prescription is designed to thin and utilize the small non-merchantable material 3-7” DBH, thin the dense commercial size trees greater than 7” DBH, selectively harvest some overstory trees, and retain and culture around the large diameter, preferred species like

the ponderosa pine, sugar pine, incense cedar, and Douglas-fir. For unit specific silvicultural prescriptions see tables in Appendix D.

The density management harvest prescription would also include group selection/patch cuts on up to 15% of a stand. The group selection/patch cut areas would be limited to five acres or less in size and retain 5-10 large trees per acre (APS 2010 p.67-68). The patch cuts would be planted and may require manual brushing in the future to ensure seedling survival. The primary objective for implementing group selection/patch cuts is to establish a new cohort of shade intolerant species (pines, incense cedar, and Douglas-fir). Group selection/patch cuts would target decadent, diseased and insect infested stands, or second growth and white fir in areas that historically contained a significant pine, Douglas-fir, and incense cedar component.

Density Management units would be harvested using a ground-based system. All operations would be mechanical. Most of the trees removed over seven inches in diameter would be sold as timber. Culturing around large, legacy trees may also be applied under this prescription.

Density Management/Underburn

The difference between this treatment and Density Management described above is that the stand would be underburned after trees are removed. The purpose of the underburn is to reduce fuel loading and to restore fire to the system as it existed historically. All other guidelines of density management apply.

District Designated Reserve (DDR) Density Management

DDR density management is similar to density management; however it focuses on retaining late successional characteristics including retaining a higher canopy closure and basal area in DDR units. Patch cuts, as described above, will occur in these units. No treatments will occur in Unmapped Late Successional Reserves (UMLSRs). All other guidelines of density management apply.

Density Management NRF

Units designated as density management NRF (Nesting Roosting and Foraging) will be managed to maintain NRF habitat and to comply with the 2011 Revised Northern Spotted Owl Recovery Plan. This typically includes retaining higher canopy cover and density. All other guidelines of density management apply.

Patch Cuts

These units will involve treatment with patch cuts only but no other silvicultural treatments, i.e., there will be no additional thinning. This treatment occurs in a District Designated Reserve Buffer (DDRB) and also focuses on retaining late successional characteristics including retaining a higher canopy closure and basal area.

Thin from Below - Manual/Mechanical

Mechanical or manual thinning from below removes small trees in the understory of the stand. The trees removed are generally of a smaller diameter (12” diameter breast height (dbh) or less) but may include larger trees up to 20” dbh. Thinning trees from below is designed to enhance vigor of the residual trees and to begin moving these stands toward a multistoried, uneven-aged structure. Most of the trees removed would be utilized as biomass or by piling and burning.

Riparian Reserve Treatments

Riparian reserves would be managed with various treatments , including density management, under burning, thinning from below, patch cuts, aspen restoration etc. Specifics are shown on a unit by unit basis in Table 3 above and Figure 3 below. Riparian reserve widths in this alternative were based on the 1995 RMP.

Construction of an Off-Highway Vehicle (OHV) Rock Crawl Area

The proposed development of an OHV rock crawling recreation site would include the cooperation, input, and active assistance of local OHV clubs and individual rock crawlers. This recreation project would require BLM to secure legal public access on road 38-6E-35.1 across 0.2 miles of private land. (See Figure 4 below.) This road is

currently closed, so under this alternative the BLM would obtain a public use easement, reopen a portion of the road, develop a parking area near the rock crawling area, and perform necessary road work such as fill, drainage, and surfacing with crushed rock adequate to accommodate expected traffic.

The quarry area would be converted/developed into a rock crawling recreation site by developing a defined parking/staging area that could accommodate up to 20 truck/trailer rigs (about two acres at completion), constructing an access road from the parking area to the new entrance to the pit , providing basic amenities such as signage, a vault toilet, a picnic area, an access return route out of the pit, installing a fence around the perimeter of the site, and installing barriers to control traffic. The current opening in the west side of the quarry would be closed to vehicle traffic through the use of fencing, barriers, and/or signage.

All vehicle traffic would be managed to control and prevent vehicles from travelling the area between the quarry and Clover Creek. This area off the west rim of the quarry would remain closed to all vehicle traffic to maintain the riparian stream buffer on Clover Creek and prevent runoff sedimentation from entering the creek. The access trail to enter the quarry on the north end would be designed and constructed with rock crawl features, to serve as a filter to limit access to the site to rock crawl vehicles. Rock crawl routes would be developed and maintained by moving boulders in the quarry and marking the routes with paint and/or sign markers. Winch anchor points would be installed at various points in the quarry and on the rim to allow crawlers to self-rescue without having to use live trees in the area as anchors. The winch anchor points would be heavy gage steel posts set deeply into the soil and rock. An access route along the south and east rims of the quarry would be developed to allow rock crawler vehicles to circle back to the entry point and reenter the pit after completing a run. Under this alternative, development would be “primitive”, or the minimal amount required to provide a basic, locally oriented, rock crawling recreation site, and to protect the resources in the area. The recreation site would be incrementally developed over time, the ultimate level of development would be determined by factors such as user interest and visitation rates, available funding, and participation of user groups in developing and managing the site. The entire recreation site, an area of approximately 10 acres, would be closed to all forms of shooting and hunting activity at all times of the year, for visitor safety and to avoid potential user conflict. As a necessary response to problem behavior and/or illegal activity that causes unacceptable resource damage, BLM would implement more restrictive management measures such as restricted season of use, hours of use, site use by reservation only, all the way up to potential closure and decommissioning of the Recreation Site.

Alternative 2

Objective

Alternative 2 harvests timber and increases long term stand growth by reducing stem densities from all canopy layers and tree size classes. Project area and stand level diversity would be maintained or improved through the promotion of an uneven-aged stand structure with variable canopy closures. This alternative was designed to meet the Management Objectives and Directions for the associated 2008 RMP Land Use Allocations including designated deferred timber management areas, special status species buffers and Riparian Management Areas (half the width of the Riparian Reserves in the 1995 RMP). The following actions, in addition to actions common to all alternatives, have been identified as part of Alternative 2 for this EA:

Aspen Restoration: Manual/Mechanical

Aspen restoration treatments would occur in both riparian and non-riparian areas. All of unit 19-1, 19-1R and 19-1IR would be manually treated. In units 19-1 and 19-1R white fir would have no diameter limit for cutting but all other cut species would have a diameter limit of 20” at dbh. Unit 19-1IR would have an imposed 12” diameter limit at dbh for all species. The cut trees may then be piled and burned at an appropriate time. Aspen restoration in unit 6-3 would include mechanical treatments with the same prescription as in Alternative 1. Fencing may be installed to exclude livestock grazing in order to allow aspen regeneration to survive.

Density Management

Same as Alternative 1; however, 84 acres of Deferred Timber Management Area would be left untreated under this alternative to comply with Deferred Timber Management Area requirements (see page 37, 2008 RMP).The

specific silvicultural prescriptions would be similar to Alternative 1 Density Management prescriptions. (See Appendix D.)

Density Management/Underburn

Same as Alternative 1.

DDR Density Management

There are no DDRB, DDR and UMLSR land use allocations in this alternative. UMLSRs are part of the NWFP LSR system and presumed incorporated into the conservation strategy of the 2011 Revised Spotted Owl Recovery Plan. The action alternatives do not propose to treat any of the UMLSR acreage.

Density Management NRF

Not proposed for this alternative.

Patch Cuts

Same as Alternative 1, however 30 acres of Deferred Timber Management Area will be left untreated under this alternative to comply with Deferred Timber Management Area requirements (see page 37, 2008 RMP).

Thin from Below: Manual/Mechanical

Same as Alternative 1.

Riparian Reserves - Proposed Treatment

Riparian areas are designated at half the width that they were under Alternative 1. Treatments include manual aspen restoration and thinning from below manually.

OHV Rock Crawl Area Development

See Alternative 1 for the basic outline of the proposed rock crawl area. Under this alternative, construction of infrastructure would be more intensive leading to a more highly developed site. In addition to the parking/staging area, a small camping area would be developed to provide basic camping facilities with approximately 10 delineated campsites, picnic tables, and fire rings. In addition to basic required signage, there would be interpretive and informational signing. This alternative would emphasize more site amenities and increased user convenience in contrast to the Alternative 1 proposal.

Alternative 3

This alternative was developed in response to comments received during the public scoping period. This alternative analyzes the use of a diameter limit in the timber harvests. The alternative is designed similar to Alternative 1 with the addition of incorporating a diameter limit for harvesting trees of most species that are greater than 20 inches DBH. White fir greater than 20 inches DBH would still be available to be cut. The following actions, in addition to actions common to all alternatives, have been identified as part of Alternative 3 for this EA:

Aspen Restoration: Manual/Mechanical

Same as Alternative 1.

Diameter Limit Density Management

Diameter Limit Density management would occur with a 20”DBH diameter limit on all Pine, Douglas-fir, Shasta red fir and incense cedar. There would be no diameter limit on white fir. The stands would be cut to the same basal area targets as Alternatives 1 for the purpose of promoting forest health and to show the impacts of implementing the diameter limit. Except for this diameter limit, the specific silvicultural prescriptions would be identical to Alternative 1 Density Management prescriptions (Appendix D).

Diameter Limit Density Management/Underburn

Same as Alternative 1, but with diameter limit as described above.

Diameter Limit DDR Density Management

Same as Alternative 1, but with diameter limit as described above.

Diameter Limit Density Management NRF

Same as Alternative 1, but with diameter limit as described above.

Diameter Limit Patch Cuts

Same as Alternative 1, but with diameter limit as described above.

Thin from Below: Manual/Mechanical

Same as Alternative 1.

Riparian Reserves - Proposed Treatment

Same as Alternative 1.

Construction of an Off-Highway Vehicle (OHV) Rock Crawl Area

None in this alternative.

Figure 3: Map of proposed treatments in Alternative 1

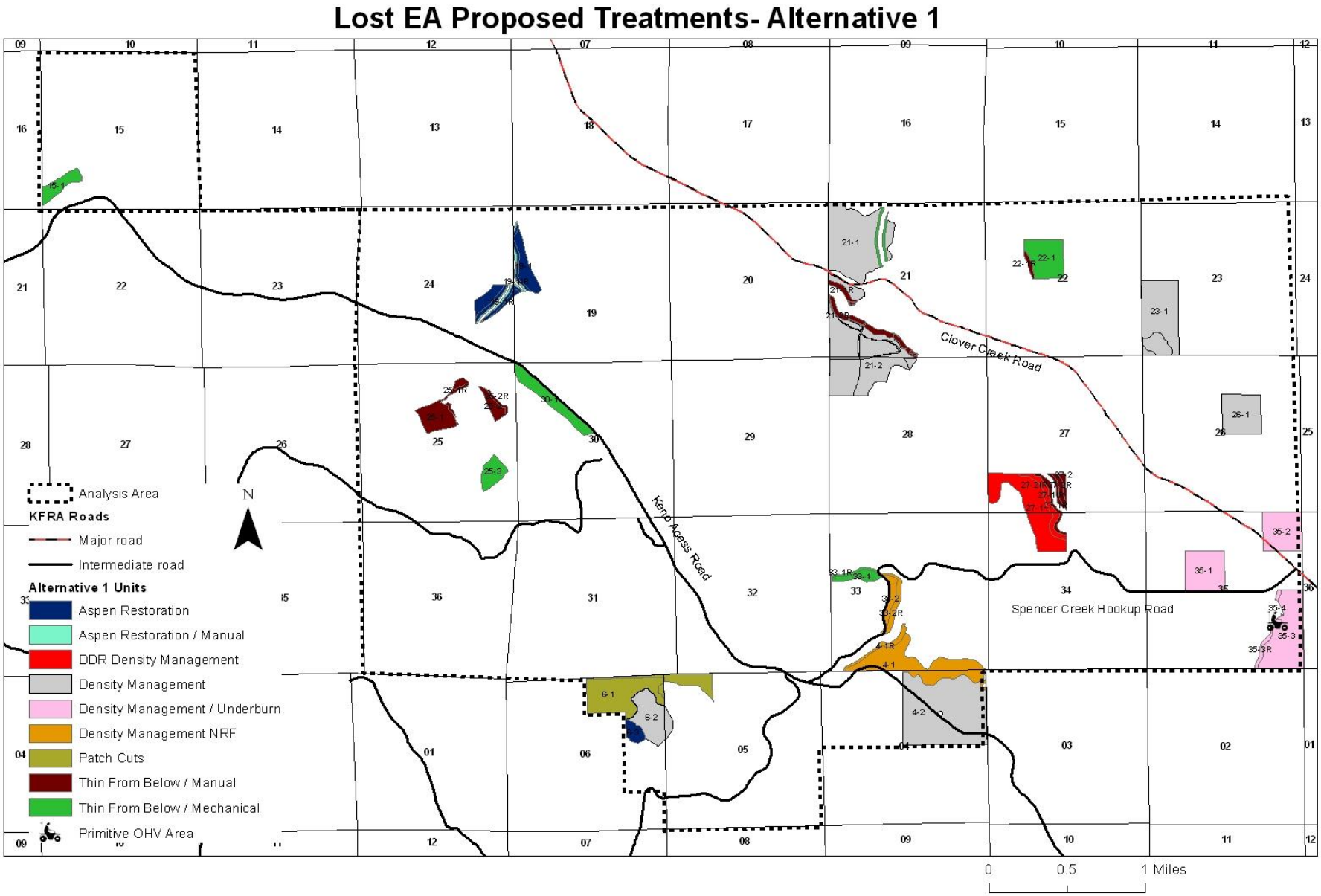


Figure 4: Map of proposed OHV Rock Crawl Area

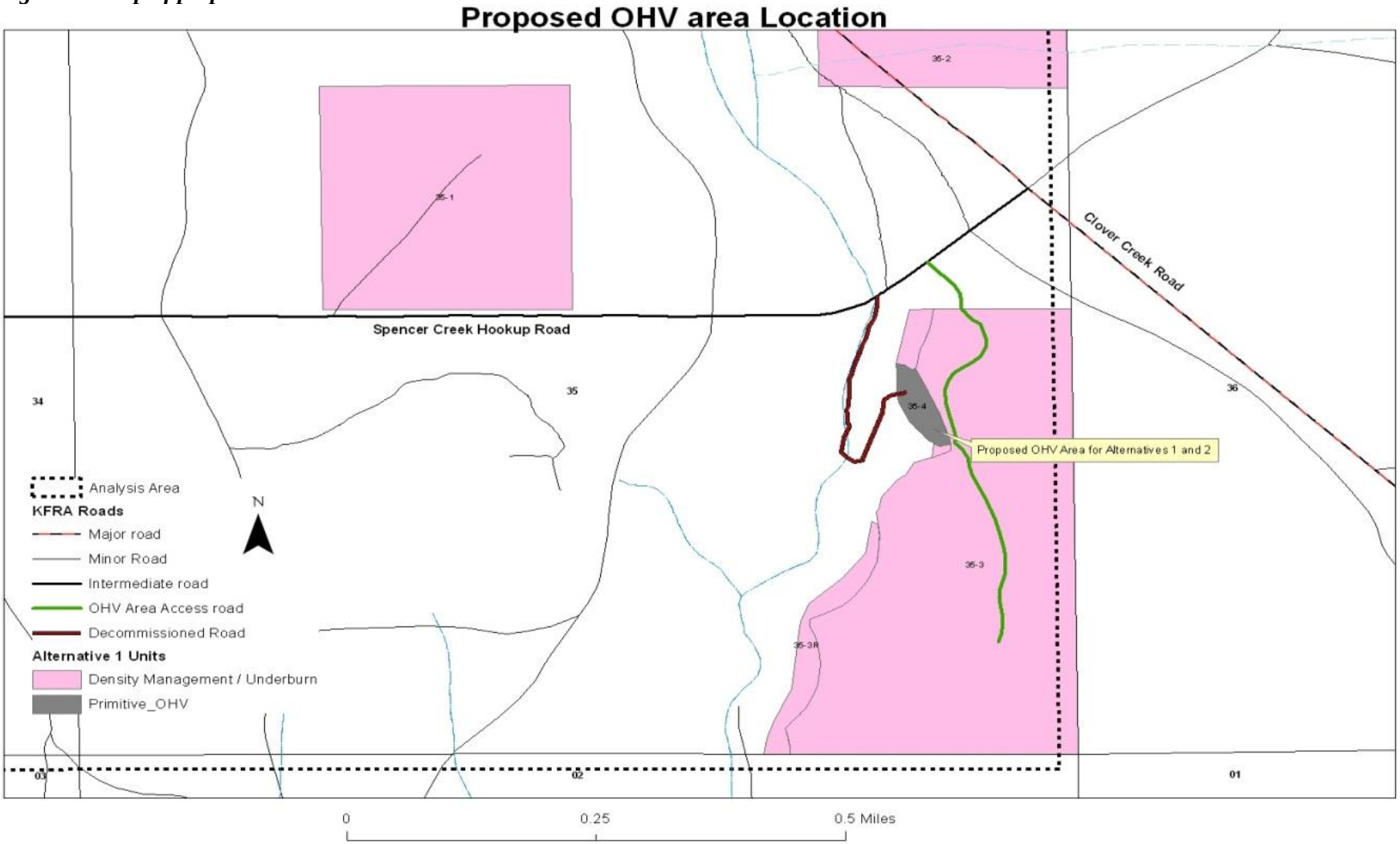


Figure 5: Map of proposed treatments in Alternative 2

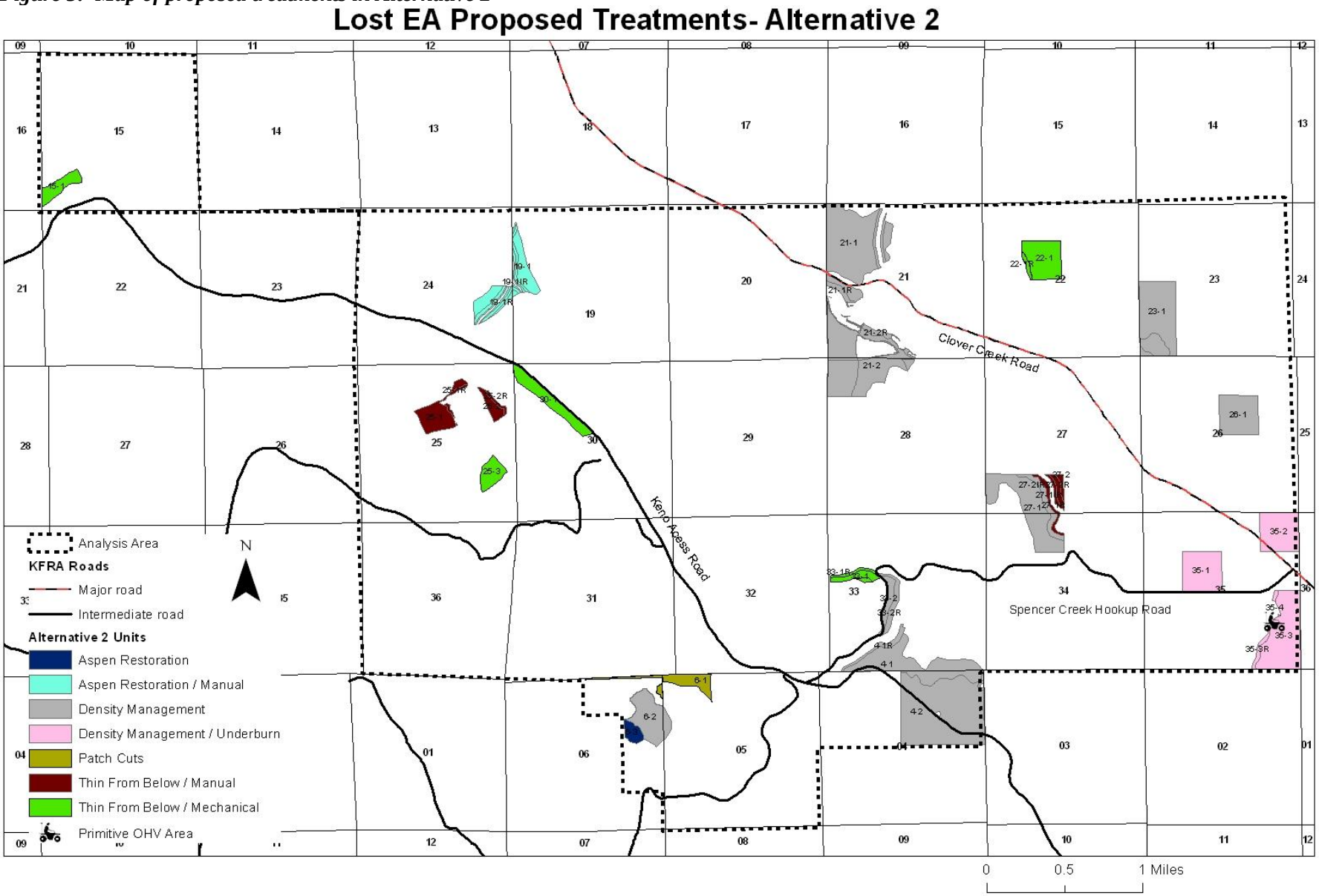
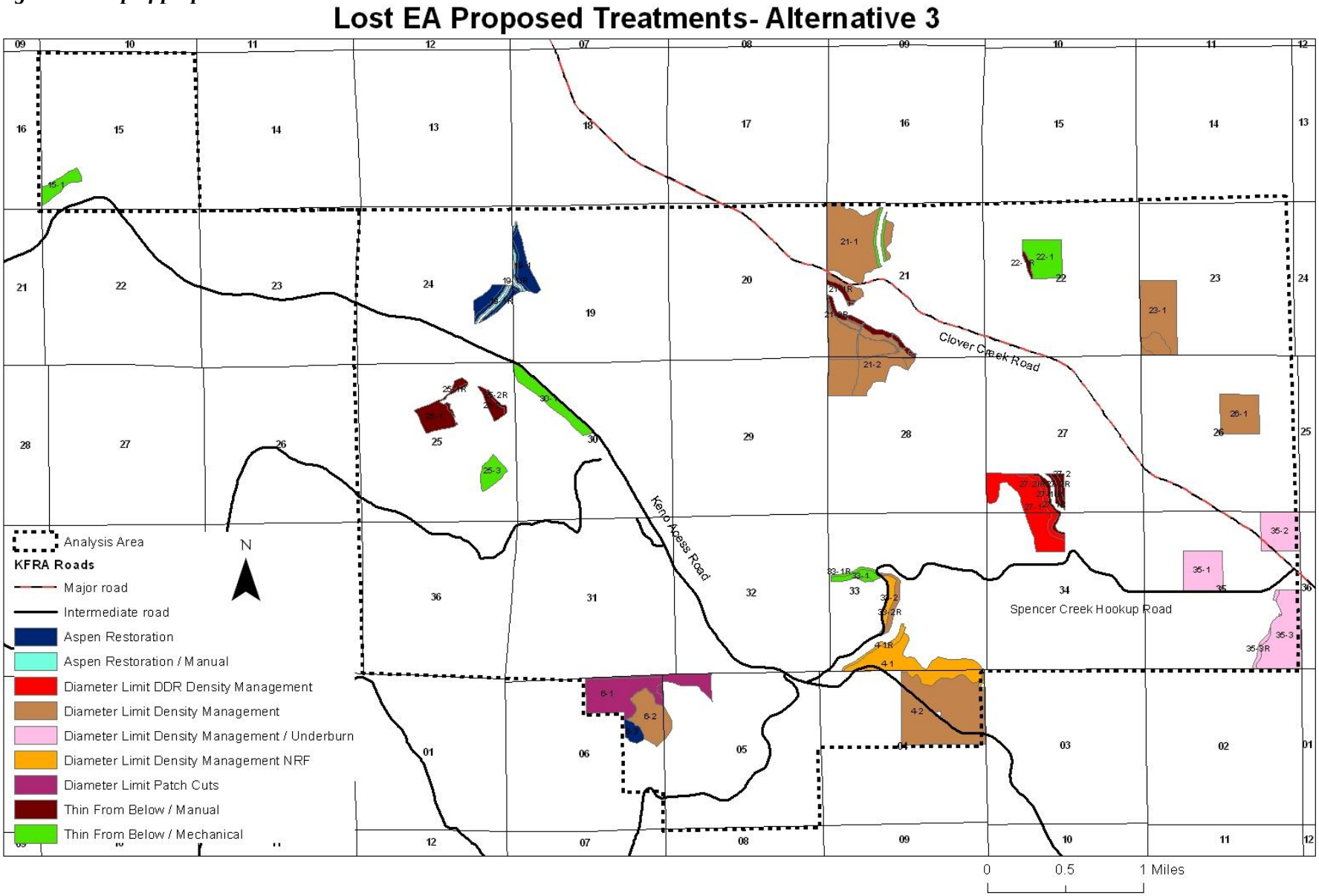


Figure 6: Map of proposed treatments in Alternative 3



No Action Alternative

The Bureau of Land Management NEPA Handbook recommends the inclusion and analysis of a No Action Alternative. Under the No Action Alternative, management activities considered in this assessment would not occur. Activities proposed in and adjacent to the analysis area that have been analyzed and approved in other NEPA documents would still occur, such as fuel reduction treatments, routine road maintenance, and fire suppression. Selection of the No Action Alternative would not change land allocations or the direction the BLM has to manage these lands.

The No Action Alternative serves as a baseline or reference point for evaluating the environmental effects of the action alternatives and to describe the current trend in resource conditions. Inclusion of this alternative is done regardless of consistency with the RMP and without regard to meeting the purpose and need.

Other Alternatives Considered But Not Analyzed In Detail

Development of a Trailhead and Non-Motorized Trail

Development of a trailhead and 0.5 miles of non-motorized trail along Spencer Creek, north of the Spencer Creek hookup road was originally considered. This proposal has been dropped due to uncertain access across private lands, lack of connectivity of the proposed trail with other recreation sites in the area, and concerns associated with potential impacts to natural resources in the riparian areas of Spencer Creek.

CHAPTER 3 – AFFECTED ENVIRONMENT & ENVIRONMENTAL CONSEQUENCES

Introduction

Only substantive site-specific environmental changes that would result from implementing the proposed action or alternatives are discussed in this chapter. Resource values that are either not present in the project area, or would not be affected by any of the proposed alternatives are: floodplains, wilderness study areas (WSAs), areas of critical environmental concern (ACECs), research natural areas (RNAs), paleontological resources, prime or unique farmlands, wild and scenic rivers, and minerals. There are no known hazardous waste sites in the analysis area. For either alternative, 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 alternatives.

The Environmental Consequences portion of this chapter provides the analytical basis for the comparisons of the alternatives and the reasonably foreseeable environmental effects. This analysis considers the direct impacts (effects caused by the action and occurring at the same place and time), indirect impacts (effects caused by the action but occurring later in time or offsite), and cumulative impacts (effects caused by the action when added to other past, present and reasonably foreseeable future actions on all land ownerships).
Impacts can be beneficial, neutral, or detrimental. The temporal and spatial scales used in this analysis may vary, depending on the resource being affected.

As the Council on Environmental Quality (CEQ), in guidance issued on June 24, 2005, points out, the "environmental analysis required under NEPA is forward-looking," and review of past actions is required only "to the extent that this review informs agency decision-making regarding the proposed action."

The CEQ stated in this guidance that "[g]enerally, agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions." This is because a description of the current state of the environment inherently includes the effects of past actions. The CEQ guidance specifies that the "CEQ regulations do not require the consideration of the individual effects of all past actions to determine the present effects of past actions." Following review of the guidance and examining the proposed project, the team found that an exhaustive listing of past projects and speculation on the effects of each would not provide needed data to make an informed

decision. Information on the current environmental condition is comprehensive and more accurate for establishing a baseline condition for a cumulative effects analysis than attempting to establish such a starting point by adding up the effects of individual past actions. Unlike current conditions, past actions and perceived effects can no longer be verified by direct examination.

When encountering a gap in information, the question implicit in the Council on Environmental Quality regulations on incomplete and unavailable information was posed: Is this information "essential to a reasoned choice among the alternatives"? While additional information would often add precision to estimates or better specify a relationship, the basic data and central relationships are sufficiently well established that any new information would not likely reverse or nullify understood relationships. Although new information would be welcome, the team did not identify any missing information as essential for the Decision Maker to make a reasoned choice among the alternatives.

Cumulative Actions – Past Actions in the Watershed

The following overview provides a context in which to analyze the effects of the Lost Project Area. This summary of the analysis area and the future foreseeable actions provides a 'big picture' look at the analysis area, puts the project into perspective, and allows for comparison of alternatives with the no action alternative (existing conditions). The Spencer Creek Pilot Watershed Analysis (1995) describes the events that contributed to the current condition such as early hunting/gathering by aboriginal inhabitants, mining, road building, agriculture and water diversions, wildfire, and timber harvest. Forested vegetation zone descriptions can be found on page 2.5 through 2.6. Current timber management on the surrounding private land is more intensive and occurs on a larger scale. This management regime is expected to continue in the future. On most private lands, it is anticipated that residual vegetation will be reflective of early seral conditions and will meet pertinent state laws governing forest management practices.

Cumulative Actions Considered

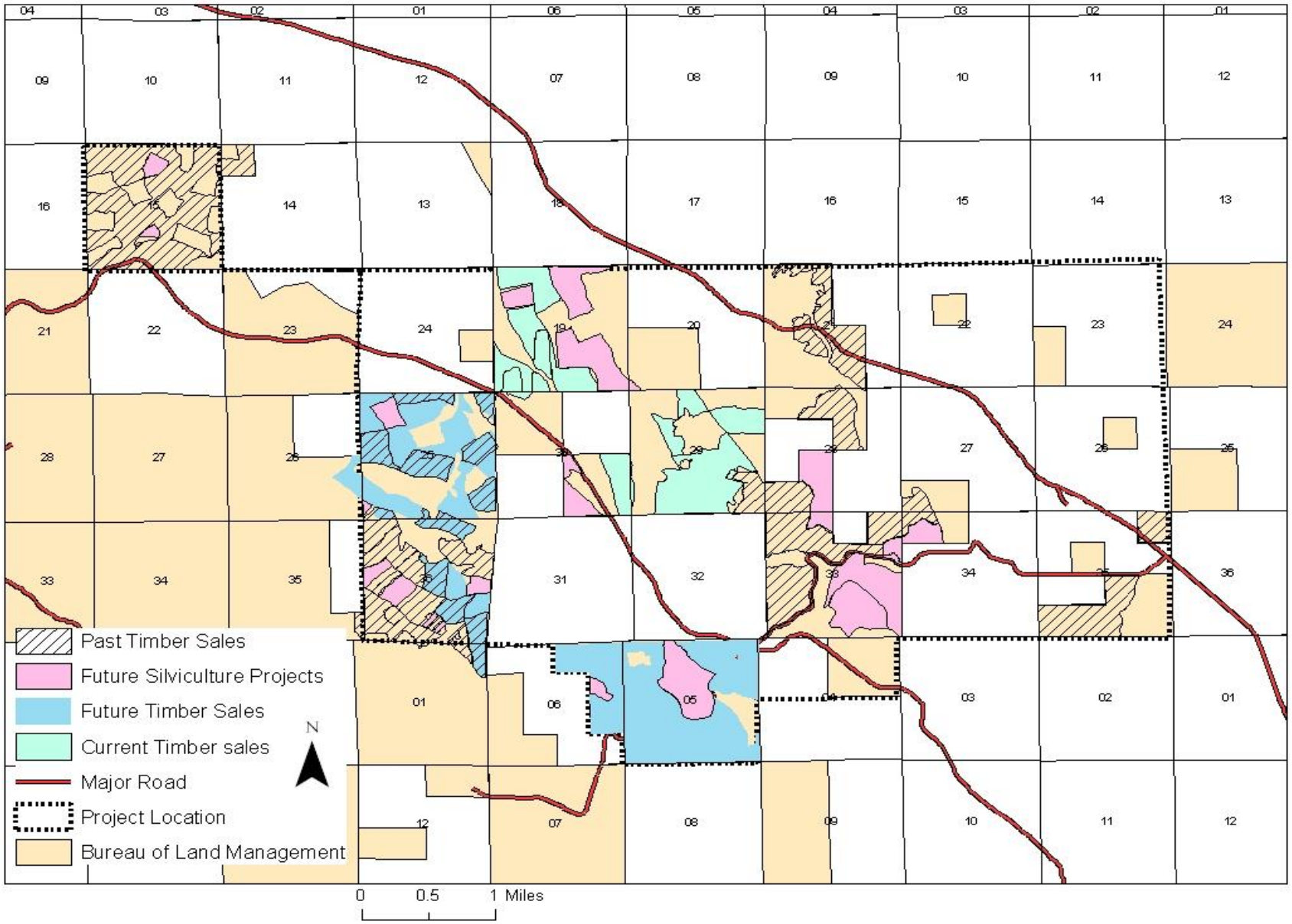
Timber management activities proposed in the Klamath Falls Resource Area consist generally of density management (thinning) prescriptions and are designed to promote uneven-aged stand structure. In density management prescriptions, trees of all diameter classes are selectively harvested with emphasis placed on retaining forest stands with representatives of all diameter classes. Approximately 20% to 40% of the stand is harvested with the vast majority of the harvested trees being from the smaller and mid diameter classes. In the future, stands throughout the Matrix allocation are expected to be selectively harvested approximately every 15-30 years, according to Klamath Falls Resource Area management plans. BLM is planning to harvest additional acres of timber within the Spencer Creek watershed within the next five years. Some of these stands scheduled for future harvest are located close to units in the Lost planning area. Specific treatments are listed in Table 4. Private industrial lands are expected to remain in early to mid seral condition.

Table 4: Additional Treatments Currently Proposed on BLM lands in the Project Area

Treatment	Approximate Acres	Anticipated Year
Miners Creek Timber Sale	400	2013
Sliding North Timber Sale	350	2013
Pacific Connector Gas Pipeline ROW	17.2	TBD
Spike Timber Sale	372	2012
Replacement Gal Timber Sale	239	2012
Spencer Silvicultural Treatments	1190	2012

Figure 7 below shows actions within the project area that have been completed as well as some that have been analyzed and decisions made for future implementation. The majority of these future actions were described in the Spencer Creek EA (EA-08-09). Two timber sales listed in Table 4 above, Miners Creek and Sliding North are proposed but will be analyzed in the future. The Pacific Connector Gas Pipeline has been in an EIS for construction within the Spencer Creek Watershed.

Figure 7: Past (1995 to present) and future cumulative actions within the project area



Vegetation - Affected Environment

Upland Forest

Forests occurring in the proposed treatment area can be generally described as multi-aged, multiple canopy, mixed conifer stands of white fir, Douglas-fir, Shasta red fir, ponderosa pine, western white pine, sugar pine, incense cedar and some lodgepole pine. Some of the riparian areas have remnant stands of aspen or evidence of past aspen occupation (aspen logs and snags). From the 1950's through the present, most of these stands were entered once or more for selective thinning or overstory removals. Many of the conifer dominated stands have been selectively cut leaving an array of trees sizes and ages. There are some areas within the project area where most of the larger and older overstory trees have been harvested and the residual stands are a dense, multistoried mix of remnant trees and second growth.

A history of fire suppression within the project area has led to encroachment by fire intolerant species (primarily true firs). This encroachment has resulted in denser stands than occupied these sites prior to European settlement. Increased stand density and ladder fuels have led to an increase in fire risk. These increases in density have also served to change the ecosystem and habitat functions from what they may have been historically.

Tree sizes range from 1" to over 50" DBH. Tree ages range from one to over 500 years old. Table 5 shows the distribution of age classes throughout the watershed for all BLM land as well as the area proposed for treatment in this EA. Many stands are uneven aged and have a wide variety of ages of trees in a single stand. The current process for determining stand age for the KFRA can be found in Appendix D.

Table 5: Land ownership and Age Class Structure in the Spencer Creek Watershed.

Owner	Age Class	Total Acres	% of BLM Land	% of Watershed	Acres Proposed for Treatment	% of Treatment area in BLM land
BLM Unforested Land		326	4%	1%		
BLM Forested Land	0-10	135	2%	0%	48	1%
BLM Forested Land	20-80	2,828	32%	4%	569	7%
BLM Forested Land	90-160	3,848	44%	6%	1,445	17%
BLM Forested Land	170+	2,549	29%	5%	323	4%
Total BLM Land		8,745		16%		
USFS Lands		22,273		41%		
Private Land		23,174		43%		
Total Watershed		54,194				

An array of bark beetles is present in the majority of forested stands within the project areas that can infest and kill different species of pine and true fir trees. The most susceptible forested areas are white fir and Shasta red fir stands, growing primarily at lower elevations in the mixed conifer zone, in stands which historically were dominated with ponderosa pine, sugar pine, and Douglas-fir as evidenced by the older and larger stumps in the area. The fir engraver beetle, *Scolytus ventralis,* has been responsible for substantial mortality to both white fir and Shasta red fir along the entire eastern slopes of both the southern Cascade Mountain Range and northern Sierra Nevada Mountain Range, which is reflected in the Spencer Creek watershed. Drought conditions in the early 1990s led to fir engraver killing over 60% of the standing volume in the Klamath basin in a four year period (Eglitis 2000). White fir stands on sites with mean annual precipitation rates below 32 inches are more susceptible to beetle kill even if stand densities are kept very low (Cochran1998, Eglitis 2000). In addition to true fir mortality, small (less than one acre) patches of ponderosa and sugar pine have been recently killed by bark beetles as well. Many of these pines are large with diameters ranging from 12-60+ inches DBH. The large pines are generally suffering from crowded growing conditions with dense stands of true firs encroaching upon the pine clumps. These crowded growing conditions often leave the pines in weakened condition and more

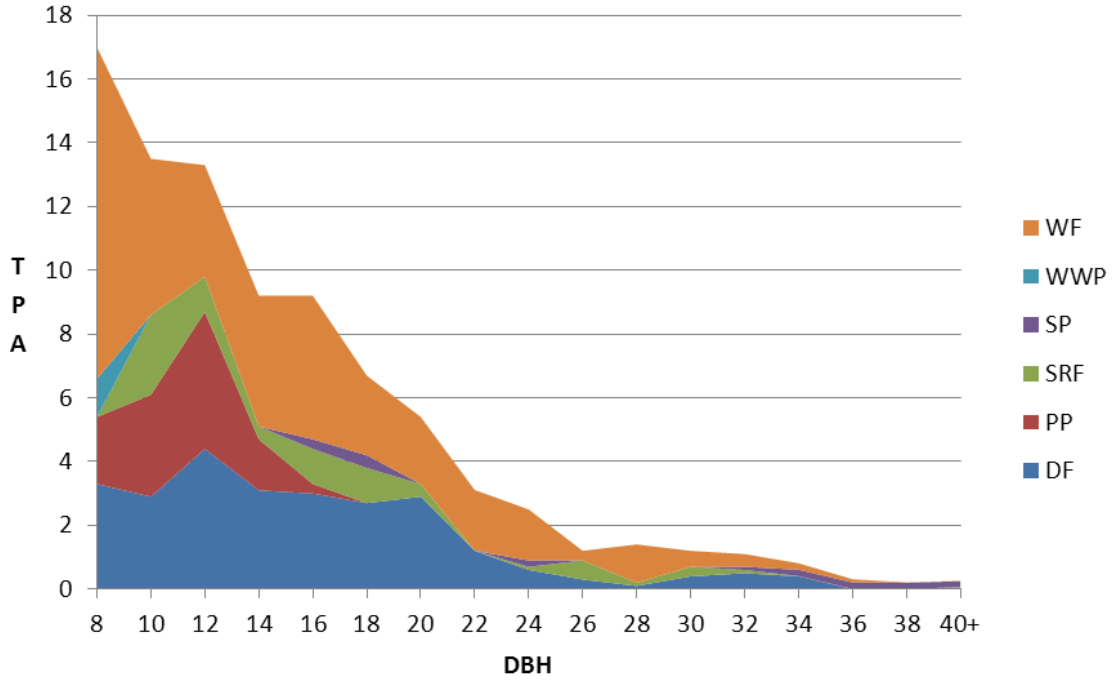
susceptible to insect and disease mortality. Neither of these insects is at epidemic levels, however, drought conditions could cause high levels of mortality, especially in overcrowded stands.

There is evidence of white pine blister rust on the western white pine and sugar pine in the project area which was found to be one of the most impacting diseases on the watershed (Spencer Creek Pilot Watershed Analysis 1995). There are a number of root rots in the project area as well, (*Phellinus weirii, Heterobasidion annosum*, and *Armillaria ostoyae*) however they are generally found in small, localized pockets.

Forested plant communities in the project area are generally categorized as being part of the moist plant association group of the White Fir-Grand Fir series by Simpson (2007) for the Oregon East Cascade region. Plant communities in the EA project area are within those plant associations described by Hopkins (1979) for the Klamath Ranger District, Winema National Forest and by Atzet and McCrimmon (1990) for the Southern Oregon Cascade Mountain Province.

According to stand exams of the proposed density management treatment units within the project area (approximately one plot every ten acres) there is a high variability between and within treatment units. The average stand has a basal area between 70 and 170 square feet/acre and trees per acre between 20 and 120. The dominant species (by BA) within these stands is Douglas fir, followed by white fir and sugar pine. Stand density indices (SDI) for these stands range from 130 to almost 500, with the majority falling between 200 and 300. The data shows an average of 1.8 snags (standing dead trees) per acre less than 20" diameter at breast height (DBH), and 0.8 snags per acre greater than 20" DBH. The area has an average of 278 linear feet of downed woody debris per acre greater than 20 feet long. The average canopy cover for the density management treatment units within the project area is 75%. Species and size distribution data is available in Figure 8. Additional information is available by unit in Appendix D.

Figure 8: Average size and species distribution of density management treatment units

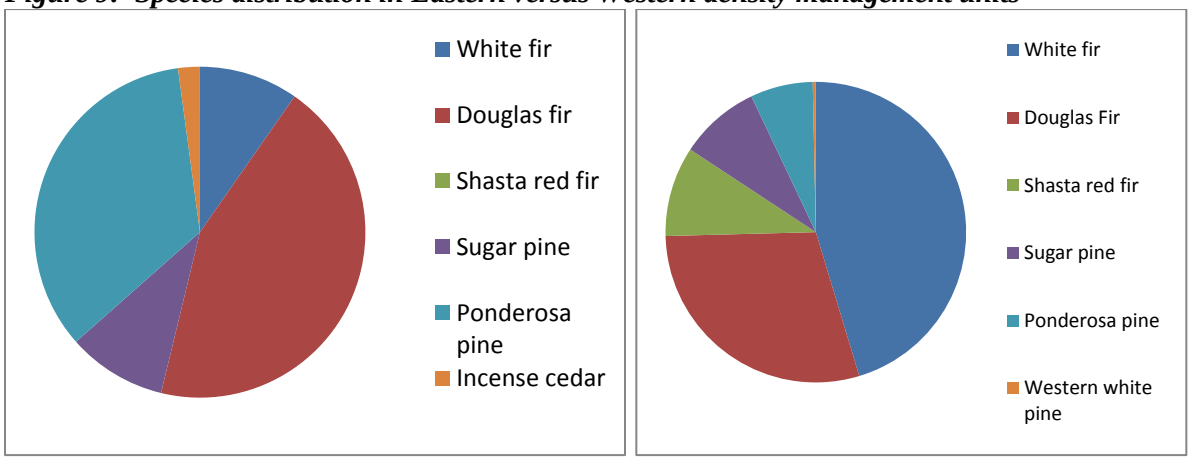


Note: (WF= White Fir, SRF= Shasta Red Fir, DF= Douglas-fir, PP= Ponderosa Pine, SP=Sugar Pine and WWP= Western White Pine)

The density management units on the east side of the analysis area (21-1, 22-1, 23-1 ,26-1, 35-1, 35-2, 35-3), vary from 4200 to 4500 feet in elevation, are primarily on a south facing slope and tend to be drier than the units further west. These units are dominated by Douglas-fir and ponderosa pine and have a much lower proportion of white fir than the units further west. Density management treatment units on the west side of the project area (21-2, 4-1, 6-1, 6-2, and 33-2) vary from 4,500 to 5,700 feet in elevation. These units are primarily

on east facing slopes (21-2, 33-2 and 4-1) or knobs (6-1 and 6-2) and tend to be more moist and true fir dominated, than the units to the east. The species composition of the eastern units is very similar to historical species composition (Leiberg 1900) which suggests that the units on the western side of the analysis area have increased levels of white fir encroachment as a result of past management or disturbance (See Figure 9).

Figure 9: Species distribution in Eastern versus Western density management units



Eastern density management units **Western density management units**

The Lower Spencer Creek district designated reserve (DDR) (stands 27-1 and 27-2) is made up primarily of white fir, Douglas fir, ponderosa pine and sugar pine. The majority of the unit is a dense stand (BA between 100 and 230 sq. ft./ac.) of primarily second growth white fir. It is a three-story stand with an average canopy closure of 88%. Snags and coarse woody debris are represented well above 1995 RMP levels throughout the stand. Species composition and stand structure in stand 27-2 is similar to stand 27-1. It is a dense stand with a thick layer of understory trees.

Units 6-3 and 19-1 consist of stands that are a mix of aspen trees, aspen sprouts, and conifers. Units 33-1 and 15-1 are plantations and Units 25-1, 25-2, 25-3 and 30-1 are former shelterwoods. The plantations are primarily sub-merchantable trees (<8") that would benefit from thinning in the next 10 years. Stands resulting from the previous shelterwood cuts currently have thick understories of sub-merchantable trees.

The coniferous forest overstory at the lower elevations of the analysis area, generally below 5,300 feet of elevation, consists mainly of ponderosa pine, Douglas-fir, white fir, sugar pine, and incense cedar, which historically had a mean fire return interval of approximately 12 years (USDA 2012). The coniferous forest overstory in the upper elevations of the analysis area, generally above 5,300 feet of elevation, consists mainly of Shasta red fir, white fir, and western white pine and historically had a mean fire return interval of approximately 26 years (USDA 2012). This forest type has highly variable mean fire return intervals and fire characteristics depending on site characteristics such as aspect and position on the slope, and historically experienced a mix of surface and stand replacement fires, and at a less frequent rate than the lower portions of the analysis area.

The Spencer Creek watershed averages approximately six wildfires per year (Spencer Watershed Analysis pages 4-22). Initial attack of these fires has been very successful, with over 99% contained at size class A (0-1/4 acre) or B (>1/4 acre, <10 acres). The largest recorded wildfire was the Big Buck fire which was contained at 67 acres in the early 1990s. Wildfires that do escape initial attack in the vegetation types listed above typically result in a stand replacing fire.

Special Status Plant Species (Survey and Manage, Bureau Sensitive, Assessment, and Tracking)

Vascular Plants

Much of the proposed project area was surveyed for botanical resources between 1989 and 2006. During the 2010 field season, approximately 4,500 additional acres within the project area were surveyed for special status vascular plant species in anticipation of future projects. Mountain Lady's-Slipper Orchid (*Cypripedium montanum*), a Survey & Manage "C" List species was found within the project area in Unit 35-1 during

botanical surveys in 2010. The recommended management for *C. montanum* is to maintain the current microclimate conditions of the habitat by avoiding direct mechanical damage to plants, avoiding changes in soil moisture and temperature as well as the nature of the duff layer. Overstory canopy cover at 60% or more should be maintained to prevent increased sunlight to the site (Seevers and Lang 1998).

Special Status Nonvascular Plants

There are no documented Special Status nonvascular plants in the Klamath Falls Resource Area. All Survey & Manage species that may be found within the Lost treatment area are designated as Category "E" species, which the 2001 ROD and the 2011 Settlement list indicate that pre-disturbance surveys are not needed.

Fungi Survey and Manage

According to the 2001 ROD, surveys for fungi are not required in treatment areas of low disturbance. The Survey & Manage Conservation Assessment for Fungi (Cushman & Huff 2007) states that manual understory thinning and pile burns should not negatively affect fungi growth due to potentially extensive mycelial networks. Therefore, surveys for fungi are not needed for 25-1 and 25-1R treatment areas.

Noxious Weeds

Several populations of noxious weed species are located on BLM lands within the project area. Weed populations are mostly located in roadside habitats or past harvest units, and are primarily associated with physical disturbance. The following noxious weeds were found in the project area during botanical surveys:

Klamath Weed (*Hypericum perforatum*) approximately 1 acre
Dalmation toadflax (*Linaria dalmatica*) approximately 2,040 ft^2
Canada thistle (*Cirsium arvense*) approximately 320 ft^2

The Oregon Department of Agriculture Noxious Weed Control Policy and Classification System for 2011 classifies these three species as "B" designated weeds which is a weed of economic importance which is regionally abundant, but which may have limited distribution in some counties.

Vegetation - Environmental Consequences

Units in this section are grouped according to stand types and are described as DDR (27-1 and 27-2), eastern units (21-1, 23-1, 26-1, 35-1, 35-3, and 35-4) and western units (21-2, 4-1, and 33-2).

Density management treatment prescriptions are described in detail in Appendix D. In general these treatments are designed to promote shade intolerant species, maintain a multistoried stand, and to improve forest resiliency to fire, insects and disease by reducing stand density. Prescriptions are site specific and based on stocking guidelines taken from Cochran et al. 1994 and Cochran 1998. These stocking guidelines were recommended by the local pathologist. Recommendations for the eastern stands are to maintain a growth basal area (GBA) between 69 and 104 sq. ft./ac. and an SDI between 123 and 185. Recommendations for western stands are to maintain a GBA between 86 and 129 sq. ft./ac. and an SDI between 220 and 330. These guidelines will maintain the stand at a low enough density to reduce the risk of density-dependent mortality due to insects and disease, especially in the instance of a drought.

In some of the stands in the western units, the prescription calls for leaving densities at or above 140 sq. ft./ac. in order to maintain NRF habitat. These prescriptions will have very few benefits for the residual stand as a whole. These units are dominated by true fir, which are susceptible to fir engraver beetle. The density will remain above silviculturally-recommended levels thus leaving the stand vulnerable to large amounts of insect mortality in the instance of a drought. There would be some benefits for individual remaining trees, especially large legacy pines, when density is reduced in their immediate area.

Forest Vegetation Simulator (FVS) was used to model a 100 year period with specific treatments repeating every 30 years. The No Action Alternative does not model any treatments within the 100 year period. Eastern

units were modeled to retain an average residual basal area of 100 sq. ft./ac. and the DDR and other western units were modeled to retain approximately 120 sq. ft/ac. There are two units (35-2 and 6-2) that are primarily pine that were modeled to retain a residual basal area of 80 sq. ft./ac. Model output is generally the same for Alternatives 1 and 2, so general trends are described under Alternative 1 and compared to Alternative 3 and the No Action Alternative. Units where the proposed treatments did not vary between alternatives were not modeled. This model is used to compare different treatments as applied to the same stands. It is not intended to provide accurate quantitative estimates of forest metrics, either post treatment or in the future.

Upland Forest

No Action

This alternative would mean no immediate timber harvest in the project area. Modeling for treatment units in the action alternatives shows that, without any treatments, an increase in residual volume, basal area, stand density index (SDI) and canopy cover would occur in all units. As a result of this, mortality would also increase. The western units would continue to be dominated by white fir, while shade intolerant species decrease. In the eastern units, Douglas-fir remains the dominant species. In areas with a large pine component, increased density dependent stress would increase the amount of mortality that could be caused by pine beetles.

In all units, overall growth would be reduced as competition for common resources (water, light and nutrients) increases. Stand density in the western units would increase for about 30 years before it hits maximum stand density and stays constant. In the patchier, eastern units, stand density would increase for about 50 years before it begins to level off.

In the DDR, modeling shows that while the average tree diameter increases over time, high densities severely reduce understory, creating a single story of older trees. In both the eastern and western units, average tree diameter of the stand increases about 2-3 inches but begins to decline again within the 100 year period due to mortality of larger trees. Mortality is higher and overall growth is lower in this alternative when compared to action alternatives. These units are at especially high risk from insect infestation as the trees would be overly dense, and therefore stressed, and more vulnerable to mortality from insect attack.

Unit 6-1 is a single storied, dense, second growth white fir stand and FVS modeling shows that this alternative would maintain it in the same condition for the next 100 years. The SDI of the stand would remain high enough to cause high levels of density dependent mortality. This stand is at especially high risk from insect infestation as the trees are overly dense, and therefore stressed and more vulnerable to mortality from insect attack.

Forest stands would grow denser making them more susceptible to insect and disease attacks and increasing density dependent mortality. Mortality from insects is expected to continue, resulting in increased fuel loadings of dead material, both standing and ground level. This would potentially increase the severity of any wildfire that would take place. This is especially true in the western units and the DDR where white fir is the dominant tree species. In the eastern units, although stand density is lower than other units, it would still reach higher levels of tree density than are optimum for drier sites.

This alternative would fail to improve resiliency to insects and disease, reduce fuel loading, restore fire dependent processes, restore historic stand structure, and promote historic stand composition.

Cumulative Effects of No Action

Considering the 5th field watershed scale, the greatest vegetation change would be, and has been, on private lands. Industrial forestry (private land) objectives involve shorter rotations resulting in a higher percentage of early seral habitat. Even-aged management on private lands usually results in young stands of seedlings, saplings and pole-sized material, typically ponderosa pine. Over time, these stands generally develop into a mosaic of even-aged ponderosa pine stands distributed over the landscape with scattered natural second growth. Although some of the BLM units have been previously thinned, BLM forest lands in the area would continue as relatively dense stands, with increased mortality from bark beetle attack, resulting in an increased amount of forest fuels. The risk of stand replacing fires on these lands would also continue to increase.

Alternative 1

Density management effects are similar for Alternatives 1 and 2, but vary from Alternative 3.

Density management thinning would increase the health and resiliency of the remaining trees by reducing the competition for limited resources, work towards restoring desired species composition to that described in the RMP (page E-10), and reduce the risk of stand replacement fire. Canopy closure, volume and basal area would be reduced by density management treatments but an uneven-aged structure would be retained, thereby meeting numerous ecosystem functions.

In modeling the eastern units, despite the initial reduction in canopy cover from tree removal, over the model period the results show that there is no variation in percent of canopy cover 100 years following harvest in any of the action alternatives from the current condition. In the western units, there is no difference in percent of canopy closure between Alternatives 1 and 2.

In both the eastern and western units, Alternatives 1 and 2 have a higher volume removed in both the short term and long term when compared to Alternative 3. This means that a lower residual volume remains post-harvest under Alternatives 1 & 2. These alternatives also provide higher growth rates, basal area (BA) and stand density index (SDI) for the western units when compared to Alternative 3. In the eastern units, the growth rate is higher in this alternative, but residual SDI and BA are higher in Alternative 3.

Some of the density management units would be thinned to a lower BA because they are primarily pine (Units 35-2 and 6-2). Thinning these units to 80 BA would reduce overall stand growth, canopy closure, BA, SDI and residual volume when compared to the No Action Alternative. This alternative would promote large trees and a multistoried structure. Since these units are primarily pine, maintaining them at this lower BA would reduce competition and therefore reduce potential bark beetle damage (Andris Eglitis 2000, Cochran 1994).

Several units (33-2, 33-2R, 4-1 and 4-1R) would be managed so that the residual stand remains at a higher basal area (140 sq. ft./ac.) in order to retain canopy closure for the Northern spotted owl. This treatment allows for very few trees to be removed and would maintain a higher density and canopy closure than the prescription in Alternative 2. The residual stand would remain above silvicultural stocking recommendations for this type of stand and consequently be at a higher risk from mortality due to insects and disease.

Culturing of large legacy pines and Douglas-fir would reduce competition and stress while increasing tree resiliency to fire and insect and disease attacks. This process would be implemented and combined with other density management treatments in most of the units that are treated under this alternative.

Thinning the conifers in the aspen units would reduce competition for resources for the residual aspen and encourage the aspen to spread throughout the stand. Fencing around the aspen stand to exclude grazing is a mitigation measure to promote aspen growth which may be implemented post-harvest. In the past when material left on the ground has been burned, residual aspen trees have been damaged. The amount of material on the ground will be evaluated post-harvest to determine whether burning residual material would be beneficial to the residual stand.

Thinning from below would reduce ladder fuels and density in riparian areas, plantations and former shelterwood units. Canopy closure of overstory trees is unlikely to be affected by thinnings in riparian reserves and former shelterwood units, however overall mid- and lower canopy closure (including small trees) would be reduced. Canopy closure would not be reduced below 50% in plantations with planned thinnings. Reducing density would reduce mortality and increase growth in the residual stand.

The treatment proposed for the DDR (1995 RMP) would be similar to the density management treatments in the western units. Patch cuts would allow for treatment of root rot pockets and encourage the development of a multistoried stand containing higher proportions of shade intolerant species (pines, Douglas-fir, and incense cedar). After they are harvested, these areas would be planted to ensure that shade intolerant species repopulate the units. When compared to Alternative 3 or the No Action Alternative, the prescription of this alternative

would treat more components of the stand and reduce density dependent mortality and mortality due to insects and disease to a higher degree. When compared to Alternative 2, this alternative would treat less of the stand, resulting in greater mortality in the untreated areas. This method of treatment would promote structural diversity within the stand more quickly than letting the heterogeneity within the stand develop by itself compared to Alternative 3 and No Action (USDA-FS 2002). This treatment is also recommended by the LSRA (USDI-BLM 2003).

Patch cuts, in unit 6-1 would allow for treatment of root rot pockets and encourage the development of a multistoried stand containing higher proportions of shade intolerant species. After they are harvested, these areas would be planted to ensure that shade intolerant species repopulate these units. This treatment would have little effect on the overall stand. Only 15% of the stand would have patch cuts, so the remaining 85% would continue along the same trajectory as the units in the No Action Alternative. The average tree size would be reduced over the 100 year period as trees are harvested and smaller, regenerating trees increase. Overall stand mortality would decrease with this treatment as some of the projected mortality would be captured by the creation of the patch cuts. Mortality is expected to remain high for this unit in all alternatives, however, because very little of the overstocked unit is being treated. Stand growth would decrease initially, but would increase to greater than the No Action Alternative as regeneration advances in the patch cut areas.

The treatments proposed under this alternative would improve resiliency to insects and disease, reduce fuel loading, restore fire dependent processes, restore historic stand structure, promote the development of historic stand composition, and benefit the long-term creation of late successional habitat. Effects to forest vegetation from implementation of this alternative would not exceed those analyzed in the KFRA FEIS.

The canopy bulk density would be reduced by timber harvest and thinning activities. Surface fuels and ladder fuels would be reduced, and the canopy base height would be increased through the use of prescribed fire in selected units. These treatments have the combined effects of reducing the likelihood of a wildfire transitioning to a crown fire, thus increasing fire suppression effectiveness, and decreasing wildfire severity.

Cumulative Effects of Alternative 1

The Spencer Creek Pilot Watershed Analysis (1995) describes the events that contributed to the current condition such as early hunting/gathering by aboriginal inhabitants, mining, road building, agriculture and water diversions, wildfire, and timber harvest. Forested vegetation zone descriptions can be found on pages 2.5 through 2.6.

Potential future harvesting and fuels treatments on BLM lands within the watershed would have similar impacts on the timbered stand density and canopy closure as described for the alternative above. These types of actions were analyzed for the Matrix and Riparian Reserve land use allocations in the FEIS (Biological Diversity 4-24 to 4-32, Ecosystem Health 4-32 to 4-33, Vegetation Management 4-35-4-4). Thinning of timber stands would affect the relative abundance of tree species in a stand, but would not affect the overall diversity of species across the landscape. Lower levels of stand density and the use of prescribed fire would result in higher vigor of individual plants and an increase in community and ecosystem stability. Density management proposed under the RMP would contribute to the improvement of forest resiliency. The potential future actions mentioned would be within the range of effects described in that FEIS analysis. The potential future recreation and road actions should have little to no effect on upland forest vegetation.

The effect of Alternative 1 on BLM lands, combined with future actions on private lands would result in no change in age or seral classification of stands on BLM lands within the watershed. Generally, the seral classification of BLM lands would remain mid to late seral as the structural and functional composition of the stands would be maintained after treatment. As stated above, the greatest change in vegetation would likely occur on private lands with an increased percentage of early seral habitat.

Alternative 2

The effects of the density management treatments under this alternative would be similar to the effects under Alternative 1. The primary difference would be in the amount of acres harvested under this alternative as

compared to Alternative 1, although some units (33-2, 33-2R, 4-1 and 4-1R, 27-1, 27-1R) would be cut to a lower basal area than in Alternative 1. This treatment would result in a lower density and canopy closure than the prescription in Alternative 1 which would bring the stands within silvicultural stocking recommendations for these types of stands. The residual stand would be more resilient to insect, disease and fire mortality than same stands under Alternative 1, 3 or the no action alternative.

Under this alternative, the DDR described under Alternative 1, would be cut to a lower basal area than in Alternative 1. This would reduce mortality in the stand and leave a lower residual volume, basal area and canopy cover than would be left in Alternative 1. This treatment is likely to contribute more to stand vigor and resiliency than either of the other action alternatives or the no action alternative.

Studies referenced below demonstrate that in the portions of these stands that are made up primarily of second growth white fir, a variable density prescription is more likely to promote late-successional characteristics in the long term (Lindh and Muir, 2004; Tappiner et al., 1997; USDA-FS, 2002; Latham and Tappeiner, 2002; Wilson and Puettmann, 2007) than letting them develop on their own over time. The same studies show that this type of prescription is more likely to promote forest resiliency than maintaining a dense, single storied stand.

Environmental effects on areas not harvested would be the same as those described under the No Action Alternative.

Environmental consequences of aspen restoration, patch cuts and thinning from below would be the same as described under Alternative 1.

The treatments proposed under this alternative would improve resiliency to insects and disease, reduce fuel loading, restore fire dependent processes, restore historic stand structure, promote the development of historic stand composition, and benefit the long-term creation of late successional stands.

Cumulative Effects of Alternative 2

Overall, the cumulative effects of the treated acres in Alternative 2 would be similar to Alternative 1. The cumulative effects on the untreated acres reserved from harvesting and prescribed fire would more closely resemble the cumulative effects of the No Action Alternative. Potential future harvesting and fuels treatments on BLM lands within the watershed would have similar impacts on the timbered stand density and canopy closure as described for Alternative 1 and would be within the range of effects described in the FEIS (referenced above). Potential future recreation and road actions would have little to no effect on upland forest vegetation.

Alternative 3

The density management treatments within this alternative restrict removal of trees of shade intolerant species (ponderosa pine, sugar pine, western white pine, incense cedar, and Douglas-fir) to those less than 20 inches DBH.

In the eastern units and Unit 6-2, the target basal area is the same with this alternative as with Alternatives 1 and 2, thus modeling predicts that this harvest regime is not sustainable. Although some material could be removed in the first projected harvest, the second harvest entry utilizing this prescription would remove essentially all the remaining trees less than 20” DBH, leaving few to no trees available for harvest for future entries. Furthermore, the units would be converted to a single story stand of large trees rather than the multistoried stands they currently are and as prescribed in both the 1995 and 2008 RMPs. The first and second entries would be likely to reduce the risk of mortality due to insects and disease because the stands would be reduced to the recommended stocking levels. If the units were not harvested in the third and fourth entries, the risk of mortality is likely to increase.

In the western units and unit 35-2, the model indicates that the parameters of the prescription cannot be met with the applied diameter limit. The stands cannot be harvested to the target basal area because there are not enough white fir or shade intolerant trees less than 20” DBH available to cut in order to reduce the basal area to

the target limit. Implementing this prescription would leave the units at higher than the recommended silvicultural stocking level, leaving them at a higher risk to insect and disease mortality than the same units would be in Alternative 1 or 2.

Thinning to 80 BA (Units 35-2 and 6-2) would reduce overall stand growth, canopy closure, BA, SDI and residual volume when compared to the No Action Alternative. However this alternative would eliminate most of the smaller size class trees, eventually leaving a single story of large trees.

Under this alternative, volume removed from these units over a 100 year period is approximately 22% (eastern units) to 72% (western units) of the volume projected to be removed in the density management treatments from Alternatives 1 and 2. The model predicts that since most of the smaller diameter trees are removed during the first and second entries, there would be little to no volume to remove during the third and fourth harvest entries. Both thinning from below and aspen restoration treatments would be similar to what is described in Alternatives 1 and 2. The only variations are in the total acreage of the treatments, and in some treatments, shifting from mechanical to manual treatment/harvest.

The DDR density management treatment proposed in this alternative would have similar consequences to the treatment described in Alternative 1. In the patch cuts however, a diameter limit would result in more residual trees and subsequently greater overstory canopy closure than in Alternative 1. This would impact available sunlight and corresponding growth of planted shade intolerant species and would likely favor shade tolerant species (white fir) for regeneration within the patch cut. Although this would still contribute to the development of a multistoried stand, it would not promote shade intolerant species thereby not fully meeting the objectives of implementing patch cuts.

The patch cuts proposed in Unit 6-1 would have similar effects to Alternative 1. Slightly more trees would be left in the patch cuts due to the restrictions on cutting shade intolerant trees >20" DBH. This may have a slight negative effect on the success of the planted trees within the patch cuts. This alternative would leave a higher volume, basal area, SDI and QMD than alternatives 1 and 2 due to the removal of many of the smaller trees. Mortality is expected to remain high for this unit in all alternatives. The treatments proposed under this alternative would improve resiliency to insects and disease damage, reduce fuel loading, restore fire dependent processes, restore historic stand structure, promote the development of historic stand composition and benefit the long-term creation of late successional stands in the eastern units. In the western units, these treatments would result in a much lower improvement in resiliency to insects and disease, reduced fuel loading, providing restoration of species composition, stand structure or historic processes.

Cumulative Effects of Alternative 3

Overall, the cumulative effects and potential future harvesting and fuels treatments on BLM lands within the watershed would be similar to Alternative 1 for the eastern units and similar to the No Action Alternative for the western units. Both of the actions were analyzed for the Matrix and Riparian Reserve land use allocations in the FEIS (referenced above), and the potential future actions would be within the range of effects described in that FEIS. Potential future recreation and road actions would have little to no effect on upland forest vegetation.

Assessment of 15% Standard and Guide

All Action Alternatives

The Northwest Forest Plan and the 1995 KFRA RMP state that federal agencies must retain on federal lands a minimum of 15 percent of the late successional forests within a fifth field watershed (KFRA/RMP page 23). Guidance from the Regional Ecosystem Office (Feb. 3, 1998) indicates that the 15 percent standard and guide applies only to commercial forest lands. At a minimum, agencies should implement the 15 percent standard and guide on the lands they manage within the watershed until further guidance is adopted. According to the Spencer Creek Pilot Watershed Analysis, 25% of federal land was in late successional habitat in 1995. Currently 86% of all federal land in the watershed is in late successional habitat. 79% of all BLM land and 89% of all USFS land is in late successional habitat (See Appendix E for definitions). The proposed treatments in all action alternatives would meet this requirement. See Appendix F for a definition of the BLM methodology for

determining stand age. Refer to Table 5 for age classes on BLM land in the watershed and seral classes of treatment units.

Special Status Plant Species (Survey and Manage, Bureau Sensitive, Assessment, and Tracking)

No Action Alternative

No direct or indirect impacts to Special Status plant species are anticipated from implementation of the No Action Alternative within the proposed project area. This alternative would not disturb or modify the current habitat conditions for the plants.

Cumulative Effects of No Action

Past harvest on BLM lands within the Spencer Creek watershed has occurred on approximately 2,342 acres. The adjacent private lands are predominately in early seral stages and provide little suitable habitat for special status plant species. Current and foreseeable future activities in the project area are expected to be similar to past activities on public lands, but will vary in scale and intensity. The BLM would continue to implement management actions using Project Design Features (PDFs), Best Management Practices (BMPs), and other mitigating measures to reduce potential impacts to resources, including protecting Special Status vascular and nonvascular plant populations. Impacts to Special Status vascular and nonvascular plants could occur as a result of unplanned events such as wildfire, recreation, trespasses, or noxious weed invasion.

Alternatives 1, 2, and 3

The area containing the documented population of *Cypripedium montanum* would be buffered to protect against potential impacts during thinning operations, such as equipment passing through the area. Buffer sizes would be determined on a site-by-site basis and will vary depending on species and environmental requirements, proposed treatments, and site conditions. Buffers would protect the Special Status plants from potential impacts.

Special status plant populations could be indirectly affected by competition from noxious weeds potentially introduced during timber harvest activities. Equipment could introduce or spread weed seeds or parts in the project areas. Ground disturbance and removal of overstory canopy leaves areas open to establishment by noxious weeds. To minimize the risk of introducing or spreading noxious weeds during and after project implementation, mitigation measures and other strategies were developed (see Appendix B, Noxious Weed section below).

Cumulative Effects of Alternatives 1, 2, and 3

Cumulative effects on special status species were analyzed in the FEIS pages 4-67 to 4-70. Past harvest on BLM lands within the Spencer Creek watershed has occurred on approximately 2,342 acres. The adjacent private lands are predominately in early seral stages and likely provide little suitable habitat for special status plant species. Current and foreseeable future activities in the project area are expected to be similar to past activities on public lands, but will vary in scale and intensity. The BLM would continue to implement management actions using Project Design Features (PDFs), Best Management Practices (BMPs), and other mitigating measures to reduce potential impacts to resources, including protecting Special Status vascular and nonvascular plant populations. This would be done by surveying prior to project implementation and designing protection measures (avoidance). Impacts to Special Status vascular and nonvascular plants could also occur as a result of unplanned events such as wildfire, recreation, trespasses, or noxious weed invasion.

Noxious Weeds

No Action Alternative

Under the No Action Alternative, there would be no direct change to populations of noxious weeds. BLM would continue to implement a noxious weed control program, including documenting, treating, and monitoring noxious weeds through an integrated weed management plan. A modest increase in noxious weed infestation would be expected in areas where noxious weeds are not currently identified due mostly to vehicle travel along roads.

Cumulative Effects of No Action Alternative

Past and future timber management projects on BLM and adjacent non-BLM lands have the cumulative effect of likely increasing the presence and spread of noxious weeds in the watershed. Effects include decreasing diversity of native plants in the area, negatively impacting the forage for grazing activities (undesirable forage), and negatively impacting wildlife forage in the area. These effects would continue to occur even if the No Action Alternative is selected. Ongoing activities in the project area such as vehicle travel, recreation, livestock grazing, and road development and maintenance on BLM and adjacent non-BLM lands would continue to create suitable conditions and avenues for the introduction and spread of noxious weeds. The BLM would continue to implement a noxious weed control program, including documenting, treating, and monitoring noxious weeds through an integrated weed management plan.

Alternatives 1, 2, and 3

The actions proposed in these alternatives could result in a greater increase in noxious weeds than the no action alternative. This would be caused by the use of heavy machinery which results in ground disturbance and the transport and embedding of weed propagules throughout the project areas. However, the implementation of the Project Design Features (PDFs) and Best Management Practices (BMPs) listed in Appendix B would reduce or prevent the spread or introduction of noxious weeds in the project area. In addition, the BLM would continue to implement a noxious weed control program, including documenting, treating, and monitoring noxious weeds through an integrated weed management plan.

Cumulative Effects of Alternatives 1, 2, and 3

Past and future timber management projects on BLM lands and non-BLM lands could have the cumulative effect of increasing the presence of noxious weeds in the watershed. The effects on vegetation including noxious weeds are discussed in the FEIS (pages 4-35 to 4-40). Potential future harvesting, fuels treatments, recreation, livestock grazing, and road actions on BLM and adjacent non-BLM lands in combination with the proposed alternatives would have the cumulative effect of increasing noxious weeds in the project area. However, the implementation of the PDFs and BMPs listed in Appendix B would reduce or prevent the spread or introduction of noxious weeds in the project area. In addition, the BLM would continue to implement a noxious weed control program, including documenting, treating, and monitoring noxious weeds through an integrated weed management plan.

Terrestrial Wildlife Species – Affected Environment

This section focuses on those species considered special status species that may be affected by management activities. These will include species listed under the Endangered Species Act (ESA - listed, proposed and candidate species), species listed under the BLM special status species policy as Bureau Sensitive, species classified as Survey and Manage under the 2001 S&M ROD, and land birds classified as Species of Concern by the U.S. Fish and Wildlife Service (USDI FWS 2008a).

Table 6 is a list of terrestrial wildlife species that may be affected by the proposed actions and were considered during the analysis for this EA. A complete list of BLM Special Status Species that occur on the Lakeview District, Klamath Falls Resource Area may be found at http://www.fs.fed.us/r6/sfpnw/issssp/agency-policy.

Table 6: Special status species in the project area potentially affected by proposed actions

Type	Common Name	Scientific Name	Status	Key Habitat Association within the KFRA	Comments
Bird	Northern Spotted Owl	*Strix occidentalis caurina*	Federally Threatened	Foraging- Mature/Late Successional Mixed Conifer Nesting – Mature/Late Successional Mixed Conifer	Project units are w/in four known nest territories surveyed. Project area is not within 2008 Designated Critical Habitat. No critical habitat within Spencer Creek watershed.
Bird	White-headed Woodpecker	*Picoides albolarvatus*	BLM Sensitive FWS BCC	Forging - Large Ponderosa Pine Nesting – Large Snags	Documented within the Project Area
Bird	Great Gray Owl	*Strix Nebulosa*	S&M	Foraging – Natural Openings or Meadows Nesting – Mature Forests	Surveys conducted w/in the commercial timber harvest area. Great gray owls detected, no nests found.
Bird	Northern Goshawk	*Accipiter gentilis*	No Special Status	Foraging -Mature Mixed Conifer Nesting – Mature Mixed Conifer	Historic sites in the project area, but not in proposed units.
Bird	Flammulated Owl	*Otus flammeolus*	FWS BCC	Foraging -Open Mixed Conifer Nesting - Snags	No systematic surveys have been conducted. May occur in the project area
Bird	Bald eagle	*Haliaeetus leucocephalus*	BCC, eagle protection act	Foraging-Near water Nesting- large trees and large snags	One nest in unit 27-2. Seasonal restriction required Jan 1- Aug. 31annually
Mammal	Pacific Fisher	*Martes pennanti*	BLM Sensitive Federal Candidate	Mature complex mixed conifer forest	Historically occurred within the watershed. Surveys conducted, no Pacific fisher detected.
Mammal	Pallid Bat	*Antrozous pallidus*	BLM Sensitive	Roosting – Primarily caves, rocks but may use large snags	Surveyed - Documented in the Spencer Creek watershed
Mammal	Fringed Myotis	*Myotis thysanodes*	BLM Sensitive	Roosting – Primarily caves, rocks but may use large snags	Surveyed - Documented in the Spencer Creek watershed
Terrestrial Mollusk	Evening Fieldslug	*Deroceras hesperium*	BLM Sensitive S&M	Moist forest in low vegetation, litter, debris, rocks. Priority habitat is considered forested habitat within 30 m (98 ft.) of perennial water (USDA/USDI 2003).	Timber harvest area has been surveyed for S&M terrestrial mollusks as per current protocol. No S&M mollusks were found.
Terrestrial Mollusk	Crater Lake Tightcoil	*Pristiloma arcticum crateris*	BLM Sensitive S&M	Moist to wet sites such as riparian areas, near springs, wetlands and mountain meadows. Priority habitat is considered forested habitat within 10 m of perennial water (USDA/USDI 2003).	Timber harvest area has been surveyed for S&M terrestrial mollusks as per current protocol. No S&M mollusks were found.
Terrestrial Mollusk	Chase Sideband	*Monadenia chaceana*	BLM Sensitive S&M	Talus and rock slides in and adjacent to conifer and oak woodlands. It may be found within 30 m (98ft.) of rocky areas, talus deposits and in associated riparian areas in the Klamath physiographic province (USDA/USDI 2003).	Timber harvest area has been surveyed for S&M terrestrial mollusks as per current protocol. No S&M mollusks were found
Terrestrial Mollusk	Oregon Shoulderband	*Helminthoglypta hertlieni*	S&M	Within rocky habitat, the species is associated with herbaceous vegetation and deciduous leaf litter, generally within 30 m. (98 ft.) of stable talus deposits or other rocky areas in shrub lands or rocky inclusions in forest habitat (USDA/USDI 2003).)	Timber harvest area has been surveyed for S&M terrestrial mollusks as per current protocol. No S&M mollusks were found.

FWS BCC – U.S. Fish and Wildlife Service Birds of Conservation Concern 2008
S&M – Survey and Manage Species included in the Standards and Guidelines in the 2001 S&M ROD
BLM Sensitive – Those Species considered By the Bureau of Land Management as a sensitive species
Federally Threatened – Those Species listed under the Endangered Species Act as Threatened

Threatened and Endangered Species

Northern Spotted Owl (*Strix occidenatlis caurina*) - Federally Threatened

Known sites within the project area and their status

There are four northern spotted owl (hereinafter "spotted owl") sites that may be affected by the proposed projects. Only one of the sites has been occupied in the past three years (Table 8). Three of the four have documented nests within the sites; the other (Spencer Creek, MSNO 2390) was identified by an activity center of owl use.

Under the 1995 RMP three of the spotted owl nest sites have an existing 100 acre District Designated Reserve (DDR) around the nest area. Two of the DDRs are buffered by approximately ¼ mile. Although the buffer area (DDRB) is still classified as matrix lands available for timber harvest the management is typically altered to maintain and enhance late-successional habitat and old growth forest stands which serves as habitat for late successional species, including the spotted owl (1995 RMP, p. 23).

Table 7: Special area designations under 1995 RMP and NWFP and proposed treatment units.

Special Area Name	Spotted Owl site?	NWFP 100 acre UMLSR?	1995 RMP DDR?	1995 RMP DDRB?	Proposed Units Within Special area
Miners Creek	Yes	Yes	Yes	Yes	6-1 partially in DDRB (the portion that's in sect.5)
East Miners Creek	Yes	Yes	Yes	No	None
Surveyor North	Yes	No	No	No	None
Spencer Creek	Yes	Yes	Yes	Yes	None
Lower Spencer Creek	No	No	Yes	Yes	All units in Sect. 27 are in the DDR

Table 8: Status of Spotted Owl Territories over the past six years

Master Site No.(MSNO) and Site Name	2005	2006	2007	2008	2009	2010	2011
3252 EAST MINERS CREEK	S	P	S	NO	NO	NO	NO
2065 MINERS CREEK	S	BO	S; BO	S; BO	BO	NO; BO	NO; BO
2390 SPENCER CREEK	S	S	BO	S; BO	BO	NO	NO; BO
0103 SURVEYOR NORTH	NS	NS	P	P	1F	P	P; BO

(Note: NS- not surveyed; NO–surveyed no spotted owls detected; S–surveyed single spotted owl located; #F- number of spotted owl fledglings; P- pair of spotted owls; BO- barred owl present)

Spotted Owl habitat at the KFRA, watershed, site, and in project area scales

NSO suitable habitat is limited on KFRA lands within the range of the NSO in general. Additionally, the majority of the private lands intermixed with the BLM checkerboard ownership are currently early seral and have been planted in ponderosa and/ or lodgepole pine. These private stands, due to the lack of a significant Douglas-fir or a true fir component, will not provide suitable habitat for the spotted owl even if they were allowed to reach maturity.

Habitat conditions on BLM lands in the watershed are more hospitable. However, timber harvest, using a variety of prescriptions, over the last few decades of the 20th century has reduced the amount and quality of habitat for spotted owls from levels that likely existed prior to the 1950s or so. Based on the current tree species mix, and tree size classes present, and the presence of very large stumps in many stands, it appears that many of the stands in the watershed that are currently classified as suitable habitat for spotted owls probably were not suitable prior to European settlement. Many stands were open stands of large, scattered trees of a mix of conifer species at higher elevations, and primarily pine at lower elevations (Leiberg 1900). These open stands were likely not spotted owl habitat in their open state. Stands appear to have grown into a suitable habitat condition as shade tolerant tree species became established in the understory and the stands developed the multi-storied structure and species mix we classify as suitable habitat today. As stands were developing into suitable habitat, stands

were also being harvested with a variety of prescriptions. There are no stands in the project area that have not been subject to some level of past timber harvest. Because harvest prescriptions varied from stand to stand, the residual stands that resulted from the harvest are also quite variable. Big trees, decadent live trees, high canopy closure, snags, down wood, high stand density, and structural complexity are all attributes or components of suitable spotted owl habitat (Courtney et al., 2004). In general, harvesting trees affects these attributes and components in ways unfavorable to spotted owls in the short term. As time passes post-harvest, different attributes and components recover at different rates. Canopy closure may recover more quickly than stem density. Some components may take centuries to recover. For example, it may take several centuries to get old growth pine trees back in a unit if they are removed and a true fir understory is left to occupy the site.

For the last two decades or more, the BLM has generally managed stands in the watershed using uneven-aged management. However, prior to this time period, and to some degree during this time period, large live and dead trees were specifically targeted for harvest across large portions of the watershed and project area, either as part of sanitation salvage prescriptions or partial overstory removal prescriptions. The stumps of these dominant trees can be found throughout stands in the project area. Most trees of this size and age generally have significant disease and decay present and structural deformities that make them suitable spotted owl nest trees. The targeted harvest of these large, old "defective" trees has reduced the number of potential spotted owl nest trees within the project area and the watershed. Many stands in the watershed that are currently classified as roosting/foraging habitat would likely be classified as nesting quality habitat if these larger, older trees were still present.

The current uneven aged management strategy aims to leave substantial amounts of the pre-harvest stand structure components on site post-harvest. After harvest under this strategy, stands generally have trees of all size classes that were present in the pre-harvest stand, but generally have fewer trees in all or most size classes. Canopy closure is reduced, the species mix is shifted, stem density (basal area, and SDI) is reduced, and although the stand may still have multiple layers, the thickness or density of each layer, and overlap of the layers is generally reduced. The stands generally have fewer thick clumps of trees than they had before harvest. So, while most or all of the stand attributes and components important to spotted owl habitat are still represented in the post-harvest stands, most or all of them have been reduced or affected negatively from a spotted owl habitat perspective. Even in stands that have been harvested but retained sufficient habitat components and attributes to still be classified as "suitable", habitat quality is generally reduced to varying degrees in the short term, and possibly the long term depending on the attribute/component, and the degree of change caused by the harvest. The stands we see today in the project area are a result of what the previous harvests left behind, the growth potential of the site, and the passage of time.

Spotted Owl Habitat at the Resource Area Scale

Suitable habitat on BLM lands was classified in 1994 during the development of the 1995 Klamath Falls RMP. Table 9 below displays the habitat classification descriptions used by BLM and the USFWS for project planning and consultation on the KFRA.

Habitat loss on KFRA has been tracked through consultation with the USFWS since the 1994 classification. Habitat in-growth or regrowth during this period has not been documented, but is expected to be minimal because of the relatively short time period (18 years) since tracking was initiated. Modeling shows that the current stands proposed for harvest will return to their current density in less than 20 years. However, much of the previous harvesting that was done prior to 1995 was more intense (set stands back more) than post 1995 and presumably require more time to recover. Also, modeling only looks at a sub set of NSO habitat components. Even though a stand regains canopy closure and /or basal area in10-20 years that does not mean that it has recovered from all the other effects that the harvest had on stand structure, layering, clumpiness, etc. In 2012 the USFWS proposed to designate almost all of the KFRA lands north of State Highway 66 as Critical Habitat for the spotted owl. This proposal included a strong recommendation to perform an analysis of spotted owl habitat condition and arrangement within the proposed critical habitat (PCH). In preparing for this analysis the KFRA determined that it needed to reclassify the spotted owl habitat within the PCH. See Appendix C for a discussion of the process used and results from the 2012 reclassification effort. This new classification effort did not cover all KFRA lands within the range of the NSO so it cannot be used to discuss suitable habitat conditions across the

entire KFRA. In order to assess the habitat conditions at the scale of the entire KFRA within the NSO range we need to fall back to the 1994 classification.

On the entire KFRA, as of January 2012, there were an estimated 15,522 acres of suitable spotted owl habitat based on the 1994 classification. This total reflects the cumulative removal (or downgrading to dispersal habitat) of approximately 6,100 acres of suitable (NRF) habitat since 1994 due to management activities.

Table 9: Spotted Owl Habitat Descriptions

Spotted Owl Habitat
*Category 1 Habitat (NRF): Comprised of coniferous forest stands that satisfy the full complement of daily and annual needs of the owl for nesting, roosting, and foraging. These stands have a multi-layered canopy of several species of conifer trees with large trees in the overstory and an understory of conifers and/or hardwoods. Canopy closure exceeds 70%. There is a significant measure of decadence in the stand resulting in the occurrence of snags and broken topped live trees along with dwarf mistletoe infections. The forest floor has substantial accumulations of large down woody material in the form of fallen trees (USDI BLM 1994).
*Category 2 Habitat (NRF): Comprised of coniferous stands that provide roosting and foraging opportunities but may lack the necessary structure for consistent nesting or roosting. The roosting and foraging qualities are less than those described for Habitat 1 due to the reduced quality or complete absence of one or more of the components of Habitat 1 (for example the absence of large trees in the overstory, a reduced amount of down woody material on the forest floor, or a reduced canopy closure). Habitat 2 generally has less diversity in the vertical structure and has either limited or poorly defined multi-layer canopy structure. The understory may be somewhat open, allowing for owl movement and foraging. Canopy closure may or may not exceed 70% (USDI BLM 1994), but is above 60%. This 60% figure has historically been used by the USFWS and KFRA for consultation purposes, and is generally accepted as the minimum canopy closure for roosting/foraging quality habitat. It is also supported in the 2011 recovery plan and in research (Courtney et al. 2004).
Dispersal Habitat: Owls use Category 1 and 2 for dispersal but this category includes those other forested stands that facilitate spotted owl movement across the landscape. Generally canopy closure is 40% or greater (USDI BLM 1994).
Nest Patch: High quality habitat around the nest site. An important attribute for site selection for spotted owls. Typically a 300 meter radius around the nest site which equates to approximately 70 acres (USDI FWS 2008b).
Core Area: Area that provides the important habitat elements of nest sites, roost sites and access to prey. Typically a ½ mile radius circle around the nest.
Home Range: Extent of area used by a pair of spotted owls for annual survival. Typically a 1.2 mile radius circle around the nest in this physiographic province.
*Category 1 and 2 equate to suitable habitat for the spotted owl.

Suitable Habitat within the Spencer Creek Watershed

Of the 6,100 acres of removed or downgraded suitable habitat on KFRA lands since 1994 approximately 2,200 acres were within the Spencer Creek watershed. In 1994 there were 4,747 acres of suitable habitat on BLM lands in the Spencer Creek watershed. Currently there are 2,546 acres of suitable habitat on BLM in the watershed. This works out to a rate of reduction in suitable habitat of approximately 120 acres per year on BLM lands in the watershed since 1994.

In the 2012 reclassification, all of the KFRA lands within the Spencer Creek watershed were reclassified. For all discussions of habitat at the watershed scale or smaller in this document, the 2012 habitat classification is used. According to the 2012 classification the habitat available for spotted owls on KFRA lands in the Spencer Creek watershed are as displayed in Table 10 below.

Table 10: Spotted Owl Habitat on BLM lands in the Spencer Creek Watershed by Category and Classification

SHB CODE	OLD CLASSIFICATION		NEW CLASSIFICATION	
1	N	3028*	NR	872
2	RF	1717*	F	2318
3	D	3938	D	3755
4	Non	62	Non	1799

* Prior to subtraction for habitat down=graded or removed by management activities
N= Nesting, R= Roosting, F= Foraging, D= Dispersal, Non= Non habitat.

In looking at the above table, it is important to note that the values for SHB Class 1 and 2 habitats are not an "apples to apples" comparison across the two classifications due to differing habitat functional groupings within classes 1 and 2 between the new and old classification. Class 1 habitat in the old classification was "nesting (N)" and Class 2 habitat was "Roosting and foraging (RF)". In the new classification, Class 1 is "Nesting and Roosting (NR)" and Class 2 is "foraging (F)". This change in functional grouping (grouping roosting habitat with nesting habitat instead of with foraging habitat) was called for in the USFWS 2012 critical habitat proposal (USFWS 2012, pg.111-112. The changes in the acreages displayed in Table 10 above come from a variety of sources:

- Formation of Homogeneous polygons from previously heterogeneous polygons
- Changed habitat functional grouping
- Management induced habitat changes
- Potential ingrowth of habitat
- Correction of classification of stands

These factors are discussed in Appendix C. Determining which of the five factors listed above accounted for the most change in acreage between the classes is not possible. For example, it is not possible to determine how much of the change in Type 3 is attributable to habitat ingrowth in stands previously classified as Type 4.

Table 11: Spotted owl suitable and dispersal habitat currently available in Spencer Creek Watershed

Ownership	Total Acres	Suitable Habitat Acres	Dispersal Habitat Acres
Bureau of Land Management	8,745	3,870*	3,410*
U.S Forest Service	22,273	9,618	1,113
Private**	23,175	0	0
Total	54,193	13,488	4,523

* BLM contribution is based on the 2012 classification. Others based on 1994 classification.
**Acres of Private lands are assumed to contain no suitable or dispersal habitat within the watershed because most have been converted to early seral conditions. There is likely some minor amount of habitat that adds to the suitable and dispersal habitat component on private lands but it likely would be in very small patches and interspersed across the landscape.

Spotted Owl Suitable Habitat within Known NSO sites

There are four spotted owl sites that may be affected by the Lost project. Table 12 displays the current acreage of suitable spotted owl habitat available within the Core Area and the Home Range of each of the four sites. Territories with suitable habitat levels below the thresholds described in the footnote in Table 12 are considered deficit in habitat for spotted owls, and any further management-induced reductions in suitable habitat below these thresholds has previously resulted in a determination of "Incidental Take" by the USFWS. Historically, the USFWS has routinely issued an opinion allowing for this incidental take as part of their Biological Opinion documents on KFRA timber sales. All four sites in the project area are presently deficient in suitable habitat at the Home Range scale and two of the four are also presently deficient at the Core Area scale.

Table 12: Current approximate acres of suitable habitat within home range and core areas of spotted owl territories

NSO Territory	Home Range (1.2 mile radius)	Core Area (.5 mile radius)	Habitat Suitability
2065 Miners Creek	615	335	*Deficit within HR
2390 Spencer Creek	794	285	*Deficit within HR
3252 East Miners Creek	386	147	*Deficit within HR and Core
0103 Surveyor North**	839	204	*Deficit within HR and Core

* Deficit - The U.S. Fish and Wildlife Service defines deficit levels to determine if sufficient habitat occurs within spotted owl territories. The thresholds for the home range and core areas are 1,200 and 250 acres respectively.
** Includes Forest Service Acres.

Project area and unit scales
Table 13 below shows spotted owl suitable habitat within specific units of the Lost planning area. The Total Acres figure given for each unit in Table 13 is based on the sizes of the units under Alternatives 1 and 3 (in which corresponding units are identical in size). Some unit sizes under Alternative 2 are different than under Alternative 1 and 3. These differences in unit sizes are accounted for and incorporated in all acreage and acreage percentage figures presented in the tables and text of the wildlife section.

Spotted Owl Populations range wide and within the Southern Oregon Cascades Demographic Study Area
Range wide scale
The latest range-wide population trend from Forsman et al., 2011 for the spotted owl indicates that the spotted owl population continues to decline across most of its range. Annual rates of population decline were most precipitous on study areas in Washington and northern Oregon. There was strong indication for declining adult survival on 10 of 11 study areas. There was strong evidence that populations on 7 of the 11 study areas (range wide) declined. In the other four study areas the authors could not conclude that populations were declining. In these four areas, demographic factors suggested that decline was likely occurring, but it could not be detected statistically with the methodology being used. Consequently, these four areas were classified as having a "stationary" population trend.

SOC scale
The Klamath Falls Resource Area is within the Southern Oregon Cascades (SOC) province and KFRA spotted owl monitoring data was included in the Forsman et al., 2011 analysis. Although the latest population trend calculations for the SOC (Forsman et al., 2011) assigned a "stationary' trend to the SOC, it looked only at demographic data through the 2008 breeding season, and thus misses data from the last three breeding seasons; two of which (2009 and 2011) were record setting poor years for spotted owls in the SOC. Even without the data from 2009-2011 breeding seasons, Forsman et al. (2011) determined that the SOC was declining in adult survival and that fecundity also continued to decrease. While not completely conclusive, these and other demographic factors from the SOC study area were strong indicators of a population that was in decline, or would likely be in decline in the near future.

The 2012 Southern Oregon Cascades Study Area Annual Report (Dugger et al., 2012) includes data from the 2009-2011 breeding seasons and strongly suggests that the demographic performance of the spotted owls in the SOC is declining. The number of spotted owl sites occupied by spotted owls continues to decline in the SOC Study Area. In 2008, the percentage of spotted owl sites occupied by spotted owls, of those sites surveyed, was below 50% for the first time in the study's 20 year life. In 2011, this figure was 38.2%, establishing a new all-time low for this important parameter for this study to date.

Overall, the mean percentage of sites with spotted owls detected, and the mean percentage of spotted owl sites with spotted owl pairs present are declining over time in the SOC study area. Spotted owl productivity and fecundity were down in 2011 in the SOC as well. The average number of young fledged per pair was below the 22 year average for the study and average fecundity for all age classes in 2011 was the second lowest recorded in the 22 years of the study. The total number of spotted owls detected in the study area has fluctuated from year to year, but in 2011 far fewer spotted owls were detected than in any other year in the 22 year life of the study (Dugger et al., 2012).

***Table 13: Spotted owl suitable habitat by proposed unit, and geographic reference to spotted owl site*s**

Unit #	Total Acres	NRF acres	Dispersal acres	NRF ac. in East Miners Cr. PHR	NRF ac. in East Miners Cr. core	NRF ac. in Miners Cr. PHR	NRF ac. in Miners Cr. core	NRF ac. in Surveyor North PHR	NRF ac. in Surveyor North core	NRF ac. in Spencer Cr PHR	NRF ac. in Spencer Creek core	# of cores overlain by NRF in unit	#of PHR's overlain by NRF in unit
4-1	68	52	14	52	20	12						1	2
4-2	142		119										
4-1R	8	3	5	3	1	1						1	2
6-1	78	76	2			76	2	65				1	2
6-2	39	2				2		1					2
6-3	8												
15-1	14	0	4										
19-1	29		17							1			1
19-1R	11		5										
19-1IR	7		3										
21-1	101		2										
21-1R	11												
21-2	119	23	96										
21-2R	14	6	8										
22-1	34		22										
22-1R	2		1										
23-1	72		58										
25-1	25	4	1										
25-1R	3	1											
25-2	9												
25-2R	2												
25-3	15	3						3					1
26-1	41		36										
27-1	60	48	11	48									1
27-1R	11	11		11									1
27-1IR	6	4		4									1
27-2	2	2		2									1
27-2R	4	4		4									1
27-2IR	3	1		1									1
30-1	29	29						7		29			2
33-1	9		6										
33-1R	3		1										
33-2	9		9										
33-2R	8		8										
35-1	41		41										
35-2	40		40										
35-3	65		42										
35-3R	5												
35-4	2												

PHR = Provincial Home Range, or province specific home range radius. On KFRA = 1.2 miles.
NRF = Nesting, roosting, foraging habitat (suitable)

Figure 10: Graph illustrating the long term trend for site occupancy by northern spotted owls

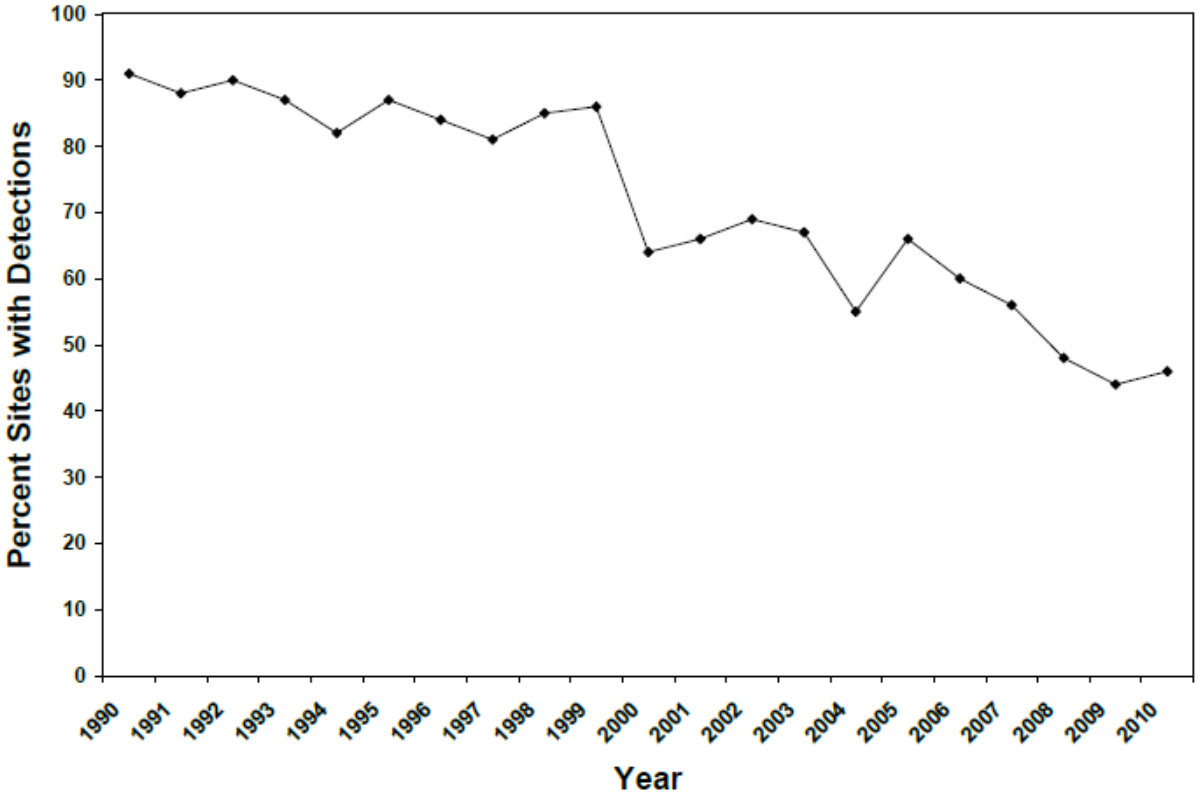


Figure 4. Percentage of all sites surveyed annually with ≥1 spotted owl detected on the Southern Cascades Study Area, Rogue River-Siskiyou and Fremont-Winema National Forests, Oregon, 1990-2010.

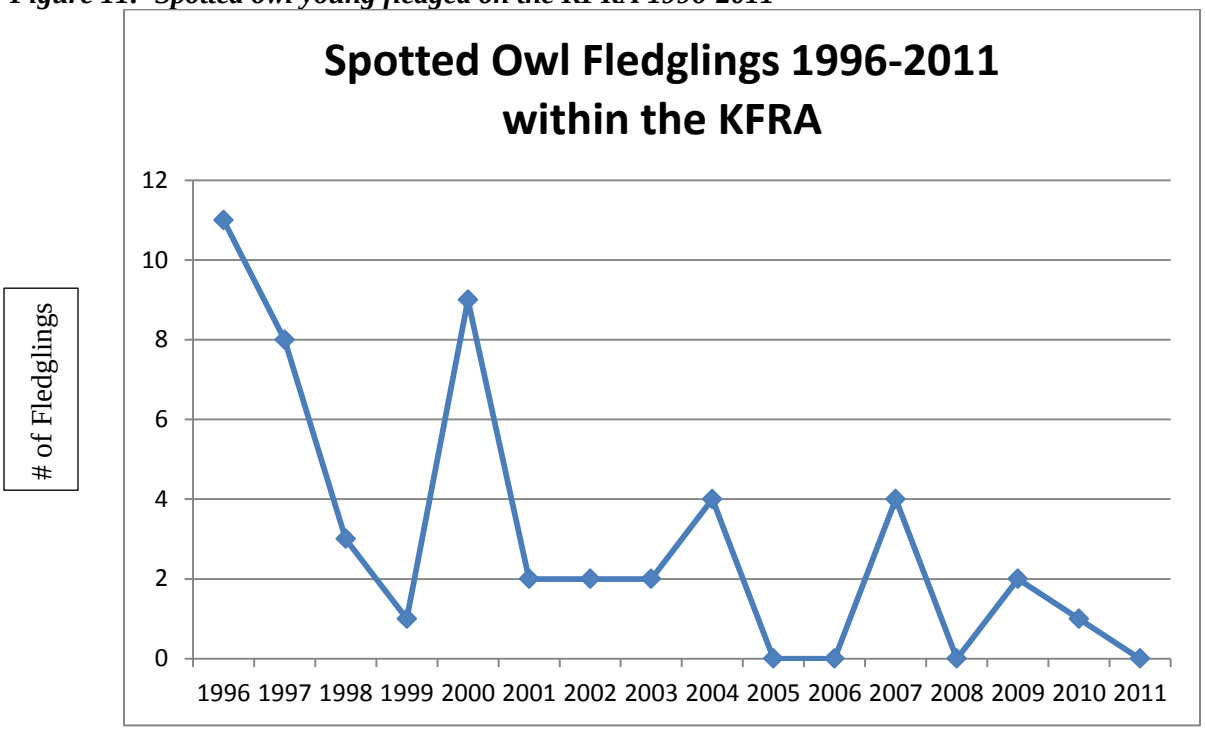
The large Late Successional Reserves (LSRs) (none present on KFRA) were designed to meet the objectives of the NWFP and be able to support 15-20 spotted owl pairs (USDA 1998). No LSR within the SOC Study Area boundary has met that objective for the last two breeding seasons. This suggests that the NWFP strategy of relying on large LSRs to maintain the spotted owl population in the SOC while allowing spotted owl sites outside the LSRs to go extinct may not result in spotted owl persistence in the SOC, much less recovery, as required by the ESA. The apparent failure of the LSRs places greater importance on maintaining the existing, occupied, spotted owl sites outside the LSRs within the SOC.

The 2012 annual report for the SOC (Dugger et al., 2012) strongly suggest a troubling outlook for the SOC spotted owl population and points out the importance of maintaining currently occupied spotted owl sites wherever they fall in the landscape regardless of land use allocation.

KFRA scale

The spotted owl site occupancy trend within the KFRA is similar to that observed in the SOC study area. The number of occupied (single or pair) owl territories on the KFRA has fluctuated but has been consistent over the past 10 +years (1998-2007) with a range of 7-12 occupied territories. However in 2009, 2010, and 2011 only five historic spotted owl sites were occupied by spotted owls. Annual monitoring indicates a sharp decline in overall reproduction for spotted owls on the KFRA since 1996. See Figure 11 below.

Figure 11: Spotted owl young fledged on the KFRA 1996-2011



Barred Owls

Surveys for spotted owls have been conducted annually within the KFRA since 1990. Until 2002, the barred owl was only rarely detected within the Resource Area. Since that time, the barred owl has regularly been detected on the Resource Area during spotted owl surveys, and presently there are five historic spotted owl sites that are now known to be occupied by barred owls. Several other barred owl detections within known spotted owl sites have also occurred. Kelly et al. (2003) reported that known site occupancy of spotted owls was significantly lower in the presence of barred owls. The latest research publications continue to show the impacts that barred owls are having on site occupancy rates of spotted owls. Dugger et al., (2011) found a strong association between barred owl detection rates and spotted owl site extinction rates (site extinction is different than species extinction). These two species are competitors and the barred owl is currently displacing spotted owls from historical breeding territories. This study also showed the strong barred owl and habitat effects on site occupancy dynamics of spotted owls provided evidence of interference competition between the species. Occupancy rates of historic spotted owl sites by spotted owls decreased when barred owls were detected at the site regardless of the habitat configuration of a territory. Extinction of spotted owl territories was lowest in areas where old forests were most abundant, and colonization by spotted owls (spotted owls moving into an area and setting up a breeding territory) was highest in forests with less fragmentation. There is some evidence that barred owls may actually prey on spotted owls as well (Leskiw and Gutierrez 1989). These results point out the increasing importance of conserving large amounts of contiguous, old forest habitat to maintain northern spotted owls in the landscape (Dugger et al., 2012).

In the SOC study area, the annual percentage of historic spotted owl sites with both spotted owls and barred owls, or barred owls alone has increased from 8.6 to 21.9% since 1997. This same metric was 28.2% for 2010 and was the same for 2011. Figure 12 below is from the Dugger et al. 2012 report and displays the trend of increasing numbers of barred owls at historic spotted owl sites in the SOC study area. While the annual proportion of historic spotted owl sites where barred owls were detected was unchanged from 2010, the cumulative proportion of sites that had ever documented at least one barred owl increased approximately 3% over the 2010 figure in the 2011 breeding season (Dugger et al., 2012). This indicates an increasing influence of barred owls on spotted owls in the SOC.

The detections of barred owls within the KFRA occurred during spotted owl surveys and it is likely that the full number and influence of barred owls within the KFRA has not been realized since systematic surveys for barred owls have not occurred.

Figure 12: Spotted owl territories with barred owls detected on the SOC Demographic study area. 1990-2011 (from Dugger et al., 2012)

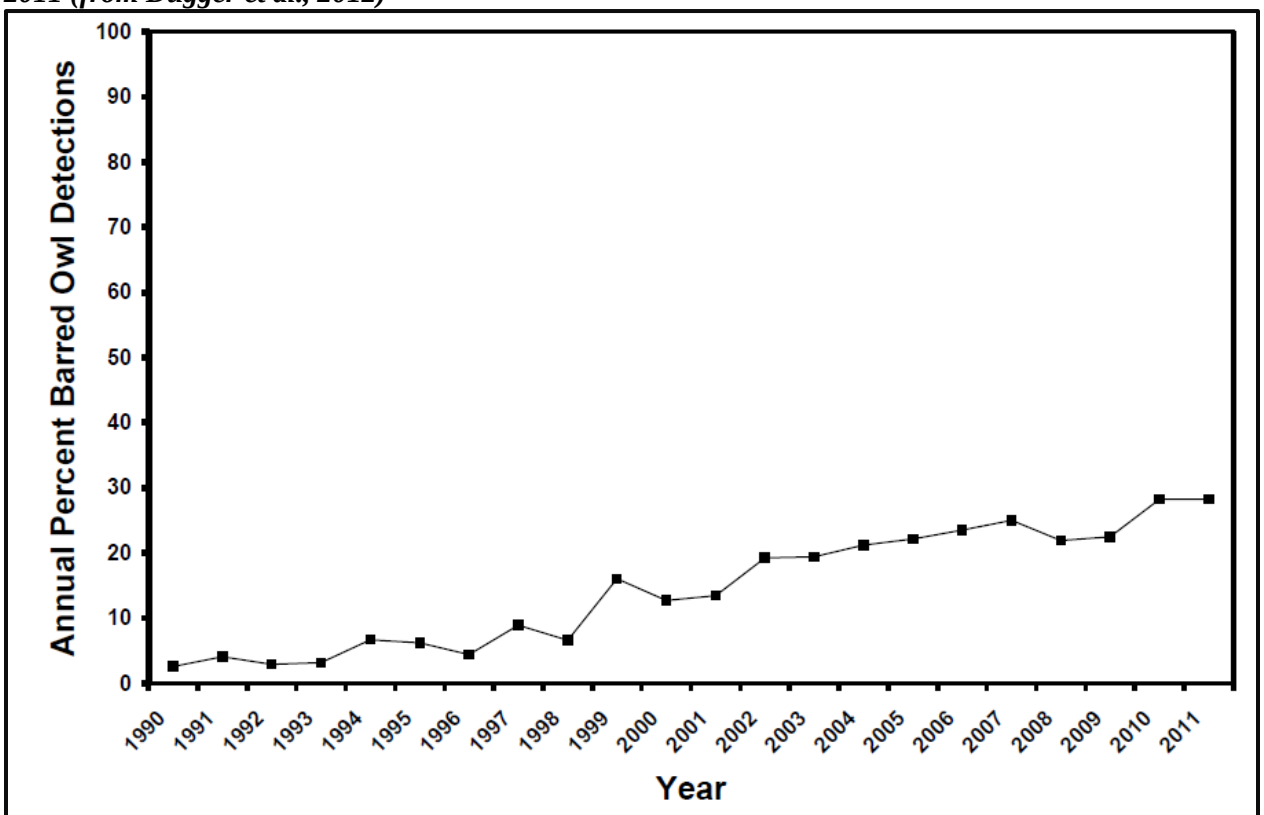


Figure 7. The annual percentages of historic spotted owl territories surveyed where barred owls were detected on the Southern Cascades Study Area, Rogue River-Siskiyou and Fremont-Winema National Forests, Oregon, 1990-2011.

<u>The 2011 Revised Spotted Owl Recovery Plan</u>

Because the 2011 Recovery plan is so new, the BLM and USFWS at the national level are working on clarification and direction, and the KFRA is actively engaged with the local USFWS office in seeking clarification on the areas where it is needed. This project will be consulted on pursuant to Section 7 of the ESA, with the Klamath Falls office of the USFWS.

The 2011 Revised Spotted Owl Recovery Plan contains over 30 recovery actions, some of which are applicable to the KFRA and some which are not. Below is a discussion of the recovery actions pertinent to KFRA in general and the Lost Project in specific.

Recovery Action 10

Recovery Action 10 requires agencies to identify and maintain some undisclosed amount of "High Value" habitat across the range of the spotted owl. The Recovery Plan does not identify the High Value habitat but instead provides some interim guidance for the action agencies to follow until such time as the High Value habitat is identified. This interim guidance describes a process through which action agencies, in cooperation with local USFWS offices, prioritize their known spotted owl sites for conservation purposes. The prioritization criteria in the interim guidance include recent history of successful reproduction, and amount of suitable habitat around the nest. While not specifically mentioned in the interim guidance, ownership pattern around sites is a factor on KFRA lands due to the checkerboard BLM ownership pattern. Most of the private

lands intermixed with BLM lands have essentially no suitable habitat on them. At many KFRA historic spotted owl sites there is sufficient private land within the PHR that even if the BLM lands within the PHR were 100% in NRF conditions the site would still be considered deficient in habitat (see Table 11 and its associated discussion). The KFRA has completed the prioritization process and has determined that 10 of its 18 sites meet the criteria for high priority sites. The Klamath Falls USFWS office has agreed with this determination, and the process used to make it. (Meeting notes, Level 1 meeting with USFWS on Oct. 11, 2011). Two high priority sites (Miners Creek, MSNO 2065) and Surveyor North (MSNO 0103) are within the Lost analysis area and potentially affected by the proposed project. Many historic spotted owl sites on KFRA land have not been used by spotted owls in the last decade most likely due to a combination of habitat loss/degradation on BLM and private lands as well as competition from barred owls. These historic sites are not good candidates for selection as high priority sites.

Per the Revised Recovery Plan, management of habitat at and around high priority sites is somewhat constrained in order to protect the integrity of the sites and maintain or increase the likelihood that spotted owls will occupy the site and successfully reproduce there. The USFWS will consider the prioritization status of affected sites when assessing impacts of, and developing Biological Opinions on, projects that may affect spotted owls.

The designation of a site as High Priority for conservation means that management may still occur within the Provincial Home Range (PHR), defined as 1.2 mile radius around the nest, but it is constrained. Actions taken within the PHR of high priority sites must be designed to be neutral or beneficial for spotted owls. Within the PHR of High Priority spotted owl sites, the FWS strongly recommends that the BLM, at a minimum, maintain habitat conditions as they currently are. That is, all habitat suitable for spotted owl nesting must remain suitable for nesting; and habitat suitable for roosting and foraging must remain suitable for roosting and foraging. This is an important change from past management. Prior to the 2011 Revised Recovery Plan when the BLM harvested in habitat that was suitable for spotted owl nesting and reduced its suitability to the point that it was suitable only for roosting or foraging (but not nesting) the Service still considered that habitat to be "Suitable" even though it no longer served the same function for spotted owls. For a complete discussion of the RA 10 interim guidance and prioritization methodology see the 2011 Revised Spotted Owl Recovery plan section on RA 10.

Spotted Owl Designated Critical Habitat

Portions of the Lost project area were formerly part of a NSO Critical Habitat (CH) Unit OR-37 (USDI FWS 1992). The Final Rule revising Designated CH issued by the Service in August 2008 changed the designation within the Lost project area. As of September 12, 2008 none of the Lost project area is classified as Designated CH for the NSO (USDI FWS 2008). Therefore BLM has made a "No Effect" determination with respect to the Lost project and designated NSO CH.

Spotted Owl Proposed Critical Habitat

The U.S. Fish and Wildlife Service issued a revised CH proposal for the NSO on February 28, 2012 and is under a court-ordered deadline to finalize a revised CH designation by November 15, 2012. The Endangered Species Act requires the BLM to conference with the USFWS when a project may adversely affect proposed CH for a listed species. All page number references to the 2012 proposed rule in this EA are to the 388 page document on the USFWS website: http://www.fws.gov/home/feature/2012/pdfs/NSO-small.pdf

In its 2012 revised CH proposal, the USFWS broke the known range of the NSO into 4 broad habitat association zones and then into a total of 11 modeling regions, which in turn yielded 11 proposed CH Units (PCHUs). Each PCHU was further broken into subunits. All of the KFRA PCH is in the East Cascades region (EC), the East Cascades South (ECS) PCHU (PCHU #8). The KFRA CH lands north of state Highway 66 are in subunit ECS-1. The Lost project falls into the proposed ECS-1 subunit of PCHU#8. The KFRA manages approximately 20,712 acres (4%) of the total 526,810 acres of the ECS-1 subunit, and the KFRA lands are the southernmost in ECS-1. The NSO habitat acreage on the KFRA portion of ECS-1 is displayed in Table 14 below.

Table 14: Spotted Owl Habitat Suitability on the KFRA Portion of ESC-1

Type	Acres	Suitability Label
Nesting/Roosting	4,089	Suitable (NRF) 8,989 acres
Foraging	4,900	
Dispersal	7,466	Non-suitable 11,723 acres
Non-habitat	4,257	

The figures in Table 14 are based on the 2012 KFRA habitat classification and making minor adjustments to the USFWS published boundaries of ECS-1 to match the ownership lines of the KFRA lands where appropriate.

The PCH includes portions of the Lost planning area. Most of the proposed Lost units are within PCH. None of the proposed Lost treatment units are split by PCH boundaries. That is, each proposed Lost unit is either entirely in or entirely out of PCH. Table 15 below displays the status of proposed lost units with regard to PCH.

Table 15: Proposed Lost treatment units relative to 2012 proposed designated spotted owl critical habitat

	Unit number
In 2012 Proposed Spotted Owl Critical Habitat	4-1, 4-1R, 4-2, 6-1, 6-2, 6-3, 15-1, 19-1, 19-1R, 19-1IR, 21-1, 21-1R, 21-2,21-2R, 25-1, 25-1R, 25-2, 25-2R, 25-3, 27-1, 27-1R, 27-1IR, 27-2, 27-2R, 27-2IR, 30-1, 33-1, 33-1R, 33-2, 33-2R, 35-2
Out of 2012 Proposed Spotted Owl Critical Habitat	22-1, 22-1R, 23-1, 26-1 35-1, 35-3, 35-3R, 35-4

Proposed Critical Habitat Objectives

The recovery objectives for the proposed ECS-1 subunit, in priority order, are to:

1. Provide demographic support (maintain existing sites and produce young for recruitment into the breeding population).
2. Provide connectivity between adjacent units and subunits (USFWS 2012, pg. 224-225).

Conferencing requirement

The proposed CH designation means that the BLM must conference with the USFWS on activities within the PCH that may affect the functionality of the PCH in order to help ensure that the proposed project will be in compliance with the final CH designation which is expected in November 2012 (USFWS 2012, pg 255). It is almost certain that the final CH designation would take place before Lost project implementation is completed on the ground. Accordingly, all Lost project actions planned to occur inside the PCH must comply with the management direction associated with PCH as described in the designation proposal document. For the Lost project, formal consultation on effects to NSOs was required prior to, and independently of the CH proposal.

Active Management Within Proposed Critical Habitat

The CH proposal includes an acknowledgement that in dry forest types (including lands in proposed ECS-1 and the Lost project) maintaining functioning, high quality NSO habitat will require careful planning and a balance between the need to actively manage the forest for fuels reduction, disease and insect resiliency V.S. NSO habitat values USFWS 2012, pg 50-51. The USFWS acknowledges that maintaining dry forest ecosystem processes and stand structure as well as high quality NSO habitat on the same acre at the same time is not a successful strategy in the long run because NSOs need forest structure that is largely incompatible with fire and disease resilience in dry forest types. The general strategy for CH in dry forests is to retain sufficient amounts of suitable NSO habitat in large enough patches to function for NSO reproduction, within a landscape of surrounding stands managed for dry forest stand structure that supports dry forest ecosystem processes and is fire resilient and/or resistant.

In order to facilitate this balancing of objectives within the PCH landscape, the CH proposal document strongly suggests that action agencies administering lands within the EC region perform a large scale analysis on their PCH lands (USFWS 2012, pg. 270-271). This analysis is to include an assessment of existing habitat conditions, potential risk to current habitat, and potential for development of future habitat in portions of the landscape where it is likely to persist long term in the presence of natural disturbances associated with dry forest types-- especially wildfire. The anticipated output of this analysis is a better understanding of places on the landscape where treatments for dry forest structure restoration and fuels reduction make sense, and places where such treatments should not occur in the short to mid-term in order to maintain sufficient high quality NSO habitat for NSO population support (USFWS, 2012, pg. 270).

The KFRA has interpreted this guidance to mean that areas that are of high NSO habitat quality and value, and at comparatively low risk of loss to fire, insects, disease and drought would be deferred from harvest in the short term until the BLM completes its on-going RMP planning process which is scheduled for completion in 2015 and will address the 2011 revised NSO recovery plan and designated NSO CH. The Lost project was well along in the planning process when the 2012 CH proposal was issued. Consequently, the proposed Lost units were not selected with the benefit of the results of such a landscape analysis, and most proposed treatment units were overlain by PCH as discussed below.

KFRA Landscape Analysis

Shortly after the 2012 CH proposed rule was issued, the KFRA essentially stopped work on the Lost EA and undertook an analysis of all KFRA administered lands in ECS-1. The data sources, assumptions, models, and processes used in the analysis are discussed in detail in Appendix C. The CHU analysis was conducted without regard to the proposed Lost project units. That is, areas were identified for deferral or potential availability for treatment in order to meet the intent of PCH without regard as to if they were inside or outside of proposed Lost project units. Consequently, one of the proposed Lost units (unit 6-1) fell into an area also identified for potential deferral in the landscape analysis. The BLM line officer will need to address this conflict specifically when crafting a proposed action from among the alternatives and in the Decision Record.

Special Status Species (Bureau Sensitive, Survey and Manage and Birds of Conservation Concern)

Survey and Manage Species

Great Gray Owl

The project area was surveyed (USDA/USDI 2004 protocol) for the great grey owl for projects that would be considered habitat disturbing to meet the requirements of the 2001 S&M ROD. The area was surveyed in 1996-1997, 2006-2007, and in 2011. Individual Great gray owls were detected twice during the 2011 survey, but no nests were located, and no sites were established as per the current interagency survey protocol. Consequently, no changes in the proposed prescription or other modifications to the proposed project are required for this species.

Terrestrial Mollusks

Potential terrestrial mollusk habitat proposed for treatment under this EA was surveyed for S&M terrestrial mollusks (surveys occurred in spring and fall 2011). The terrestrial mollusk protocol (USDA/USDI 2003) identified priority habitat for surveying for specific species. Under the 2001 S&M ROD there are four terrestrial mollusk species (see Table 6) that require pre-disturbance surveys that may occur in the project area. Management direction for locations where S&M mollusks are found is to protect the microsite of the habitat feature. (USDA/USDI 2004b, 2005). Two of the four have not been documented on the KFRA (Oregon shoulderband and the Crater Lake tightcoil). However, both were originally listed as suspected within the Resource Area so they were included in the target list for surveys on the KFRA.

The **Oregon shoulderband** range is Northern California and Southwest Oregon. In Oregon it has been located in Jackson, Josephine and Douglas counties (USDA/USDI 2004b). The species is associated with rocks and wood debris in rocky areas within forest habitat often adjacent to areas with substantial grass or seasonal

herbaceous vegetation (USDA/USDI 2004b). This species was removed from the Resource Area survey list in 2002 under the Annual Species Review process due to the change in the known and suspected range.

The **Crater Lake tightcoil** snail is sparsely distributed throughout the Oregon Cascades at elevations above 2000 ft. It has been found from the Winema National Forest to the Bull Run Watershed in Northern Oregon. This species may be found in perennial moist situations in mature conifer forests or meadows amongst rushes, mosses and other surface vegetation or under rocks or woody debris within 10 m of open water in wetlands, springs, seeps, and streams (USDA/USDI 2004).

The other two mollusks (evening field slug and Chase sideband snail) have been documented in the Resource Area.

The **evening field slug** is associated with perennial wet meadows in forested habitat; microsites include a variety of low vegetation, litter and debris, rocks may also be used as refugia. Suitable habitat may be considered to be limited to moist surface vegetation and cover objects within 30m (98ft.) of perennial wetlands, springs, seeps and riparian areas (USDA/USDI, 2005a). This is consistent with where they have been located within the Resource Area. This species was added to the Resource Area survey list in 2003 under the Annual Species Review process due to the expansion of the known range.

The **Chase sideband snail** is associated with forested and open talus or rocky areas (USDA/USDI, 2005b). Vegetation types include dry conifer and mixed conifer/hardwood forest communities as well as oak communities (USDA/USDI 2005b). This is consistent with where they have been located within the Resource Area.

Bureau Sensitive and/or Birds of Conservation Concern

Bat surveys were conducted within the Spencer Creek watershed (Cross and Kerwin, 1995). Several bat species were detected including the pallid bat, a BLM sensitive species. The fringed myotis, another BLM sensitive species, was not detected but has been documented in similar habitat to the proposed project area and is likely to occur within the project area.

The proposed project area contains suitable habitat for other special status species including the white-headed woodpecker and flammulated owl. These two species are closely associated with stands containing high densities of large pines, either in mixed conifer stands or pine dominated stands. There is currently less than 1,500 acres of preferred habitat for the white-headed woodpecker within the Spencer Creek watershed (BLM, 1995). This habitat is scattered throughout the watershed (BLM, 1995). Considering the fragmented habitat and the relatively large home range needed in a fragmented habitat situation, it is likely the white-headed woodpecker is scarce within the project area and the watershed. In fragmented habitat the home range for a white-headed woodpecker is approximately 130 acres (Altman, 2000). No extensive, systematic, surveys were conducted for these species but the white-headed woodpecker has been documented in the project area and it is assumed that the flammulated owl may use the project area. Limited surveys of potential habitat for the white-headed woodpecker were conducted in the Spencer Creek watershed in 2010. This effort consisted of three transects in the watershed and resulted in one detection in the Miners Creek area. No nests were located.

The Klamath Falls Resource Area was surveyed for forest carnivores (Canada lynx, wolverine, Pacific fisher and American marten) in 1998-2001 including the Spencer Creek Watershed. Photographic bait stations were set up systematically throughout the resource area using Zielenski's protocol (Zielenski and Kucera, 1995). The American marten was the only target species located during these surveys. No special status species were located during these surveys. The fisher historically occurred within the Spencer Creek Watershed but declined over the first part of the 20th century (BLM 1995). There was a reintroduction attempt in the 1960's at Buck Lake in the Spencer Creek Watershed but that attempt was not considered successful. The fisher is listed as a Federal Candidate species and its current range is thought to be limited to two populations in Oregon, the Southern Cascade Mountains and the Siskiyou Mountains of Southwestern Oregon which does not include the

Klamath Falls Resource Area (Aubry and Lewis, 2003). Therefore impacts to the Pacific Fisher will not be analyzed further in this document.

There is a Bald Eagle nest in unit 27-2. This nest has been active annually for the past 10+ years. This site would require the application of a seasonal restriction on treatment activities near the nest as per the appropriate PDF (see Appendix B for PDFs). This protection would apply under all action alternatives.

Other Terrestrial Wildlife Species of Interest

Other terrestrial wildlife species of interest in this area are deer and elk. Both of these species occur in the project area with deer being much more abundant, and more flexible in their habitat selection. Elk generally select areas with sharp contrast between forested hiding cover and grassy foraging areas. The early seral stages provided by private lands adjacent to more heavily forested BLM lands provides this preferred mix of habitat types in the project area. Deer are browsers and their preferred forage species occur throughout the project area. Both deer and elk inhabit the project area in summer and in all but the harshest of winters when they must move to lower elevations. In mild winters it is not uncommon to see deer and elk wintering in the flats along Clover Creek Road that bisects the project area. Both of these species prefer habitats away from open roads and frequently used ATV trails.

Terrestrial Wildlife Species – Environmental Consequences

Threatened and Endangered Species

Northern Spotted Owl

No Action Alternative

The No Action Alternative would have no direct or indirect short-term impacts to the northern spotted owl or its habitat. The current stand conditions would continue to provide a mix of nesting, roosting/foraging and dispersal habitat for spotted owls. The No Action Alternative would not result in any incidental take of spotted owls because no suitable habitat would be degraded or removed. The Spotted owl population on KFRA would likely continue to decline due to invasion by the competitive barred owl and continued habitat loss or degradation on private and BLM lands outside the project area.

This alternative would comply with the 2011 Spotted Owl Revised Recovery Plan because no direct or indirect impacts to spotted owls would occur. The recovery plan's general call to actively manage landscapes for a variety of purposes would be satisfied by the on-going, and planned future forest management elsewhere in the Spencer Creek watershed on both BLM (Spencer Creek EA and planned out- year sales) and on private lands. Although most of the KFRA lands within the Spencer Creek watershed are proposed for designation as Critical Habitat, active management (including timber harvest) would still be allowed on most of the designated acres according to the USFWS proposed critical habitat designation rule.

Long-term, without the proposed harvest, the trees would continue to grow. The increasing density of the forest stands, an increase in the number of large trees, and the development of decadence in the units would increase the amount and quality of the suitable habitat in the project area. However, the lack of low intensity fires and/or fuels reduction treatments (as proposed in the action alternatives) within the units would reduce stand resiliency and increase the risk of fires of stand replacing intensity, bark beetle attacks, and subsequent tree mortality. The threat to spotted owl habitat values from fire and other "natural" change agents is discussed and analyzed in the Appendix C. Younger stands proposed for treatment under the action alternatives would not be treated under the No Action Alternative. Consequently, the anticipated, treatment induced, accelerated development of multilayered canopy, large trees, and favorable species mix in these younger stands would be forgone. The development of these features would still take place, but would be slowed considerably.

In the vegetation section of this EA, the no action alternative was modeled as if the units were not harvested now, and were allowed to grow unharvested for 100+ years into the future. Under this scenario, spotted owl habitat components would continue to develop in the units. Given enough time, all of the current dispersal, and roosting/foraging quality stands would eventually develop into spotted owl nesting quality habitat, unless it

burned up in a wildfire. The time to reach nesting quality habitat conditions would depend on each stand's current stand make up and structure and its growing site potential. Most, if not all, of these stands would likely achieve nesting quality within 100 years, assuming no significant stand altering event such as catastrophic beetle kill or high intensity fire.

Cumulative Effects of No Action

Current habitat conditions limit the amount of suitable habitat available for the spotted owl in the watershed. The majority of private lands adjacent to the project have been harvested in the past 10-15 years to the point that cumulatively, suitable habitat is very limited within the watershed, especially nesting quality habitat. The harvested acres on private lands have typically been regeneration harvests and been planted primarily with ponderosa pine and/or lodgepole pine and therefore would not provide spotted owl nesting habitat in the future but potentially may provide some dispersal habitat. If past management trends continue on private lands, those lands would not provide suitable spotted owl habitat and may or may not provide dispersal habitat depending on harvest rotation intervals.

Selecting the No Action Alternative for the Lost units at this time would require that another sale already in the planning process be moved up in the KFRA timber sale schedule in order to meet BLM's ASQ commitment. Therefore, other units elsewhere on KFRA would be analyzed for harvest sooner than they would have been if one of the action alternatives in this EA were selected. Most other harvest units could potentially impact NSO habitat as well.

The Lost units could be looked at again for harvest at some point in the future. The 1995 RMP modeled a harvest entry schedule of approximately every 20 years. The vegetation section of this EA modeled entries every 30 years under alternatives 1, 2, and 3. In reality, selecting the No Action Alternative at this time would not be a permanent withdrawal of the units from the timber harvest base, but rather a temporary deferral of harvest for an undetermined period of time until a new planning process is completed. Under the no action alternative, BLM matrix lands in the Spencer Creek watershed, including most of the proposed Lost units would continue to be managed on a sustained yield basis using an uneven aged management strategy. The designation of some of these lands as critical habitat for spotted owls, as currently proposed, would likely reduce the amount of acreage available for harvest and the intensity of harvest on some of the acres.

Other BLM timber sales are planned in the vicinity of the proposed Lost treatment units, in fact, some planned units, and some units already approved for cutting but not yet logged, are interspersed with the proposed Lost project units. These units waiting to be cut were consulted on with the USFWS under the Spencer Creek EA/BA/BO, and will remove or downgrade 570 acres of suitable spotted owl habitat within the Spencer Creek watershed. The figures stated above for current acres of suitable habitat on the KFRA and within the Spencer Creek watershed count these 570 acres as already having been removed or degraded because the decision to harvest the units has been made as part of an earlier planning process(s). The observed rate of suitable habitat removal or downgrade on BLM lands in the Spencer Creek watershed is approximately 120 acres per year, assuming no in-growth of habitat. The selection of the no action alternative would likely not alter this rate of loss in the long term. This long term rate of loss in the Spencer Creek Watershed is anticipated to be essentially equal under the no action, and the action alternatives. The designation of some of these lands as critical habitat for spotted owls, as currently proposed, would likely reduce the rate of habitat loss to near zero for the designated lands.

The barred owl has been detected at three of the four spotted owl sites in the project area. If the current trend of barred owl range expansion and colonization continues, it is likely that within the foreseeable future the barred owl will be detected at the fourth spotted owl territory as well. If this invasion by the barred owl continues, it will likely preclude re-occupancy of the currently unoccupied territories by spotted owls and displace or negatively impact the spotted owls that currently use the one occupied territory in the project area. Suitable spotted owl habitat is very limited in the project area and the watershed. If barred owl populations continue to increase, there may not be enough suitable habitat to support both spotted and barred owls in the project area. The No Action Alternative would allow the maintenance/ retention of more suitable spotted owl

habitat in the watershed than either of the action alternatives, at least in the short term. Retaining currently suitable spotted owl habitat in the watershed has obvious benefits to spotted owls in the watershed.

Consequences to Spotted Owls Common to All Action Alternatives
This section describes the anticipated effects on spotted owls and their habitat that are common to all action alternatives.

Suitable Habitat effects
Dugger et al. (2005) found that loss of suitable habitat, especially close to the nest (core area), can be detrimental to owls (both survival and reproduction) especially if non-habitat exceeds 50% within the core area. Bart (1995) reported a linear reduction in northern spotted owl productivity and survivorship as the amount of suitable habitat within a spotted owl home range declined. In northwestern California, Franklin et al. (2000) found that survivorship of adult owls was greater where greater amounts of older forest were present around the activity center, but also found increased reproductive success where the amount of edge between older and younger forest was relatively high. Based on analysis of radio-telemetry data, Bingham and Noon (1997) reported that a sample of spotted owls in northern California focused their activities in heavily-used "core areas" that ranged in size from about 167 to 454 acres, with a mean of about 409 acres. These core areas, which included 60 to 70 percent of the owl telemetry locations during the breeding season, typically comprised only 20 percent of the area of the wider home range. In a study that included radio tagged spotted owls in the Lost project area, Irwin et al. (2012) found that the presence of stands with a significant component of large trees (>66cm [26" DBH]) within 400 meters (¼ mile) of the nest is an important habitat selection factor for night foraging spotted owls. These studies suggest that habitat removal or downgrading within core areas could have disproportionately negative effects on owls.

The body of research cited immediately above suggests that development of younger stands into suitable spotted owl habitat within the core areas has the potential to increase the quality or suitability of a site for spotted owl survival and reproduction. Under all of the action alternatives, those stands currently classified as dispersal habitat only or non-habitat would be treated within the core areas. These treatments are designed to favor development of multiple canopy layers, increase growth rates of large trees of favorable species, and generally put these younger stands on a trajectory to develop into suitable spotted owl habitat.

2011 Revised Spotted Owl Recovery Plan Compliance
The Recovery Plan utilizes the habitat reserve network (LSR's, etc.) from the Northwest Forest Plan (NWFP) as the basis for a habitat conservation network for the spotted owl. This adoption of the LSR's includes the geographic extent of the LSRs as well as the direction for management of LSRs as described in the NWFP, as amended. None of the proposed Lost treatment units are in NWFP (1995 RMP) LSRs. Additionally, Recovery Actions 10 and 32 within the Recovery Plan describe the need to maintain more suitable habitat for the northern spotted owl across the landscape, as well as the need to avoid actions which may displace spotted owls from known sites.

None of the proposed treatment units are classified as High Quality spotted owl habitat pursuant to RA 32 of the 2011 Revived Recovery Plan by the KFRA wildlife biologists. Consequently no impact to High Quality habitat is anticipated to occur under any of the action alternatives. All action alternatives would be in compliance with RA 32 of the 2011 Revived Recovery Plan.

Prey availability
Prey availability for the spotted owl can be affected by forest management. The northern flying squirrel (Glaucomys sabrinus) and bushy-tailed and dusky footed woodrats (Neotoma fuscipes and N. cinerea) are essential components of the spotted owl diet. Management directed towards reducing woody fuels and to restore low-intensity high-frequency fire regimes in ponderosa pine and dry Douglas-fir forest likely would reduce bushy-tailed woodrat populations to some degree in the treated units unless prescriptions can mitigate the loss of snag, mistletoe, and downed log cover (Lehmkuhl et al., 2006a) . Although snags are often reserved from harvest in the prescriptions currently applied on KFRA timber sales, some may be removed for safety and operational reasons. Tree canopy cover had the single best correlation with flying squirrel density with an

apparent threshold of 55% canopy cover separating stands with low density populations from high density populations (Lehmkuhl et al., 2006b). Therefore maintaining canopy closure and structure is necessary to maintain prey availability for spotted owls.

Under the prescriptions in the action alternatives, treatments would maintain structures necessary to maintain prey availability within the core areas and PHRs for the spotted owl sites within the project area. Under some alternatives, a few stands would have the canopy closure reduced to levels at or below 55% which might negatively affect flying squirrel numbers in the treated stands in the short term, but the opening of the canopy would likely allow the shrub and grass/forb layers to develop more fully and this would be expected to increase habitat quality for wood rats and gophers; other spotted owl prey species. Overall the treatments proposed under any of the action alternatives are not expected to have a negative effect on spotted owl prey species populations within the PHRs. The treatment units are scattered and occur within a mosaic of habitat types offering habitat for a variety of prey species.

Disturbance of reproductive spotted owls
Timber harvesting, timber hauling, and fuels treatments may all require heavy equipment, chainsaws and large vehicles that produce high levels of noise. Spotted owls are susceptible to disturbance from human caused activity (Delaney et al., 1999) especially during critical periods in the nesting season. Activity in and around the nest patch during the breeding season may increase the chances for nest failure. Table 16 describes thresholds for several activity types.

Table 16: Disturbance and Disruption threshold distances for northern spotted owl (USDI FWS 2006)

Activity	Spotted Owl	
	Disruption Threshold Distance	Disturbance Threshold Distance
Use of chainsaws	65 yards	440 yards
Use of heavy equipment	35 yards	440 yards
Prescribed burning	440 yards	

Disturbance/Disruption Distances Definitions
A **disruption distance** is the distance within which the effects to listed species from noise, or mechanical movement associated with an action would be expected to exceed the level of "insignificant" or "discountable". The disruption threshold is the distance within which activities occurring during the critical breeding period could significantly disrupt the normal behavior pattern of individual animals or breeding pairs and could create a likelihood of injury. Thus, within the disruption distance, actions would be expected to adversely affect listed species.

A **disturbance distance** is the distance within which the effects to listed species from noise, human intrusion, and mechanical movement associated with an action would be expected to be discountable or insignificant. Effects are expected to be insignificant or discountable beyond the disruption distance and up to the disturbance distance. Thus, between the disruption distance threshold and disturbance distance threshold, effects would be expected to not adversely affect listed species. Beyond the disturbance distance threshold, no effects to listed species are expected.

Of the four spotted owl territories in the project area, only one (Surveyor north) is known to be currently occupied by spotted owls based on annual monitoring. Under all action alternatives a seasonal restriction, also known as a limited operating period (LOP) would be implemented. A seasonal restriction on harvest activities (altering habitat) within ¼-mile around known nest sites from March 1st – September 30th would be implemented under all action alternatives. This restriction would apply to portions of units 6-1, 6-2, 4-1, 4-1R, 33-2 and 33-2R. Hauling, loading and other heavy equipment operations not involving altering habitat but associated with forest operations would be buffered by 105 ft. around known nest sites from March 1st – September 30th. Because of these restrictions, no disruption to spotted owls during the breeding season would occur from proposed activities. This restriction would be applied to all four territories annually unless and until it is determined by the KFRA wildlife biologist that sites are unoccupied for the season or that the owls are not

reproducing that year. Disturbance could still potentially occur on individual adult owls outside of the seasonally restricted areas, or within non-reproductively active sites, but the effects to spotted owl survival and reproduction would be considered insignificant or discountable.

Barred owl
The differences in the effects of the action alternatives with regard to barred owl invasion are indistinguishable. There is no solid evidence that partial cut timber harvest has any effect on barred owl invasion rates, positive or negative. However, Barred owls are habitat generalists and readily use a wider variety of habitat types including younger and more open stands than do spotted owls (Dugger et al., 2011). Accordingly, it is probable that timber harvest as proposed in the Lost project would be better tolerated by barred owls than spotted owls. Because barred owls and spotted owls are competitors, the negative effects of timber harvest on spotted owls are likely to be greatly intensified in the presence of the more aggressive barred owl (Dugger et al., 2011).

The action alternatives vary in terms of amount and intensity of effect on suitable spotted owl habitat, but all of the action alternatives would downgrade suitable spotted owl habitat in the presence of barred owls. Timber harvest as proposed in the action alternatives in Lost is likely to facilitate the takeover of spotted owl territories by barred owls by decreasing the suitability of spotted owl nest sites. The less suitable habitat there is around a spotted owl site, the more likely it is that barred owls will invade the site and displace the spotted owls (Dugger et al., 2011). With limited suitable habitat on the landscape, displaced spotted owls have few places to go and often end up occupying low quality stands surrounded by insufficient amounts of suitable habitat to support survival and reproduction (unpublished NCASI radio telemetry data on barred and spotted owls from KFRA).

Cumulative Effects
Cumulative actions were analyzed in the 1995 BLM RMP FEIS and the potential future actions would be within the range of effects described in that analysis. Current habitat conditions and land ownership patterns limit the amount of suitable habitat available within the four spotted owl territories in the project area. Within the 5th field watershed the BLM manages only 16% of the total acreage, with private lands making up 43% of the acreage. The majority of private lands within the PHRs and the remainder of the Spencer Creek watershed, have been harvested in the past 15-20 years and are in an early seral condition. These same harvested private acres have been planted primarily with ponderosa and/or lodgepole pine and therefore will not provide spotted owl suitable habitat in the future but potentially could provide some dispersal habitat in the future depending on harvest rotation schedules.

Long-term, most of the proposed Lost treatments are likely to be beneficial to spotted owl habitat development and retention if the stands are allowed to recover from harvest effects and develop the desired structures and attributes. The proposed harvest would reduce competition between residual trees (including large trees of species important to spotted owl habitat), increase stand resiliency, and improve overall tree vigor and growth rates for the remaining trees. These effects would reduce the risk of widespread insect and disease mortality. The risk of stand replacing wildfire would also be reduced somewhat. Density is one stand parameter important to spotted owl habitat that is fairly easy to model. Other important attributes such as, canopy layer over lap, deformed trees, mistletoe clumps and the presence of extra dense patches may take longer to recover and are impossible or impractical to model. Based on FVS model projections, treated stands would generally return to, or surpass, their pre-harvest density (BA and or SDI) within 20 years if they are not re-entered for harvest during that time period. The modeling described in the vegetation section assumed that for each action alternative the currently proposed treatment would be implemented, and then implemented again in 30 year intervals for 100+ years, if possible, based on stand growth and constraints placed on harvestable tree sizes in the various alternatives. Under this scenario, the stands would alternate between suitable and not suitable habitat for varying periods of time through time unless and until harvest was precluded by some constraint.

Current rates of harvest (harvest return interval) on the KFRA suggest that some of these stands could be re-entered for harvest as early as between 10 and 15 years after the current proposed entry. This is especially true for stands that are left with higher canopy closure and /or BA in the presently proposed entry. Stands that are

re-entered before they grow back into suitable spotted owl habitat conditions would not re-grow back into suitable habitat in the foreseeable future due to the cumulative loss of habitat features and attributes such as high canopy closure, high density, multi-layered structure etc.

Regardless of the alternative selected, the rate of spotted owl habitat loss is likely to slow in the short and long term due to reduced timber harvest levels resulting from the proposed and anticipated designation of Critical Habitat for the northern spotted owl.

As of February 2012 the USFWS has proposed to designate 20,712 acres of BLM land in the Spencer Creek watershed as Critical Habitat. The designation does not prohibit or preclude commercial timber sales within CH, but places constrains upon harvest in order to provide habitat for spotted owls. It is likely that the rate of loss of suitable spotted owl habitat within the CH portion of the watershed will approach 0 acres per year if the service designates critical habitat as currently proposed. The NSO habitat acreage on the KFRA portion of the CH proposal is displayed in Table 14 above. The figures in Table 14 are based on the 2012 KFRA habitat classification and making minor adjustments to the USFWS published boundaries to match the ownership lines of the KFRA lands where appropriate.

The action alternatives were developed prior to the USFWS proposal to designate spotted owl Critical Habitat in the area, thus the action alternatives vary in their effects on suitable spotted owl habitat and in their level of compliance with the direction regarding, and intent of, CH. The level of compliance with CH direction and intent is discussed below in the sections on the specific effects of each action alternative.

Impacts Specific to Alternative 1

Northern spotted owl habitat

Impacts to spotted owl suitable habitat under this alternative would consist of 82 acres of suitable habitat thinned to the point that they would no longer function as suitable habitat, but would still function as dispersal habitat. This reduction represents 31% of the suitable habitat in the treatment units and less than 1% of the total amount of suitable habitat within the Spencer Creek watershed. No suitable or dispersal habitat would be removed. Of the 82 acres downgraded from NRF (suitable) to dispersal, 59 acres would be from within the PHR of at least one of the four spotted owl sites within the project area. Table 17 below displays the distribution of NRF that would be downgraded under this alternative.

Table 17: Distribution of NRF habitat that would be downgraded as a result of Alternative 1

			NRF Acres Downgraded in PHR's				Downgrade acres not in any PHR	Notes
Unit #	Total Acres	Acres NRF	East Miners Creek	Miners Creek	Surveyor North	Spencer Creek		
21-2	119	23	0	0	0	0	23	
27-1	60	48	48	0	0	0	0	
27-1R	11	11	11	0	0	0	0	
Total downgraded acres per PHR			59	0	0	0		
Total acres downgraded within PHR's ----------=> 59								
Total acres downgraded outside PHR's ---------- => 23								
Total downgraded acres under this alternative ----------=> 82								

Based on past ESA Section 7 consultation history with the USFWS, Alternative 1 would likely result in a determination of incidental take by the USFWS on the East Miners Creek spotted owl site due to the downgrading of 59 acres of suitable habitat to dispersal habitat within the PHR of the site. This site is currently deficit in suitable habitat at the PHR and Core Area scales. This alternative would reduce the amount of suitable habitat in the PHR from 386 to 327 acres. The USFWS threshold for determining incidental take is 1,200 acres of suitable habitat within the PHR.

Mitigation for Spotted Owl Suitable Habitat Impacts – Alternative 1
Incidental take of the East Miners Creek site could be avoided by modifying the prescription for units 27-1, 27-1R, and 27-1IR to maintain NRF habitat. This modification would need to retain a basal area of 140 or more and canopy closure of 60% or more.

Alternative 1 Compliance with the 2011 revised Spotted Owl Recovery Plan
While the interim guidance for the 2011 Spotted Owl Recovery Plan recognizes the need for active management within the range of the spotted owl for a variety of reason, it also provides guidance to the action agencies regarding areas that would be low versus high priority areas for implementing active management. High priority spotted owl sites as identified per the interim guidance on RA 10 are areas where active management is a **lower** priority than immediate conservation needs of the spotted owl. The immediate, site specific, need to retain functional habitat for spotted owls at the designated High Priority sites trumps the general need to actively manage forested stands on the landscape.

Units 6-1, is currently classified as suitable spotted owl habitat and is entirely within the Miners Creek spotted owl site PHR. This spotted owl site has been identified by the KFRA and the Klamath Falls office of the USFWS as a High Priority site for conservation of the species pursuant to interim guidance for RA 10 in the 2011 Revised Spotted Owl Recovery Plan. Any treatment that would reduce the current function of this unit would not be consistent with the interim guidance.

Unit 6-1 is currently typed as suitable for spotted owl nesting. The proposed treatment under Alternative 1 (patch cutting up to 15% of the stand) would probably be beneficial for the spotted owl in the long term (100+ years) because it would facilitate the development of a more species-diverse and structurally-diverse stand. However, the proposed treatment as described in Table D-1(Appendix D) would reduce the suitability of the stand from nesting /roosting quality habitat foraging quality habitat immediately post-harvest. This shift from nesting quality to foraging quality would still leave the stand in a 'suitable' habitat condition as defined by USFWS (see Table 9). Under Alternative 1 there could be a total of 12 acres in patch cuts out of 78 total acres in the unit. Creation of patch cuts as proposed in this alternative would: 1) reduce the overall stand canopy closure to at or near the minimum threshold level for nesting habitat, 2) further fragment the stand, and 3) increase the amount of hard edge within the core area of the Miners Creek owl site. These changes would result in the stand being reduced from nesting/roosting quality habitat to foraging quality habitat. This change would be inconsistent with the interim guidance for RA 10 in the 2011 Revised Spotted Owl Recovery Plan.

Mitigation in order to achieve Compliance with the 2011 revised Spotted Owl Recovery Plan – Alternative 1
Choosing the No Action alternative for this unit or altering the proposed prescription for unit 6-1 under this alternative to leave at least 70% canopy closure and/or significantly reduce the size and/or number of patch cuts would achieve compliance with the RA 10 interim guidance for high priority sites. If this unit were dropped from the project or modified, the need to develop large, shade intolerant trees in the core area of the Miners Creek spotted owl site could be met outside unit 6-1 by applying appropriate silvicultural treatments to the well-stocked and well-advanced ponderosa pine regeneration in the plantation immediately adjacent to unit 6-1. This plantation is identified as unit 6-2 in this EA.

<u>Impacts Specific to Alternative 2</u>
Northern spotted owl habitat
Impacts to spotted owl suitable habitat under this alternative would consist of 117 acres of suitable habitat thinned to the point that they would no longer function as suitable habitat, but would still function as dispersal habitat. This reduction represents 60% of the suitable habitat in the treatment units and approximately 1% of the total amount of suitable habitat within the Spencer Creek watershed. No suitable or dispersal habitat would be removed (see glossary for definition of habitat removal). Of the 117 acres downgraded from NRF (suitable) to dispersal, 114 acres would be within the PHR of at least one of the four spotted owl sites in the project area and 20 of those 114 acres would be within the core area of one site. Thirteen of the 114 downgraded acres would come from within 2 PHR's. Table 18 below displays the distribution of NRF that would be downgraded within and outside the four PHRs under this alternative.

Table 18: Distribution of NRF habitat that would be downgraded as a result of Alternative 2

			NRF Acres Downgraded in PHR's				Downgrade acres not in any PHR	Notes
Unit #	Total Acres	Acres NRF	East Miners Creek	Miners Creek	Surveyor North	Spencer Creek		
4-1	68	52	52	12*	0	0	0	Of the 52 acres down-graded in E. Miner's PHR, 20 are in the core.
4-1R	8	3	3	1**	0	0	0	
21-2	99	3	0	0	0	0	3	Unit is 20 acres smaller (99ac) under this alt.
27-1	60	48	48	0	0	0	0	
27-1R	11	11	11	0	0	0	0	
Total downgraded acres per PHR			114	13	0	0		
Total acres downgraded within PHR's ----------=> 127 ***								
Total acres downgraded outside PHR's ---------- => 3								
Total downgraded acres under this alternative ----------=> 117								

* These 12 acres are some of the same ground as the 52 acres downgraded in East Miner's PHR
**This 1 acre is part of the same ground as the 3 acres downgraded in East Miner's PHR
*** This figure based on double count of 13 acres because they lay within 2 PHR's

Based on past ESA Section 7 consultation history with the USFWS, Alternative 2 would likely result in a determination of Incidental Take by the USFWS on the East Miners Creek and Miners Creek spotted owl sites due to downgrading of suitable habitat to dispersal habitat.

East Miners Creek Site
This alternative would downgrade 114 acres within the PHR of this site. This site is currently deficit in suitable habitat at the PHR and Core Area scales. This alternative would reduce the amount of suitable habitat in the PHR from 386 to 272 acres. The USFWS threshold for determining incidental take is 1,200 acres of suitable habitat within the PHR. Of the 114 acres degraded within the PHR, 20 are within the Core Area. These 20 acres are part of unit 4-1. At the Core Area scale suitable habitat at this site would be reduced from 147 to 127 acres which is below the USFWs incidental take threshold of 250 acres within in the Core Area.

Mitigation for Spotted Owl Suitable Habitat impacts of East Miners Creek Site - Alternative 2
Probable incidental take of the East Miners Creek site could be avoided by modifying the prescription under Alternative 2 for units 27-1, 27-1R, 4-1 and 4-1R to maintain NRF habitat. This modified prescription would need to retain a basal area of 140 or more and canopy closure of 60% or more. This modified prescription would need to be applied to those portions of the above listed units that are within the PHR of this site, and are currently classified as NRF habitat (114 acres).

Miners Creek Site (High Priority Site)
This alternative would downgrade 13 acres within the PHR of this site. This site is currently deficit in suitable habitat at the PHR scale, but not at the Core Area scale. This alternative would reduce the amount of suitable habitat in the PHR from 615 to 602 acres. The USFWS threshold for determining incidental take is 1,200 acres of suitable habitat within the PHR. At the Core Area scale the suitable habitat acreage would not be reduced. However, the habitat quality of 2 acres within the core would be reduced from nesting/roosting to foraging (foraging is still considered suitable).

Mitigation for Spotted Owl Suitable Habitat impacts of Miners Creek Site - Alternative 2
Potential incidental take of the Miners Creek site could be avoided by modifying the prescription under Alternative 2 for units 4-1 and 4-1R to maintain NRF habitat. This modified prescription would need to retain a basal area of 140 or more and canopy closure of 60% or more. This modified prescription would only need to be applied to the portions of units 4-1 and 4-1R that are within the PHR of this site and are currently classified as NRF habitat (total of 13 acres).

These 13 acres are currently classified as foraging habitat, which is still considered "suitable". Downgrading of 13 acres of foraging habitat to a dispersal habitat condition within the PHR of the high priority Miners Creek spotted owl site would not be in compliance with the interim guidance for RA-10 in the 2011 Revised Spotted owl recovery plan as BLM understands the guidance. Compliance could be achieved by modifying the prescription under Alternative 2 for unit 4-1 and 4-1R to maintain NRF habitat. This modified prescription would need to retain a basal area of 140 or more and canopy closure of 60% or more. This modified prescription would only need to be applied to the portions of unit 4-1 and 4-1R that are within the PHR of this site and are currently classified as NRF habitat (total of 13 acres).

Alternative 2 Compliance with the 2011 revised Spotted Owl Recovery Plan
While the 2011 spotted owl recovery plan recognizes the need for active management within the range of the spotted owl for a variety of reason, it also provides guidance to the action agencies regarding areas that would be low versus high priority areas for implementing active management. High priority spotted owl sites as identified per the interim guidance on RA 10 are areas where active management is a lower priority than the immediate conservation needs of the spotted owl. The immediate, site specific, need to retain functional habitat for spotted owls at the designated high priority sites trumps the general need to actively manage forested stands on the landscape.

Under this alternative, unit 4-1R does not exist as a separate treatment unit operationally and its acres would be incorporated into the adjacent unit 4-1. The Alternative 2 prescription for unit 4-1 would be applied to those acres. Units 6-1, and 4-1, are currently classified as suitable spotted owl habitat and are partially or entirely within the Miners Creek spotted owl site PHR. This spotted owl site has been identified by the KFRA and the Klamath Falls office of the USFWS as a high priority site for conservation of the species pursuant to interim guidance for RA 10 in the 2011 Revised Spotted Owl Recovery Plan. Any treatment that would reduce the current level of suitability of these three units would not be consistent with the interim guidance.

In unit 6-1the proposed treatment under Alternative 2 (patch cutting up to 15% of the stand) would probably be beneficial for the spotted owl in the long term (100+years) because it would facilitate the development of a more species-diverse and structurally-diverse stand. However, the proposed treatment as described in Table D-2 (Appendix D) would reduce the suitability of the stand from nesting quality habitat to foraging quality habitat immediately post-harvest. Under Alternative 2 there could be a total of 3 acres in patch cuts out of 21 total acres in the unit. Creation of patch cuts as proposed in this alternative would: 1) reduce the overall stand canopy closure to at or near the minimum threshold level for nesting habitat, 2) further fragment the stand, and 3) increase the amount of hard edge within the core area of the Miners Creek owl site. These changes would result in the stand being reduced from nesting quality habitat to foraging quality habitat. This shift from nesting quality to foraging quality would still leave the stand in a 'suitable' habitat condition as defined by USFWS (see Table 9). However, this change would be inconsistent with the interim guidance for RA 10 in the 2011 Revised Spotted Owl Recovery Plan.

Most of unit 4-1 is currently typed as suitable for spotted owl foraging. The proposed treatment under Alternative 2 would be beneficial for the spotted owl in the long term because it would facilitate the development of a more species-diverse and structurally-diverse stand. However, Alternative 2 would apply a prescription that would reduce the suitability of the stands from foraging conditions to dispersal habitat conditions immediately post- harvest because the stand would be too open (less than 140 BA) and canopy closure would likely be below 60%. Lowering the canopy closure of the stand to a level below 60% and/or taking the basal area down to below 140 would result in the stand being classified as dispersal instead of

foraging habitat. This change in stand classification/function would be inconsistent with the interim guidance for RA 10 in the 2011 Revised Spotted Owl Recovery Plan.

Mitigation for Compliance with the 2011 revised Spotted Owl Recovery Plan – Alternative 2
For unit 6-1, altering the proposed prescription under this alternative to leave at least 70% canopy closure and/or significantly reduce the size and/or number of patch cuts would achieve compliance with the RA 10 interim guidance for high priority sites. The need to develop large, shade intolerant trees in the core area of the Miners Creek spotted owl site could be met outside of unit 6-1 by applying appropriate silvicultural treatments to the well-stocked and well advanced ponderosa pine regeneration in the plantation immediately adjacent to unit 6-1. This plantation is identified as unit 6-2 in this EA.

For unit 6-1, altering the proposed prescription for unit 6-1 under this alternative to leave at least 70% canopy closure and/or reduce the size and/or number of patch cuts would achieve compliance with the RA 10 interim guidance for high priority sites.

Impacts Specific to Alternative 3
Northern spotted owl habitat
Impacts to spotted owl suitable habitat under this alternative would consist of 23 acres of suitable habitat (in unit 21-2) thinned to the point that they would no longer function as suitable habitat, but would still function as dispersal habitat. This reduction represents 9 percent of the suitable habitat in the treatment units and less than 1 % of the total amount of suitable habitat within the Spencer Creek watershed. No suitable or dispersal habitat would be removed (see glossary for definition of habitat removal). Of the 23 acres downgraded from NRF to dispersal, no (0) acres would be within the PHR of any of the four spotted owl sites potentially affected by this project. However, this alternative would reduce the habitat quality of unit 6-1 from nesting/roosting quality to foraging quality as described under the other alternatives.

Under this alternative, Unit 6-1 would have patch cuts created as in Alternative 1. The Alt. 3 diameter limit (20 inch) would apply. However, the effect of the diameter limit in this stand would be minimal because of the species composition of the stand. The vast majority of trees over 20 inches in diameter in the stand are shade tolerant species (white Fir and Shasta red fir) and thus would be available for harvest in patch cuts. Consequently, the effects of Alternative 3 and Alternative 1 with regard to this stand are indistinguishable. Because of this impact, in this unit, Alternative 3 would not be consistent with the interim guidance for RA 10 in the 2011 Revised Spotted Owl Recovery Plan.

Based on past ESA Section 7 consultation history with the USFWS, Alternative 3 would not likely result in a determination of incidental take by the USFWS on any spotted owl sites.

Summary of differences of effects on spotted owls and their habitat between action alternatives
The alternatives vary substantially in their effects on suitable spotted owl habitat, assuming no mitigation is applied. Alternative 3 would downgrade the fewest acres (23) of NRF habitat. Alternative 2 would downgrade the most acres (117). Alternative 3 would not downgrade any suitable habitat within the PHR of any of the four spotted owl sites potentially affected by the project. Table 19 below displays the anticipated effects of the action alternatives on NRF habitat on a unit by unit basis. (The No Action Alternative is not included in this table because the cells under a No Action Alternative column would all say: "No short term effect on NRF, Long term increase in NRF quality".)

Alternative 1 would degrade 59 acres within the East Miners Creek PHR. Alternative 2 would degrade 114 acres within the East Miners Creek PHR (20 of it within the core area) and 13 acres within the PHR of the High Priority Miners Creek site. None of the action alternatives, as currently designed, provides for the retention of all NRF habitat within the proposed units. However, each unit that is currently classified as suitable does have at least one action alternative that provides a prescription for the maintenance of NRF habitat. Table 19 below displays the percentages of suitable habitat downgraded by each alternative at the project area and watershed scale.

Table 19: Total Acres Treated, and Acres of Suitable Spotted Owl Habitat Downgraded by Alternative

Alternative	Total acres treated	NRF acres treated	NRF acres downgraded	Percent of treated NRF downgraded	Percent of NRF in watershed to be downgraded
1	1,150	194	82	31	<1
2	1,066	267	117	60	1
3	1,150	194	23	9	<1
No Action	0	0	0	0	0

Table 20 below summarizes the effects of the alternatives with respect to spotted owl habitat downgraded, incidental take, and revised Recovery Plan compliance.

Table 20: Effects of the Alternatives With Respect To Spotted Owl Habitat Downgraded, Incidental Take, and Recovery Plan Compliance

Alternative	Habitat Degraded (acres)	Sites Likely incidentally Taken	2011 Recovery Plan compliance	Notes
1	82	1	No	Unit 6-1. See Alt. 1 effects discussion above
2	117	2	No	Units 6-1 and 4-1. See Alt. 2 effects discussion above
3	23	0	No	Unit 6-1. See Alt. 3 effects discussion above
No action	0	0	No	No short term negative effects to owls, but does not meet Recovery Action 16 (supply local mills) and does not provide for "active management"

Non-Listed Special Status Species (Survey and Manage, Bureau Sensitive)

No Action

Under the No Action Alternative there would be no short term change in habitat conditions for special status species in the project area. Long-term, the increasing density of the forest stands, an increase in the number of large trees, and the development of decadence in the stands would increase the amount and quality of the suitable habitat for species that use large trees and snags such as the white-headed woodpecker, flammulated owl, and bats. However, the lack of low intensity fires and/or fuels reduction treatments within the stands would put the stands at increasing risk of stand replacement fires. Also, younger stands proposed for treatment under the action alternatives would not be treated under the No Action Alternative. Consequently, the treatment induced long term accelerated development of multilayered canopy, large trees, and favorable (fire tolerant/shade intolerant) species mix in these stands would be forgone.

Cumulative Effects of No Action

Late successional habitat is already limited in the area and the majority of the adjacent private lands are currently early seral and have been planted in ponderosa and/ or lodgepole pine. These private stands, based on anticipated harvest entries would not be allowed to grow into late successional habitat. Consequently, those special status species requiring late successional habitat for some or all of their life functions will continue to depend on federal lands to provide this habitat in the project area.

Alternatives 1 and 3

These alternatives with their identical PDF's (see Appendix B for PDF's) would result in impacts to survey and manage and other non-ESA listed special status species less than or equal to the impacts anticipated, disclosed, and discussed in the 1995 KFRA RMP and the NWFP EIS.

Alternative 2

This alternative with its associated PDF's (see Appendix B for PDF's) would result in impacts to S&M and other non-ESA listed special status species less than or equal to the impacts anticipated, disclosed, and discussed in the 1995 BLM RMP.

Proposed Rock Crawling Pit

The direct effects on wildlife of developing and using the proposed rock crawling pit would be minimal and discountable due to the small geographic extent of the development, the general abundance of the habitat types that would be impacted, and the current disturbed condition of the area proposed for development. Because rock crawling enthusiasts often bring family members with other vehicles it is expected that use of surrounding roads and trails would increase thus OHV use is likely to increase in the project area as a whole due to the proposed development. The presence of OHV/ORVs has been shown to be detrimental to numerous species of wildlife through direct physical harm, harassment, and habitat damage. The amount of current impact within the project area is unknown, and would be very difficult to predict or estimate. The impact is likely to increase by an unknown amount if the rock crawling facility is developed. The more inviting the development, the more the impact of ATVs/ OHVs on the landscape and wildlife in the planning area is likely to be. Alternative 1 is a less developed option, Alternative 2 is a more developed option, and Alternative 3 does not include development of the rock pit.

Under the No Action Alternative, there would be no development of the rock pit. There would still likely be an increase of unknown rate in OHV use in the project area in general based on casual observation of increased use in the area over the last five years (M. Broyles, pers. obs.)

Under Alternative 1, the impacts to wildlife of OHV use (harassment, direct mortality, and habitat damage) would likely increase from the baseline levels of today.

Under Alternative 2, the impacts to wildlife of OHV use (harassment, direct mortality, and habitat damage) would likely increase above the level anticipated under Alternative 1.

Under Alternative 3, the impacts to wildlife of OHV use (harassment, direct mortality, and habitat damage) would be the same as under the no action alternative.

Effects Common To All Action Alternatives

Fuels Treatment

The treatment of residual fuels (slash) as biomass (chip and haul) or by piling and burning; and 150 acres of prescribed fire underburning under any of the action alternatives, with their associated PDFs (see Appendix B) is not anticipated to have any negative effects beyond those anticipated under the 1995 KFRA RMP/ROD and NWFP.

Proposed Road Re-Closures, Temporary Road Construction and Regular Road Maintenance

The effects of these activities as proposed under the action alternatives are expected to be beneficial as long as the temporary road(s) are actually closed and kept closed. The BMPs applicable to the action alternatives are sufficient to protect wildlife during the implementation of these activities.

Table 21: Summary of effects of action alternatives on special status species occurring in the project area

Common Name	Alternative 1	Alternative 2	Alternative 3 (Diam. Lim.)	Comments
White-headed Woodpecker	Snag retention measures should maintain population	Snag retention measures should maintain population	Snag retention measures should maintain population	Alternative 3 retains more large trees than the other two and as such, it would be better for this species than the others. How much better is impossible to quantify accurately.
Great Gray Owl	No effect.	No effect	No effect	
Northern Goshawk	No effect	No effect	No effect	No known nets in project area.
Flammulated Owl	Snag retention measures should maintain population	Snag retention measures should maintain population	Snag retention measures should maintain population	Alternative 3 retains more large trees than the other 2 and as such, it would be better for this species than the other 2. How much better is impossible to quantify accurately
Pacific Fisher	No effect	No effect	No effect	No effect
Pallid Bat	Snag retention measures should maintain population	Snag retention measures should maintain population	Snag retention measures should maintain population	Alternative 3 retains more large trees than the other 2 and as such, it would be better for this species than the other 2. How much better is impossible to quantify accurately
Fringed Myotis	Snag retention measures should maintain population	Snag retention measures should maintain population	Snag retention measures should maintain population	Alternative 3 retains more large trees than the other 2 and as such, it would be better for this species than the other 2. How much better is impossible to quantify accurately
Evening Fieldslug	No effect due to protection of all known special status mollusk sites	No effect due to protection of all known special status mollusk sites	No effect due to protection of all known special status mollusk sites	
Crater Lake Tightcoil	No effect due to protection of all known special status mollusk sites	No effect due to protection of all known special status mollusk sites	No effect due to protection of all known special status mollusk sites	
Chase Sideband	No effect due to protection of all known special status mollusk sites	No effect due to protection of all known special status mollusk sites	No effect due to protection of all known special status mollusk sites	
Oregon Shoulderband	No effect due to protection of all known special status mollusk sites	No effect due to protection of all known special status mollusk sites	No effect due to protection of all known special status mollusk sites	

Soils - Affected Environment

Soils in the Spencer Creek area were derived primarily from andesite, basalt, and ashy deposits of the High Cascade Province. Upland plateaus and lava flows dominate the landscape, with elevations ranging from about 5,100 to over 6,000 feet. Most of the landscape in the area consists of nearly level to steep slopes. The geologically young parent material coupled with the cold climate has produced soils in an early or intermediate stage of development (NRCS, 1993).

The 1993 Soil Survey of the Jackson County Area identified fourteen soil map units, comprised primarily of the Oatman, Otwin, Pokegama, and Woodcock soils. The very deep well drained Oatman and Otwin soils formed from volcanic ash, contain many rock fragments, and typically lack a thick dark surface horizon. Pokegama and Woodcock soils, also deep and well drained, formed in material derived from mudflows. Both have thick dark surface horizons, and are differentiated by the amount of rock fragments throughout the soil profiles. With the exception of the riparian areas, the soils consist of loams or sandy loams. Most of the soil units within the project area rate high for forest productivity (both site index and cubic feet per acre per year).

Fragile groundwater soils (defined in the 1995 Klamath Falls Resource Area ROD/RMP, page D-12) are present in the project area. They are located primarily in map unit 99A (see Table 22 below) and in a few small wetland inclusions. Fragile soils with water tables at or near the soil surface for extended periods are sensitive to surface disturbing activities, and require additional best management practices to mitigate resource damage.

All soils in the project area exhibit a low resistance to compaction and a severe rutting hazard. In their natural state, the soils allow water to move freely into and through the profile, creating a slow to medium potential for runoff when thoroughly wet. The hazard of erosion, from both roads and off-road areas following disturbance activities trends from slight to moderate. Soils with a severe erosion hazard and rapid runoff potential are found on very steep slopes and comprise a minor component (2%) of the units within the project area. Table 22 displays the soil map units and characteristics relevant to project analysis. A soil map is available in the project record.

The 1995 ROD/RMP identifies objectives and practices to maintain or improve soil productivity. To meet those objectives, best management practices have been established limiting soil detrimental conditions to no more than 20 percent of the total acreage within an activity area. "Detrimental soil conditions" are defined in terms of detrimental compaction, displacement, and creation of adverse cover conditions. With the exception of displacement, quantitative specifics and thresholds of detrimental soil condition variables are outlined in the ROD, page D-11. For this analysis the Region 6 Forest Service threshold for displacement is referenced, defined as the loss of 50 percent of the A horizon (surface layer) from an area of 500 ft2 (FSM 2520, R-6 Supplement No. 2500-98-1).

The Spencer Creek Watershed Analysis concludes that some losses in soil productivity have likely occurred in the watershed due to timber harvest and recreational activities. The losses are mainly due to compaction and displacement. However, the extent to which soil productivity has been affected by management activities is unknown (BLM, 1995). Previous attempts to measure detrimental soil conditions have been conducted in the watershed. Compaction monitoring studies were performed in 1999 through 2002 on the Frosty Too and Kakapoo sales to assess soil disturbance after timber sale activity. Results of both studies concluded soil disturbance was at or near compaction levels considered detrimental. However, quantifiable increases in soil bulk density could not be determined. Subsequent studies suggest continued soil monitoring utilizing methodology other than bulk density sampling.

Pre-treatment field surveys conducted by KFRA staff during 2010 and 2011 confirmed existing soil conditions in the project area overall met RMP standards for detrimental soil disturbance. All of the units visited showed signs of previous entry. Detrimental soil disturbance was estimated at 10 to 15 percent of the total project area, and generally confined to old skid trails and landings. GIS and GPS analysis performed by Resource Area KFRA timber staff on the Grenada East timber sale suggests the total area of soil disturbance resulting from skid trails, landings, and temporary road construction typically ranges from 5 to 12 percent (KFRA staff, 2004). The 2008 RMP asserts that the area of residual detrimental soil disturbance remaining after all timber harvest activities is closer to 15 percent when utilizing ground-based logging methods (KFRA RMP, 2008; page 8-838). Discrepancies in data are presumably due to the fact that the 2004 analysis did not consider soil disturbance off of skid trails, whereby the 2008 RMP accounts for all disturbances from timber harvest activities. The latter data more accurately reflects current conditions in the project area.

Pre-treatment field surveys in FY 2010-2011 verified that previously implemented mitigation measures were effective in reducing and/or preventing soil damage and subsequent loss of productivity in approximately 85 percent of the project area. Woody debris was scattered across most skid trails providing erosion control and nutrient input. Large extents of bare ground were rare. Saplings, brush, and small vascular plants were typically growing on old skid trails and decommissioned roads. Although all soils in the project area have a severe rutting hazard and low resistance to compaction, site evaluations indicated the 20 percent detrimental threshold was not exceeded at the current time. This was likely attributed to effective implementation of BMPs and mitigation measures, as well as natural soil resiliency and recovery processes.

Table 22: Mapping Units and Interpretations for Management (NRCS, 1993)

Map Unit	Soil & slope	Erosion Hazard (water)	Compact-ion Resistance	Rutting Hazard	Runoff Potential	Fire Damage Suscept.	Acres/ % area
13C	Bly-Royst complex, 1-12% slopes	Slight to Moderate	Low	Severe	Slow	Slightly	17/ 1.5%
79E & 80E	Greystoke-Pinehurst complex, 12-35% north- & south-facing slopes	Moderate	Low	Severe	Medium	Highly	35/ 3%
99A	Klamath silt loam, 0-1% slopes	Slight	Low	Severe	Slow	Slightly	40/ 3.5%
135E & 136E	Oatman cobbly loam, 12-35% north- & south-facing	Moderate	Low	Severe	Medium	Highly	63/ 5.5%
138C	Oatman-Otwin complex, 0-12%	Slight	Low	Severe	Slow	Moderate	147/ 13%
135G	Oatman cobbly loam, 35-65% north slopes	High	Low	Severe	Rapid	Highly	11/1%
137C	Oatman cobbly loam, depressional, 0-12% slopes	Slight	Low	Severe	Slow	Moderate	8/<1%
145C	Pinehurst-Greystoke complex, 1-12% slopes	Slight	Low	Severe	Slow	Moderate	37/3%
147C	Pokegema-Woodcock complex, 1-12%	Slight	Low	Severe	Slow	Slightly	421/ 37%
203F	Woodcock stony loam, 35-55% south slopes	High	Low	Severe	Rapid	Highly	12/ 1%
204E & 205E	Woodcock-Pokegema, 12-35% north- & south-facing	Moderate	Low	Severe	Medium	Highly	361/ 31%

In two proposed treatment units, however, ground conditions were approaching or exceeding RMP soil quality standards. Documented detrimental soil conditions were estimated at 15 to 20 percent of the unit areas of 22-1 and 27-1 (on file, KFRA). Disturbance was limited primarily to topsoil displacement, large connected areas of bare ground, exposed mineral soil, and subsoil mixing. Evidence of erosion was not observed. Soils in the disturbed treatment units included map units 147C, 204E, and 205E.

Soils - Environmental Consequences

No Action

Under this alternative no soil-disturbing treatments would be implemented. Detrimental soil conditions from timber harvest activities would not increase above existing levels. There would be no immediate soil impacts such as compaction, rutting, or displacement associated with timber harvest or thinning operations. Previously disturbed areas would continue the recovery process at the present rate, toward improved soil productivity.

Conversely, the absence of timber harvest and fuel treatments would result in denser forest stands, higher fuel loading of dead material, and potentially more intense wildfires. The ultimate effects on the soil would be a greater potential for soil nutrient loss due to volatilization and the formation of a hydrophobic (water-repellant) surface following a wildfire event. Fire results in the loss of cover and, on steeper slopes, renders the soil more susceptible to surface erosion.

Units 22-1 and 27-1 would not be further impacted by management activities. Natural processes such as vegetative development and nutrient cycling would continue to advance soil recovery. The OHV area would not be constructed, and thus soil impacts from related construction activities would not occur. OHV use and dispersed camping is expected to continue throughout the project area.

The No Action Alternative would have the least impacts of all the alternatives on soil productivity. This alternative would meet BLM objectives for soil resource protection.

Effects Common to All Action Alternatives

Ground-based surface disturbing activities would occur on all soil types throughout the project area. Conducting mechanical thinning activities for density management or riparian restoration would result in some degree of soil disturbance. These activities are likely to cause isolated areas of compaction and topsoil displacement. However, with the exception of units 22-1 and 27-1, extensive areas of detrimental soil conditions are not likely to occur under implementation of any action alternative. Soil productivity, that is the ability to provide stability, nutrients, and water for sustained plant growth, would be maintained. Effects would be alleviated by implementation of Best Management Practices and Project Design Features (Appendix B), and are expected to remain below threshold limits established by the 1995 RMP. To ensure compliance with RMP objectives and goals in units 22-1 and 27-1, see "Soil Disturbance Monitoring and Additional Design Criteria" recommendations listed at the end of this section.

Soils found on the steeper slopes have moderate erosion hazards and medium runoff potentials. To prevent erosion from ground-disturbing activities, the KFRA ROD (page D-11) prescribes minimum effective ground cover amounts. Vegetative retention and establishment is specified at 30- 45% in the first year and 40-60% in the second year on disturbed sites of moderate erosion hazard. It is anticipated that adherence to BMPs on these steeper sites would result in less than 20 percent detrimental conditions.

Manual thinning of selected trees is expected to have no measureable impact on the soil resource, except when followed by pile burning. Depending on the size, intensity, and duration, burning slash piles could damage the soil. Piled slash burns hotter than underburning. Soils below the burned piles can incur loss of organic matter, changes to physical properties such as structure and water-repellency, and exhibit increased erosion rates. Those soils in the treatment area on slopes greater than 12 percent are highly susceptible to forming a water-repellent surface layer. The threshold for detrimentally burned conditions occurs when the mineral soil (below the duff or litter layer) is oxidized to a red color; the next half-inch is blackened due to charring of organic matter. To alleviate potential detrimental effects, burned areas should remain small and interspersed throughout the units. Burning should only occur when the soil surface is very moist or wet. Thinning small diameter material and utilization of logging debris could avoid the need to pile and burn.

Low-intensity underburns would have minimal effects on soil properties. Typically, cool broadcast burns have a slight short-term positive effect of increasing available nutrients, with a slight negative effect three to five years post burning, due to decreases in nitrogen. Soils within the project area are expected to remain in good condition post-treatment.

A number of existing roads would be closed, decommissioned, or temporarily opened until harvest activity is completed. Approximately 300 feet of temporary road would be built for access to sale units. Fully decommissioning roads (ripping the surface, filling ditches, removing culverts, etc) should result in decreased erosion rates to near natural levels within five to ten years (Hass, 2009). Depending on amounts of use and

precipitation, it is anticipated that roads within the project area will continue to yield some amounts of sediment.

Restoration activities utilizing mechanical methods could have initial adverse effects on soils. Specifically, operating heavy equipment on fragile wet soils could cause compaction, rutting, and ultimately modify the hydrology of the site. Since areas of fragile soils are sensitive to surface disturbing activities, additional BMPs for Fragile Groundwater soils are detailed in the KFRA ROD (pages D-12 and 13):

- avoid machine piling or ripping
- limit the use of tractors and other major surface-disturbing activities
- commence rehabilitation promptly, by seeding or planting of native species or species that will quickly establish desired ground cover conditions
- on completion of restoration project, block unsurfaced roads to prohibit motorized vehicle use

Restoration treatments on Fragile Groundwater soils using manual treatment methods are expected to have no measureable effects.

Field studies and GIS analysis of the effects from previous management activities and mitigation measures validate the supposition that existing conditions have achieved soil productivity objectives of the RMP. Consequently, with continuous implementation of BMPs, soil impacts are anticipated to be within RMP acceptable levels. With the exception of the riparian areas, effects would occur primarily on the main skid trails, landings, and temporary roads. Impacts are not expected to affect long-term (greater than 10 years) soil productivity.

Effects Specific to Alternative 1 and Alternative 3

Under Alternative 1, density management involving ground based mechanical thinning, under burning, and patch cut activities mirrors management prescriptions of Alternative 3. The primary difference between the two alternatives relates to the harvest diameter limits that are proposed under Alternative 3. The harvest units and basal area would be the same, and mechanical equipment would be used in about the same areas of each unit whereby implementation of either alternative would have similar effects on the soil resource.

Alternative 1 includes a primitive OHV rock crawl area. The area under consideration consists of an existing two-acre abandoned rock quarry and a proposed two-acre crushed rock surface parking/staging area. If site use is unregulated or barriers not maintained, the potential exists for resource damage from off road vehicle use. Provided the rock-crawling activities are confined to the rock pit, there would be no measureable impact on the soil resource. Implementation of Alternative 1 would also require permanently reopening 0.2 miles of road 38-6E-35.1. Effects of reopening and maintaining this road are likely to result in sediment production, but in the long-term would remain at current levels. A detailed discussion of the effects roads have on sediment production and delivery to the watershed can be found in the Hydrology section of this document. The OHV rock crawl area and reopening of road 38-6E-35.1 is not proposed under Alternative 3. Consequently, no ground disturbing effects associated with the OHV site would occur. Of the three action alternatives, soil impacts from recreational activities would be the least under Alternative 3.

Both Alternatives 1 and 3 would treat slightly more acres than are proposed in Alternative 2. Likewise, effects on the soil resource are expected to be slightly greater under Alternatives 1 and 3 in relation to Alternative 2. With the exception of the previously cited units approaching the detrimental threshold, both alternatives meet the 1995 RMP standards for soil resource management objectives and goals.

Alternative 2

Effects to the soil resource under implementation of this alternative would be less than those of Alternatives 1 or 3. Approximately 85 acres would be left untreated, resulting in less soil impacts than would occur than under implementation of the other alternatives. Fewer mechanical treatments would take place, causing less

ground disturbance. The potential for soil compaction, displacement, or reduced productivity would diminish slightly.

With respect to the soil resource, the primary difference between the three alternatives is in regards to the aspen restoration and riparian treatments. Alternatives 1 and 3 propose predominantly mechanical treatments, whereas under Alternative 2 the treatments would be primarily manual. Implementation of Alternative 2 would incur less impact on the fragile riparian soils than that of Alternatives 1 or 3.

Similar to Alternative 1, this alternative also includes an OHV rock crawl area. Under Alternative 2, the rock crawl project includes more development of the area surrounding the existing rock quarry including construction of an improved parking lot, camp and picnic areas, and toilet facilities. Soil impacts from construction equipment, vehicles, and campers are anticipated to be greater under Alternative 2 than Alternative 1 or 3. The initial construction activities, on-going recreational use, and periodic maintenance would result in soil disturbance, but it is anticipated that the levels and magnitude of disturbance would remain within the 1995 RMP limits.

In addition, Alternative 2 proposes to permanently reopen 0.2 miles of road 38-6E-35.1, and establish an access route from the parking lot to the rock crawl area. Effects of reopening and maintaining road 35.1 and creating an access route are likely to result in sediment production, but in the long-term would remain at current levels.

With effectively applied mitigation measures, implementation of Alternative 2 would limit impacts on the soil resource to acceptable thresholds of the 1995 and 2008 Resource Management Plans.

Cumulative Effects of Alternatives 1, 2, and 3

Past, present, and future activities in the project area include, but are not limited to: timber sales, vegetation and fuels treatments, grazing, dispersed recreation, road construction and maintenance, and watershed improvement projects. Wildfires have occurred and are expected to continue to occur at some reduced level (from the No Action Alternative) throughout the watershed.

It is recognized that former management treatments, human activities, and naturally occurring events have resulted in various degrees of soil disturbance within the project area boundaries. As a consequence, soil productivity has been impacted to various degrees. The 1994 FEIS describes cumulative effects on soils (at 4-11 to 4-16). The FEIS assumed a 4% loss in sustained timber productivity from soil compaction on primarily skid trails as a result of past and future management actions. Detrimental soil conditions likely resulted from prior activities, but presently, detrimental conditions exceeding the standards enumerated in the KFRA RMP have not been documented or observed. Although the precise extent and degree of disturbance is unknown, it is presumed that over a period of several decades, the addition of organic matter residues and freeze-thaw cycles have improved soil productivity and advanced recovery.

Under all alternatives, the cumulative amount of detrimentally disturbed soil from all management actions would impact no more than 20 percent of the activity area, and remain well within the allowable RMP limit for maintaining soil productivity.

Future actions anticipated within the project area include commercial timber harvest, thinning, planting, and underburn activities. Most of these actions were analyzed in previous EAs. An EIS is currently analyzing the effects of the Pacific Connector Gas Pipeline ROW in the analysis area. Continued implementation of project design features, mitigation measures, and monitoring would ensure compliance with soil resource management objectives enumerated in the RMP.

Roads - Affected Environment

Current road densities on BLM land in the project area are approximately 2.3 miles of open road per square mile (mi/sq.mi).The details of this calculation can be found in the project record. Public access on roads to the

analysis area is limited during the winter months due to snow depths, with some roads often snowed in until early summer. In some winters some paved and graveled roads in the project area are plowed free of snow in order to allow access for timber harvest operations on BLM and private lands. Some roads within the project area had work completed during the summers of 2003 and 2005 for the purposes of watershed restoration (see Table 23, Projects for Watershed Restoration in the Hydrology section). This restoration included relocating roads out of Riparian Reserves/Riparian Management Areas, decommissioning roads and blocking roads with gates. These activities reduced open and existing road densities in the proposed project area. There are approximately six miles of road in the analysis area that were closed or decommissioned during past projects which require maintenance of the closures. Existing Rights-of-Ways within the area of the project are summarized in Table D-6 (Appendix D). These roads are primarily associated with Timber use roads. Specific information on ROW's in the project area can be found in the project record.

Roads - Environmental Consequences

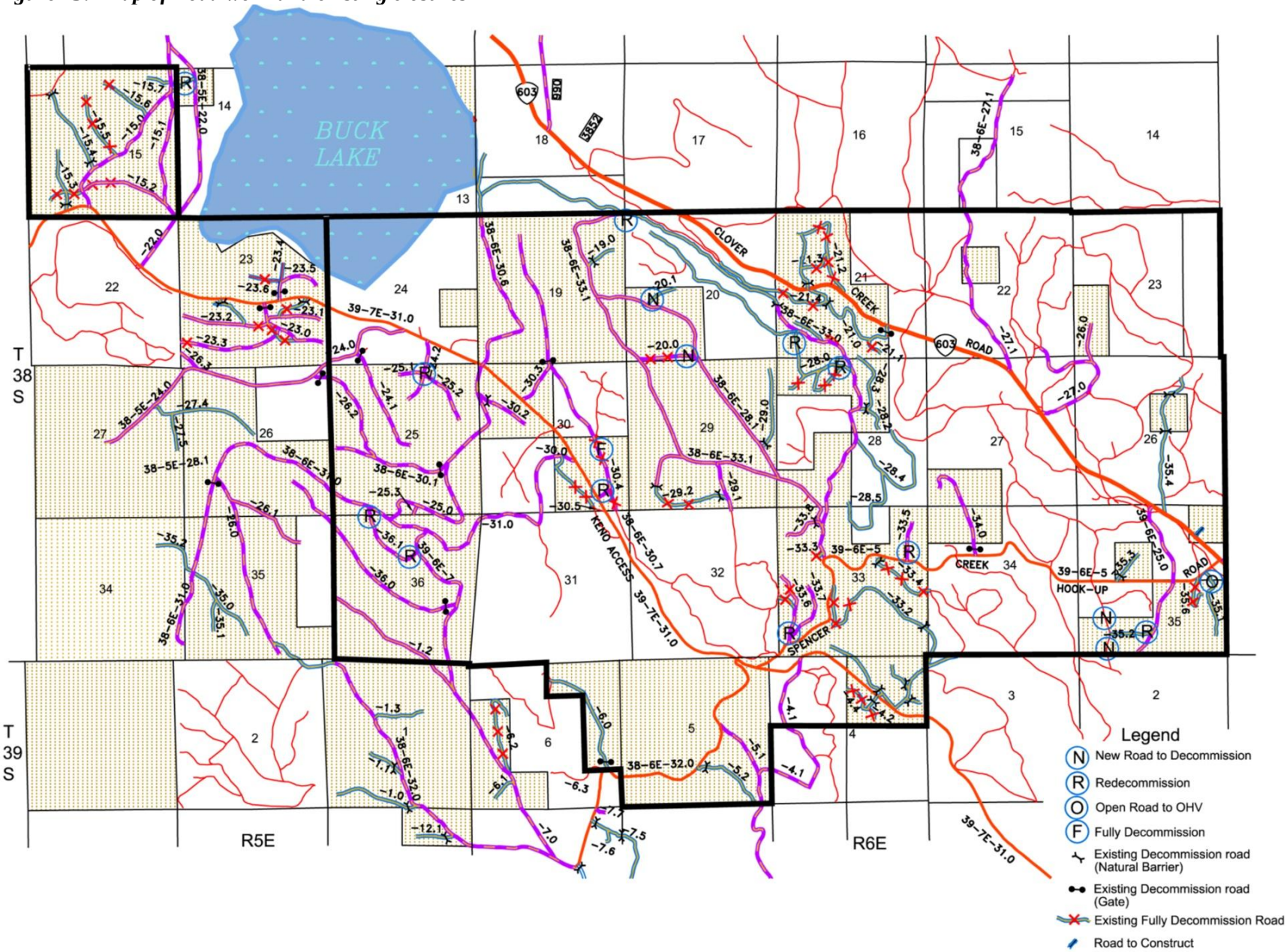
No Action

Under the No Action Alternative, current road trends would continue, including periodic road maintenance. This would involve grading and spot rocking depending on annual maintenance needs and funding. There would be no proposed road obliteration or construction. There would be no improvement of existing road surfaces or drainage features apart from current road trends including periodic maintenance needs.

Alternatives 1, 2 and 3

All roads within project area will be assessed periodically for road maintenance deficiencies and improvement needs. Some roads may need to be upgraded for winter hauling. Roads within the project area that are closed to vehicle traffic would be reopened during the timber sale contract and then closed afterward. A few roads presently closed within the EA boundary would need to be reclosed. For all three action alternatives approximately 300 feet of new temporary road would be constructed for safe access into unit 35-2. This spur road would be obliterated after all harvesting operations are complete. In Alternatives 1 and 2, approximately 0.2 miles of road number 35.1 would be permanently opened if permanent legal access across private property for the public to the proposed OHV area can be obtained. See Figure 13 below and Table D-5 in Appendix D for details.

Figure 13: Map of Road work and existing closures



Cumulative Effects

Periodic maintenance or storm proofing of system roads would reduce erosion and provide a safe travel way. The Resource Area has worked extensively with both JELD Wen Timber and Ranches and the USFS analyzing and reviewing opportunities to reduce road densities in the Spencer Creek Watershed (See Spencer Creek Restoration EA#OR-014-04-08). The KFRA continues to strive to reduce open road density and environmental effects associated with roads and road use during implementation of projects. A combination of BLM and private checkerboard ownerships and historic (1950-1960) O&C Right-of-Way access agreements with adjacent landowners reduces BLM's flexibility to reduce densities further. Potential future harvesting, fuels treatments, and recreation on BLM lands would utilize existing roads, either currently open or closed. In all three action alternatives 300 feet of temporary new road construction is planned to provide safe access and landing areas for unit 35-2. This road would be obliterated afterwards. Therefore, no long term detrimental effects to the road system are expected. The road density for the analysis area would increase slightly under alternatives 1 and 2 due to the permanent reopening of road number 38-6E-35.1.

Hydrology and Water Quality – Affected Environment

Riparian Areas

Lotic Riparian Resources

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. Ephemeral and intermittent streams are more common in the watershed, 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 substantially affected by management actions. Stream channel functions have been affected by roads and stream crossings and past harvest activity

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 down-cut and widen. This leads to increased stream energy (due to less interactions with floodplain areas) and may cause water quality degradation. As a result of increased runoff and decreased channel-stabilizing structure (i.e., large wood), some stream channels in the analysis area have 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. Some of these riparian areas have been affected detrimentally by past logging activity (including the removal of large trees 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, soil compaction and loss of site potential, loss of stream shading, and trampling of riparian vegetation.

Although PFC (Proper Functioning Condition) surveys have been completed for fishbearing streams in the analysis area (see Aquatic Species Section), they have not been completed for the smaller streams within the analysis area. Informal surveys of the stream channels suggest that most of the streams are likely either "Properly Functioning" or "Functional At-Risk" with a stable or improving trend. 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 (USDI BLM, 1995).

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. Informal surveys suggest that they are generally Properly Functioning. Some areas are bisected by, or are downslope from, roads and log landings which may affect flow routing

Riparian buffers are areas around both lotic and lentic riparian resources. To protect the areas from degradation and facilitate long term down wood recruitment, the Spencer Creek Watershed Analysis (1995) recommends placement of a one site potential tree height buffer area around springs and seeps less than one acre in size and a buffer of two site potential tree heights for fishbearing streams and lakes and natural ponds. Dense riparian stands have decreased health and vigor, resulting in increased time to develop large tree structure for wildlife, stream shade, and future instream wood. These conditions are compounded by an increase of fuel loading, reducing available resources to trees and increasing risk of a stand-replacing fire. RMP direction is to apply silvicultural practices for riparian reserves to control stocking, reestablish and manage stands and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy Objectives (1995 BLM RMP) . Riparian Management Areas (2008 RMP) have designed buffers that are one-half the width of Riparian Reserve Buffers from the 1995 RMP, and have very similar management objectives to those that apply to Riparian Reserves, however the specific Aquatic Conservation Strategies from the Northwest Forest Plan (and 1995 RMP) do not apply.

Hydrology

The hydrology of the Spencer Creek watershed 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. The proposed treatments are located in the upper part of the Spencer Creek watershed, a Northwest Forest Plan Tier 1 Key Watershed (19995 BLM RMP). Perennial streams in or near the analysis area include Spencer Creek (as it flows through Buck Lake), Tunnel Creek, Miners Creek, and a small spring-fed portion of Clover Creek. Streams in the analysis area either drain east into Spencer Creek, via Buck Lake or Miners 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; Grant et al. 2008). The percent of the watershed area in a hydrologically unrecovered status is commonly used to assess the cumulative hydrologic impacts of past and proposed timber harvest (Grant et al. 2008).

Assessment of Current Condition for the Analysis Area

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 in the 1995 in the Spencer Creek Watershed Analysis. Public land survey data indicate that approximately 17 percent of the watershed was in Equivalent Clear-cut Area (ECA) condition 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 difference between the historic and current conditions suggests that past management actions have affected stream flow timing and duration in the watershed (Spencer Creek Watershed Analysis, page 4-41).

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. Roads with native surfaces showed the highest potential for sediment production. Where native surface roads are hydrologically connected to streams, there is the potential for sedimentation to aquatic habitats. Many of the native road surface roads that had potential hydrologic connections to the stream network were identified in the

road inventory and have subsequently been addressed through road closure, obliteration, or other means of disconnecting the roads from the stream network.

The Spencer Watershed Analysis identified the high density of roads as contributing to the excess levels of sediment in Spencer Creek. There were 150 road crossings and 23 miles of road within 100 feet of stream channels within the watershed. Roads and increased compaction decrease soil productivity**,** prolong the vegetative recovery process, and increase runoff potential. The density of roads also exceeds the recommended level for several wildlife species of concern, including deer and elk. In addition, Changes in habitat condition were determined to be chronic and problematic for native fish in Spencer Creek; fine sediment, high temperature, and low flows. The significant causal mechanisms for reduced habitat quality are road crossings, streamside timber harvest, and channelization and grazing at Buck Lake. Watershed restoration projects addressing sediment problems completed since the Spencer Watershed Analysis are listed in Table 23.

Table 23: Projects for Watershed Restoration

Type of Project	Project Activities
"Structural" Treatments/Improvements	• 4 stream crossing improvements • 4 stream crossings in riparian reserves removed • 2.1 miles of riparian fencing • 7 miles of large wood placement (320 logs via Helicopter) • 5 miles of road decommissioning • 2 ac of Gravel crushing operation tailings removal
"Vegetative" Treatments/Improvements	• 96 acres of riparian hand thinning • 665 acres of Rx Burning • 110 acres of Mechanical Fuels Treatments (106 acres in DDR1) • 1745 acres of Hand Fuels Treatments (107 acres in a DDRB2) • 2,689 acres of Density Management**

The assessment of watershed-scale impacts suggests that the magnitude of management impacts has affected hydrologic processes the Spencer Creek watershed by changing the timing, magnitude and duration of flows. Reduced canopy closure and the increased extent of large openings are likely increasing peak flows in these watersheds to be higher that they were historically. The magnitude of these effects, if they are occurring, cannot be quantified.

Water Quality

The primary water quality concerns in the Spencer Creek watershed are temperature and sediment. Throughout the mainstem of Spencer 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). Ongoing restoration projects are showing indications of improvements and address these concerns on both private and public lands in the watershed. These include improved stream shading, livestock management improvement, road closures and obliterations, culvert removal or replacement, and large woody debris placement.

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.

Hydrology and Water Quality – Environmental Consequences

The 1994 FEIS analyzed the effects of all actions proposed in the 1995 RMP on pages 4-16 to 4-24. That description of effects concluded that effects from timber harvest would generally be short term and would tend to diminish as areas revegetate and soil conditions improve when appropriate BMPs are adhered to. It went on to say that on a watershed scale continual disturbance and long-term hydrologic changes will result from harvesting in one area while an adjacent area is still recovering from previous harvests (regardless of ownership).

Effects Common to all Action Alternatives

Effects of Thinning, Density Management, and Patch Cuts

At the scale of individual treatment units, until forest canopy recovery occurs, decreased evapo-transpiration will make more soil water available for streamflow, and may cause slightly increased early winter water availability and summer base flow. Recovery is expected to occur within a decade after harvest for thinning harvest and 25 years for regeneration patch cuts. Due to the porous soils and geology 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 Riparian Reserve Treatments

Treatments within buffer areas would be designed to maintain and restore forest composition, canopy closure, and late-successional characteristics. These treatments would cause immediate reductions in canopy closure but would favor the long-term maintenance or restoration of hydrologic processes, stand health, and structural diversity.

Effects of Prescribed Fire and Non-Commercial Thinning 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).

In the short-term, noncommercial thinning treatments and prescribed fire would 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 project specific PDFs in Appendix B) would minimize detrimental hydrologic effects of noncommercial treatments and prescribed burning.

The effects of noncommercial treatments and prescribed burns outside of timber sale units are not likely to directly compound the effects of timber harvest on hydrologic processes. 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 and should not detrimentally affect hydrologic resources.

Effects of Road Use and Maintenance

Road reopening/ and construction and subsequent obliteration of a temporary road in unit 35-2 would potentially cause short term increases in sediment production, but long term the sediment would remain at current levels.

Implementation of road related best management practices during timber sale contracts 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. Actions of this type would reduce overall 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). Implementation of the roads BMPs would reduce the potential for sediment delivery to streams.

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) and soil analysis report 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 (Appendix B) and PDFs would reduce the likelihood of adverse sediment and water quality impacts (see Table 24).

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 permeable nature of soils in the analysis area and the implementation of appropriate BMPs and PDFs (see Table 22). 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 (Debano et al. 1996).

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 native surface (dirt roads) (BLM Spencer Creek Road inventory report 2003). Most roads in the analysis area do not have direct hydrological connections with stream channels. Ensuring that haul roads are maintained in good condition and all applicable BMPs for roads are followed, would mitigate detrimental impacts of road use associated with timber harvest.

The width of riparian reserves and no-machine-entry buffers 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. Harvest and thinning in the outer half of the management areas or riparian reserves could slightly reduce shade originating from the secondary shade zone (the area potentially providing shade during the morning and afternoon when sun angle is low). Effects on temperature are expected to be negligible and short-term because riparian buffers are at least 80 feet wide (Brazier and Brown 1973) and effective shade is near system potential in the primary shade zone. In the long-term, thinning would accelerate the achievement of system potential shade by accelerating growth of the largest overstory trees in dense second growth stands. No patch cuts are proposed for Riparian Reserve areas and thus there would be little potential for shade reductions or microclimate changes from reduced shade in the primary or secondary shade zones (Anderson et al. (2007).

Table 24: Potential effects on water quality and mitigating design features/best management practices

Management Action	Potential Effect	Mitigating actions
- 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 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 volatilization 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

Effects Common to Alternatives 1 and 2

A small portion of the proposed rock crawl area is within the 1995 RMP Riparian Reserve Area in unit 35-3 adjacent to Clover Creek, a fish bearing intermittent stream in the Clover Creek subwatershed. The rock crawl area is currently an inactive hard rock quarry with no apparent surface water drainage. The conversion of the area to a rock crawl area is not expected to alter the drainage configuration or cause erosion that would lead to stream sedimentation. The access road to the proposed rock crawl area is currently closed and would need to be reopened to the rim of the quarry and would need to be modified to provide vehicle access and approximately two acres of crushed rock surface parking. An entry and exit road to the rock quarry from the access road and parking area would need to be developed. Road BMPs would be followed, including the design of proper drainage features, to minimize potential for surface runoff. Under Alterative 2, Recreation BMPs regarding the construction of new recreation facilities would be followed. This activity would occur outside the Riparian Reserve but would increase road related traffic and soil disturbance. Implementation of this project would result in an increase of open road of .20 miles.

Effects Common to Alternatives 1 and 3

Treatment would occur only in the outer 1/2 of the Riparian Reserve (outer 80 feet for intermittent and non-fishbearing streams and the outer 160 feet of fish bearing streams). Where patch cuts would occur in the outer ½ of riparian reserves, they would be designed and placed to ensure there would be no reduction in stream shading from the secondary shade zone. No detrimental impacts to aquatic resources would occur as a result of harvest in Riparian Reserves. Design of these projects would be consistent with meeting ACS objective (see appendix—ACS objectives analysis).

Effects of Alternative 2

Under Alternative 2, these areas would be treated under density management prescriptions and would have slightly more mechanical versus manual treatment acres (see Table 25). However, the differences in amount of disturbance are not substantial enough to distinguish hydrologic effects between the action alternatives. Where patch cuts would occur within the secondary shade zone, they would be designed and placed to ensure there would be no reduction in stream shading as a result of harvest.

Table 25: Summary of Riparian Reserve Treatments

	Alternative 1		**Alternative 2**		**Alternative 3**	
Subwatershed	**Acres Mechanical**	**Acres Manual**	**Acres Mechanical**	**Acres Manual**	**Acres Mechanical**	**Acres Manual**
Buck Lake	11.4	11.5	0	22.9	11.4	11.5
Lower Spencer	19.7	0	19.7		19.7	0
Upper Spencer	18.1	32.4	28.8	13.1	18.1	32.4
Clover Creek	4.66	2.45	7.11	0	4.66	2.45
Total	**53.9**	**46.4**	**55.6**	**36.0**	**53.9**	**46.4**

Watershed- and Subwatershed-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 and scope of activity proposed in the alternatives there would be little potential for the action alternatives 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 slow recovery processes from past timber harvest. Recovery of vegetation in previously regeneration or clear-cut acres on the public lands is likely to outpace the effects of additional thinning and patch-cut effects.

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 low stream densities in the Spencer sub-watersheds make it unlikely that detrimental impacts would occur.

Proposed commercial and pre-commercial thinning, under all alternatives, would likely retain sufficient canopy and ground cover such that no hydrologic impacts would be realized at the subwatershed (6th field) or watershed (5th field) scales. Density management treatments (including patch-cuts within density management prescriptions) would cover 0 to 3 percent of the watershed acres for each of the four subwatersheds (6th field hydrologic units) and approximately 1% of the Spencer Creek 5th field watershed (Table 26). Since canopy retention is estimated to be approximately 50-60% within the density management units, the actual ECA impact should be approximately ½ the acre values or less than 1% for the entire watershed. These treatments would, in the long term, maintain forest composition and sufficient canopy closure to prevent changes in peak flows. The area is in the snow zone and not typically susceptible to rain-on snow event processes. The area treated by density management thinning as well as associated road use and maintenance in all three action alternatives is similar enough that it would not be possible to distinguish hydrologic effects between alternatives.

Harvest of overstocked forested stands would modestly decrease ET rates throughout the year, thus altering the water balance in favor of soil recharge and streamflow. High elevation patch cuts may lead to increased late spring and early summer flows. Increased low flows would benefit water quality by reducing the warming rate of small streams. Assumptions for ECA analysis are that density management prescriptions would reduce canopy closure to approximately 50%-60 and patch cuts would be done throughout the density management units equivalent to 15% ECA of each harvest unit.

Table 26: Density Management Treatments including the Action Alternatives and their ECA Consequence for each 6th Field Watershed

	Alternative 1			**Alternative 2**			**Alternative 3**		
Subwatershed	**Density Management (Acres)**	**Percent of sub Watershed Area)**	**Hydrologically Unrecovered %**	**Density Management (Acres)**	**Percent of sub Watershed Area)**	**Hydrologically Unrecovered %**	**Density Management (Acres)**	**Percent of sub Watershed Area)**	**Hydrologically Unrecovered %**
Buck Lake	1.6	0.0%	0.0%	1	0.0%	0.0%	1.6	0.0%	0.0%
Lower Spencer	355	2.7%	1.7%	299	2.2%	1.5%	355	2.7%	1.7%
Upper Spencer	291	2.5%	1.6%	289	2.5%	1.6%	291	2.5%	1.6%
Clover Creek	259	1.8%	1.2%	259	1.8%	1.2%	259	1.8%	1.2%
Totals	906.6		1.1%	848		1.0%	906.6		1.1%

Cumulative Effects of Action Alternatives

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 any of the action alternatives (DeBano et al., 1996).

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 would be intercepted and transported by roads. The magnitude and extent of this effect would be minor. The use of skid trails and roads would channelize some runoff, especially on steep slopes or in riparian zones, or where ruts develop. Implementing BMPs for roads and logging operations would mitigate and minimize these effects.

Other road actions not part of this proposed action are planned in the watershed for approximately the same timeframe. These include road closures, culvert replacements and drainage improvements (Spencer Creek Treatments EA # OR-014-08-09). These actions will function to offset the effects of road reopening and rock crawl development that would occur under Alternatives 1 and 2.

No Action Alternative and Cumulative Effects of No Action Alternative

Under the No Action Alternative, there would be no ground disturbing effects of sedimentation or increase in road related sediment inputs due to increased levels of road use and maintenance resulting from timber management activities. Compaction and soil disturbance would not occur thus cause any direct or indirect increase in sedimentation potential. Indirect and cumulative impacts associated with current watershed conditions identified in the affected environment section will continue to occur.

High density stands in Riparian Reserves would remain overstocked and suppressed. If a stand replacing wildfire was to occur, likely negative effects on aquatic species would include loss of canopy shading, negative impacts on water quality due to higher than normal nutrient concentrations in soil adjacent to the stream, and sedimentation.

Conifer growth in overstocked stands adjacent to streamside areas would continue to be suppressed, reducing long term stream shading and the potential for large wood recruitment. Understory species and structural diversity would remain low. Overstocked stands in the Riparian Reserves would maintain largely uniform age/size and species distributions until shade tolerant tree establishment and/or natural mortality (either chronic or catastrophic) allows understory development. This type of development will contain a simplified size and age class stand structure and is not typical of late successional stand characteristics. Late seral stand characteristics in riparian areas allow for many benefits to streams including, channel stability and complexity, large wood contributions and nutrient recycling.

Aquatic Species and Habitat – Affected Environment

There are four streams that contain habitat for fish and other aquatic species within or directly adjacent to the analysis area. They include Spencer Creek, Clover Creek, Miners Creek and Tunnel Creek (outside, yet adjacent to analysis area). The following table is a list of aquatic species documented within or adjacent to the analysis area.

Table 27: Aquatic Species in/adjacent to the analysis area

Common Name	Scientific Name	Status	Distribution
Klamath smallscale sucker	*Catostomus rimiculus*	None	Widely distributed in Spencer Creek
Klamath redband trout	*Onchorhynchus mykiss*	None	Widely distributed in Spencer Creek, in Miners Creek and in Clover Creek upstream of analysis area.
Klamath speckled dace	*Rhinichthys osculous*	None	Widely distributed in Spencer and Tunnel Creek
Marbled sculpin	*Cottus klamathaensis*	None	Widely distributed in Spencer Creek
Lamprey species	*Lampetra ssp.*	None	Widely distributed in Spencer Creek
Tui chub	*Gila bicolor*	None	Present in Tunnel and Spencer Creeks
Eastern brook trout	*Salvelinus fontinalis*	None	Non-native, present in Spencer, Tunnel, Clover and Miners Creeks
Brown bullhead	*Ameiurus nebulosus*	None	Non-native, present in Tunnel Creek
Oregon Spotted Frog	*Rana pretiosa*	Federal Candidate	Present in Buck Lake, outside analysis area.
Cascade frog	*Rana cascadae*	None	Present in and adjacent to Miners Creek
Pacific Giant Salamander	*Dicamptodon tenebrosus*	None	Widely distributed in Spencer Creek downstream of Buck Lake
Klamath Pebblesnail	*Fluminicola sp.*	BLM Strategic, Survey & Manage	Documented in Miners Creek

Spencer Creek

Spencer Creek supports a variety of native aquatic species. It has recently had restoration activities implemented, including instream and floodplain log placement in 2006 and 2009. It is also part of a Tier 1 key watershed and is important as habitat for aquatic species.

Spencer Creek is an important perennial, fish bearing tributary of the Klamath River, providing the majority of spawning habitat for Klamath redband trout (*Onchorhynchus mykiss*) residing in Klamath River between Keno Dam and the California/Oregon state line. Spencer Creek also provides important rearing and migratory habitat for redband trout. Klamath smallscale suckers (*Catostomus rimiculus*) use the creek for spawning, rearing, and migratory habitat. Other resident species include lamprey species (*Lampetra* sp), Klamath speckled dace (*Rhinichthys osculus*), marbled sculpin (*Cottus klamathaensis*), Tui chub (*Gila bicolor*) and the non-native eastern brook trout (*Salvelinus fontinalis*).

Pacific giant salamanders (*Dicamptodon tenebrosus*) are also known to reside in Spencer Creek. Spencer Creek is one of the eastern most streams occupied by this species, making this a significant population. The Pacific giant salamander largely exhibits the aquatic (neotenic) form, maintaining gills into adulthood.

Spencer Creek contains two life history forms of redband trout—a resident form and a migratory (fluvial) form. Adult migratory forms migrate from the Klamath River in March through April to spawn and migrate back to the Klamath River in May. Migratory forms attain sizes up to 20+ inches. Juveniles of the migratory form generally rear in Spencer Creek for one year and migrate out to the Klamath River from March to July. Prior to dams

blocking access in the early 20th century, anadromous forms of rainbow trout or steelhead (*Onchorhynchus mykiss*) migrated to Spencer Creek to spawn and rear (Hamilton et al. 2005). Resident forms of rainbow (redband) trout are smaller and generally attain lengths of 8 to 10 inches. These fish spend their entire life cycle in Spencer Creek. Resident forms have been documented in Buck Lake and upstream of Buck Lake on U.S. Forest Service lands. It is unknown whether migratory forms routinely migrate as far upstream as Buck Lake. There is a relatively steep cascade ¼ mile below Buck Lake that may be a partial barrier to upstream fish migration when streamflow is low. The watershed assessment for the Spencer Creek Watershed (USDI BLM 1995) notes that the health of the aquatic ecosystem is impaired by changes in function due to management activities.

Three changes in habitat condition were determined to be chronic and problematic for native fish species in Spencer Creek; fine sediments, high water temperature, and low flows. The causes of a downward trend in habitat condition for Spencer Creek were attributed to high numbers of road crossings, past streamside timber harvest, and channelization and grazing in Buck Lake. The channel substrate although dominated by gravel, is highly embedded with fine sediment. This condition diminishes the quality of the habitat for spawning and food production. There is the potential for fine sediment runoff from bare soil areas adjacent to the stream. The condition of the stream channel in this area likely contributes to sediment and temperature problems in Spencer Creek.

Tunnel Creek

Tunnel Creek flows into the southwest corner of Buck Lake. In T38S-R5E-Sec.15, the creek flows intermittently but downstream in sections 22 and 23 it is perennial. Sections 15 and 23 are managed by BLM and Section 22 by a private landowner. The perennial section of Tunnel Creek is fishbearing and Klamath speckled dace (*Rhinichthys osculus*), eastern brook trout (*Salvelinus fontinalis*), tui chub (*Gila bicolor*) and brown bullhead *(Ameiurus nebulosus)* have been documented.

The Buck Lake population of Oregon Spotted Frog also uses beaver ponds in Tunnel Creek, section 23, for breeding and possibly overwintering habitat.

Clover Creek

Clover Creek flows intermittently from the Mountain Lakes Wilderness in the northern part of the watershed through USFS and privately managed lands. The stream becomes perennial and fishbearing below Dead Porcupine Spring located in T38S-R6E-sec.10 on private land. It is perennial for approximately three miles as it flows through USFS and private land. In this reach, it flows near the boundary of T38S-R6E-sec.22 which is BLM land. Between Clover Creek Road and Spencer Hook-up Road, Clover Creek once again becomes intermittent and continues for approximately 3.5 miles until the confluence with Spencer Creek. Within this reach, it flows through T38S-R6E-sec.35 which is also BLM land.

Clover Creek is fishbearing below Dead Porcupine Spring and contains redband trout (*Onchorhynchus mykiss*) and eastern brook trout (*Salvelinus fontinalis*) (ODFW 2003). Fish utilize the perennial section of Clover Creek year round and the intermittent section seasonally.

Miners Creek

Miners Creek flows intermittently through the southwestern part of the watershed until it crosses under the 38-6E-33.2 road in T38S-R6E-Sec.33 which is BLM land. From this point, the stream is considered perennial and fish presence has been verified. Redband trout (*Onchorhynchus mykiss*) and eastern brook trout (*Salvelinus fontinalis*) have been documented from this stream crossing downstream approximately two miles to the confluence of Spencer Creek (ODFW 2003).

The pebblesnail is generally found in bodies of water with gravel-boulder substrates and moderate flow. It prefers cold, oligotrophic water with high dissolved oxygen content. It is typically found in springs and avoids areas with dense macrophyte beds. In 2001, Miners Creek was surveyed for aquatic mollusks for projects that would be considered habitat disturbing to meet the requirements of the 2001 Survey and Manage Record of Decision.

During these surveys, the Klamath pebblesnail (*Fluminicola sp*.) was documented in Miners Creek in section 33. Specific threats identified in the conservation assessment (Mothey 1998) for this species include degradation of water quality, excessive sedimentation, water diversion and barrier construction.

Aquatic Species and Habitat – Environmental Consequences

Aquatic species and habitats in the timber sale planning area would be affected to the extent that hydrologic regimes of streams are altered by reduction in stream shading, ground disturbance and road use (see Hydrology section). If ground disturbances (compaction, vegetation removal, loss of duff/organic layer, and increased road use) act in combination to increase the magnitude of peak runoff events, negative effects on aquatic species from streambank erosion, higher than normal nutrient concentration, and sedimentation would be expected.

The proposed project would maintain and restore habitat to support well-distributed populations of native plant, invertebrate and vertebrate riparian-dependent species. Implementation of any of these alternatives with the application of the identified and appropriate BMPs and PDFs are expected to minimize short term impacts to aquatic resources and riparian reserves/riparian management areas (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 and riparian reserves/riparian management areas.

Alternative 1 and Alternative 3

Density Management

Due to the use of riparian buffers, there are no perennial, intermittent or fishbearing streams/waterbodies within or adjacent to the proposed density management treatment units of the analysis area (See Appendix B). However, there are ephemeral drainages within or adjacent to these units and therefore specific project design features (PDFs) are in place to minimize impacts. Implementing the PDFs in Appendix B is expected to mitigate effects on downstream aquatic species to levels analyzed in the 1995 KFRA RMP and FEIS. Along fishbearing streams, a 320 foot Riparian Reserve buffer (two site potential tree heights) will be applied, and along perennial/intermittent non-fish bearing streams, a160-foot buffer (one site potential tree height) will be established. The trees in this buffer account for nearly all stream shading and contribution of coarse woody debris (CWD) entering the aquatic system. Management actions within the 1995 KFRA RMP states: Neither conduct nor allow timber harvest, including fuel wood cutting, in Riparian Reserves, with the exception of the following: apply silvicultural practices for Riparian Reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives (USDI BLM 1995, pgs 13-14).

Riparian Mechanical and Manual Thinning

The proposed Riparian Reserve treatment would reduce stem densities, increasing average tree diameter, and potentially increase species diversity. As the treated stands age, ecosystem processes consistent with old-growth stands would begin to evolve, including CWD recruitment regimes, where trees would fall into the stream channel and the riparian zone at a variable rate. This would provide the streams/riparian areas with a variety of size, species, and decay classes of CWD, which is critical in order to provide aquatic species habitat and channel stability and complexity.

Under this alternative there are seven proposed mechanical riparian thinning units totaling 54 acres and eight proposed manual riparian thinning units totaling 46 acres (see Table 3). One perennial fishbearing section of Miners Creek and one intermittent fishbearing section of Clover Creek have adjacent manual riparian units proposed. Implementing the PDFs in Appendix B is expected to mitigate effects on downstream aquatic species to levels analyzed in the 1995 KFRA RMP and FEIS. Along these two stream segments, a 320 foot Riparian Reserve buffer (two site potential tree heights) would be established. In addition, there are several intermittent drainages which have mechanical and manual riparian units proposed and therefore specific PDFs are in place to minimize impacts. Implementing the PDFs in Appendix B is expected to mitigate effects on downstream aquatic species to levels analyzed in the 1995 KFRA RMP and FEIS. Along intermittent streams, a 160 foot Riparian Reserve buffer (one site potential tree height) would be established. The trees in this buffer account for nearly all stream shading and contribution of CWD entering the aquatic system. Management direction within the 1995 KFRA RMP states:

Neither conduct nor allow timber harvest, including fuel wood cutting, in Riparian Reserves, with the exception of the following: apply silvicultural practices for Riparian Reserves to control stocking, reestablish and manage stands, and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives (USDI BLM 1995, pgs 13-14).

By following guidelines set by the 1995 KFRA RMP PDFs, no substantial detrimental impacts to fisheries resources are expected to occur as a result of water temperature from streamside shade reduction or peak/base flow alterations from stream channel alterations caused by the proposed mechanical and manual riparian treatments.

The proposed actions are consistent with the objectives for Riparian Reserves and the Aquatic Conservation Strategy (ACS) in the 1995 KFRA RMP and would not prevent or retard attainment of any of the ACS objectives in the long term (USDI BLM 1995, pgs 7-8).

Aspen Thinning Treatments

There are no perennial or fishbearing streams within or adjacent to the proposed aspen treatment units in the analysis area (sections 24, 19 and 6). However, there are intermittent/ephemeral drainages associated with these units and therefore specific PDFs are in place to minimize impacts. Implementing the PDFs in Appendix B is expected to mitigate effects on downstream aquatic species to levels analyzed in the 1995 KFRA RMP and FEIS.

Underburning & Jackpot Prescribed Fire

Implementation of PDFs in Appendix B is expected to mitigate impacts of fuel treatments within the proposed project area. Objectives of fuels treatments within riparian reserves are: protection of vegetation and soils from catastrophic fire, (including overhead canopy for stream shading); restoration of riparian areas to the potential natural community for the site; and retention and protection of CWD and overhead cover for stream function and aquatic habitats. Ignition of prescribed fire is restricted depending on topography, distance to stream, ignition methods, and fuel moisture as defined in Appendix B. Ignition limitations are designed to prevent negative impacts to aquatic habitat such as introducing chemicals into streams and protecting riparian vegetation and canopy cover. Spencer Creek has recently had restoration activities implemented, including instream and floodplain log placement in 2006 and 2009. It is also part of a Tier 1 key watershed and is important as habitat for aquatic species. Therefore, within the Riparian Reserves in sections 21, 27, 28 and 34, pile burning should occur following PDF's and BMP's in Appendix B.

OHV Rock Crawl Area Project

This project area would occur near Clover Creek in section 35. The following PDF would be implemented in order to reduce impacts of this development to the creek and riparian area: Close off the outlet from the west side of the rock pit to Clover Creek and install signage and perimeter fencing.

Alternative 2

Density Management

Due to the use of riparian buffers, there are no perennial, intermittent or fishbearing streams/waterbodies within or adjacent to the proposed density management treatment units of the analysis area (See Appendix B). However, there are ephemeral drainages within or adjacent to these units and therefore specific project design features (PDFs) and best management practices (BMP's) are in place to minimize impacts. Implementing the PDFs and BMP's in Appendix B are expected to mitigate effects on downstream aquatic species to levels analyzed in the 2008 KFRA RMP and FEIS. Along fishbearing streams, a 160 foot Riparian Management Area buffer (one site potential tree height) will be applied, and along perennial/intermittent non-fishbearing streams, an 80 foot buffer (one half site potential tree height) will be established. The trees in this buffer account for nearly all stream shading and contribution of CWD entering the aquatic system. Implementing the PDFs and BMP's in Appendix B are expected to mitigate effects on aquatic species and aquatic habitat. The 1995 RMP direction is to apply silvicultural practices for riparian reserves to control stocking, reestablish and manage stands and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy Objectives. Riparian Management Areas in the 2008 RMP have designed buffers that are one-half the width of 1995 Riparian Reserve Buffers, and have

very similar management objectives to those that apply to Riparian Reserves; however the specific Aquatic Conservation Strategies from the Northwest Forest Plan do not apply.

Riparian Mechanical and Manual Thinning

The proposed Riparian Reserve treatment will reduce stem densities, increasing average tree diameter, and potentially increasing species diversity. As the treated stand ages, ecosystem processes consistent with old-growth stands would begin to evolve, including CWD recruitment regimes, where trees would fall into the stream channel and the riparian zone at a variable rate. This would provide the streams/riparian areas with a variety of size, species, and decay classes of CWD, which is critical in order to provide aquatic species habitat and channel stability and complexity.

Under this alternative, there are three proposed manual riparian thinning units totaling 16 acres (see Table 3). One perennial fishbearing section of Miners Creek and one intermittent fishbearing section of Clover Creek have adjacent mechanical riparian units proposed. Implementing the PDFs and BMP's in Appendix B are expected to mitigate effects on downstream aquatic species to levels analyzed in the 2008 KFRA RMP and FEIS. Along these two stream segments, a 160 foot Riparian Reserve buffer (one site potential tree height) would be established. In addition, there are several intermittent drainages which have mechanical and manual riparian units proposed and therefore specific project design features (PDFs) are in place to minimize impacts. Implementing the PDFs in Appendix B is expected to mitigate effects on downstream aquatic species to levels analyzed in the KFRA RMP and FEIS. Along intermittent streams, an 80 foot Riparian Reserve buffer (one half site potential tree height) would be established. The trees in this buffer account for nearly all stream shading and contribution of CWD entering the aquatic system. The 1995 RMP direction is to apply silvicultural practices for riparian reserves to control stocking, reestablish and manage stands and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy objectives. Riparian Management Areas (2008 RMP) have designed buffers that are one-half the width of 1995 Riparian Reserve Buffers, and have very similar management objectives to those that apply to Riparian Reserves, however the specific Aquatic Conservation Strategies from the Northwest Forest Plan do not apply.

By following guidelines set by the KFRA described in Appendix B, no substantial detrimental impacts to fisheries resources are expected to occur as a result of water temperature from streamside shade reduction or peak/base flow alterations from stream channel alterations caused by the proposed mechanical and manual riparian treatments.

Aspen Thinning Treatments

There are no perennial or fishbearing streams within or adjacent to the proposed aspen treatment units of the analysis area (sections 24, 19 and 6). However, there are intermittent drainages associated with these units and therefore specific project design features (PDFs) are in place to minimize impacts. Implementing the PDFs in Appendix B is expected to mitigate effects on downstream aquatic species to levels analyzed in the KFRA RMP and FEIS. The 1995 RMP direction is to apply silvicultural practices for riparian reserves to control stocking, reestablish and manage stands and acquire desired vegetation characteristics needed to attain Aquatic Conservation Strategy Objectives. Riparian Management Areas (2008 RMP) have designed buffers that are one-half the width of 1995 Riparian Reserve Buffers, and have very similar management objectives to those that apply to Riparian Reserves, however the specific Aquatic Conservation Strategies from the Northwest Forest Plan do not apply.

Underburning & Jackpot Prescribed Fire

Implementation of project design features (PDF'S) in Appendix B is expected to mitigate impacts of fuel treatments within the proposed project area. Objectives of fuels treatments within riparian reserves (RRs) are: protection of vegetation and soils from catastrophic fire, (including overhead canopy for stream shading); restoration of riparian areas to the potential natural community for the site; and retention and protection of LWD and overhead cover for stream function and aquatic habitats. Ignition of prescribed fire is restricted depending on topography, distance to stream, ignition methods, and fuel moisture as defined in Appendix B, designed to prevent negative impacts to aquatic habitat such as introducing chemicals into streams and protecting riparian vegetation and canopy cover. Spencer Creek has recently had restoration activities implemented, including instream and floodplain log placement in 2006 and 2009. It is also part of a Tier 1 key watershed and is important as habitat for

aquatic species. Therefore, within the Riparian Reserves in sections 21, 27, 28 and 34, pile burning should occur following PDF's and BMP's in Appendix B.

OHV Rock Crawl Area Project

This project area would occur near Clover Creek in section 35. The following PDF would be implemented in order to reduce impacts of this development to the creek and riparian area: Close off the outlet from the west side of the rock pit to Clover Creek and install signage and perimeter fencing.

Cumulative Effects

Indirect cumulative impacts associated with current watershed conditions identified in the affected environment section will continue to occur if the No Action Alternative is selected.

Because other activities including future harvesting, fuels treatments, recreation and road actions are either already approved or potentially would be approved in the future, both direct and indirect cumulative impacts would potentially include increased sediment delivery to streams from road surfaces and ditch lines during hauling operations. These types of cumulative actions are analyzed in the FEIS (at 4-89 to 4-91). As discussed in the Hydrology section, potential increases in sediment delivery due to hauling would be small, and would not be expected to have a detrimental effect on aquatic species.

No Action and Cumulative Effects of No Action

Under the No Action Alternative, there would be no ground disturbing effects of sedimentation or increase in road related sediment inputs due to increased levels of road use and maintenance.

Overstocked areas in Riparian Reserves/Riparian Management Areas would remain at an elevated risk for stand replacing wildfire. If a stand replacing wildfire were to occur, negative effects on aquatic species and their habitat could include; loss of canopy shading, negative impacts on water quality due to higher than normal nutrient concentrations in soil adjacent to the stream, and sedimentation. Conifer growth in overstocked stands adjacent to streamside areas would continue to be suppressed, reducing forest health, long term stream shading and large wood recruitment. Overstocked stands in the Riparian Reserves would maintain mostly uniform age/size and species distributions until shade tolerant tree establishment and/or natural mortality (either chronic or catastrophic) allows understory development. This type of development will contain a simplified size and age class stand structure and is not typical of late succession stand characteristics. Late seral stand characteristics in riparian areas allow for many benefits to streams and aquatic species including, channel stability/complexity, large wood contributions and nutrient recycling.

Grazing Management - Affected Environment

Livestock

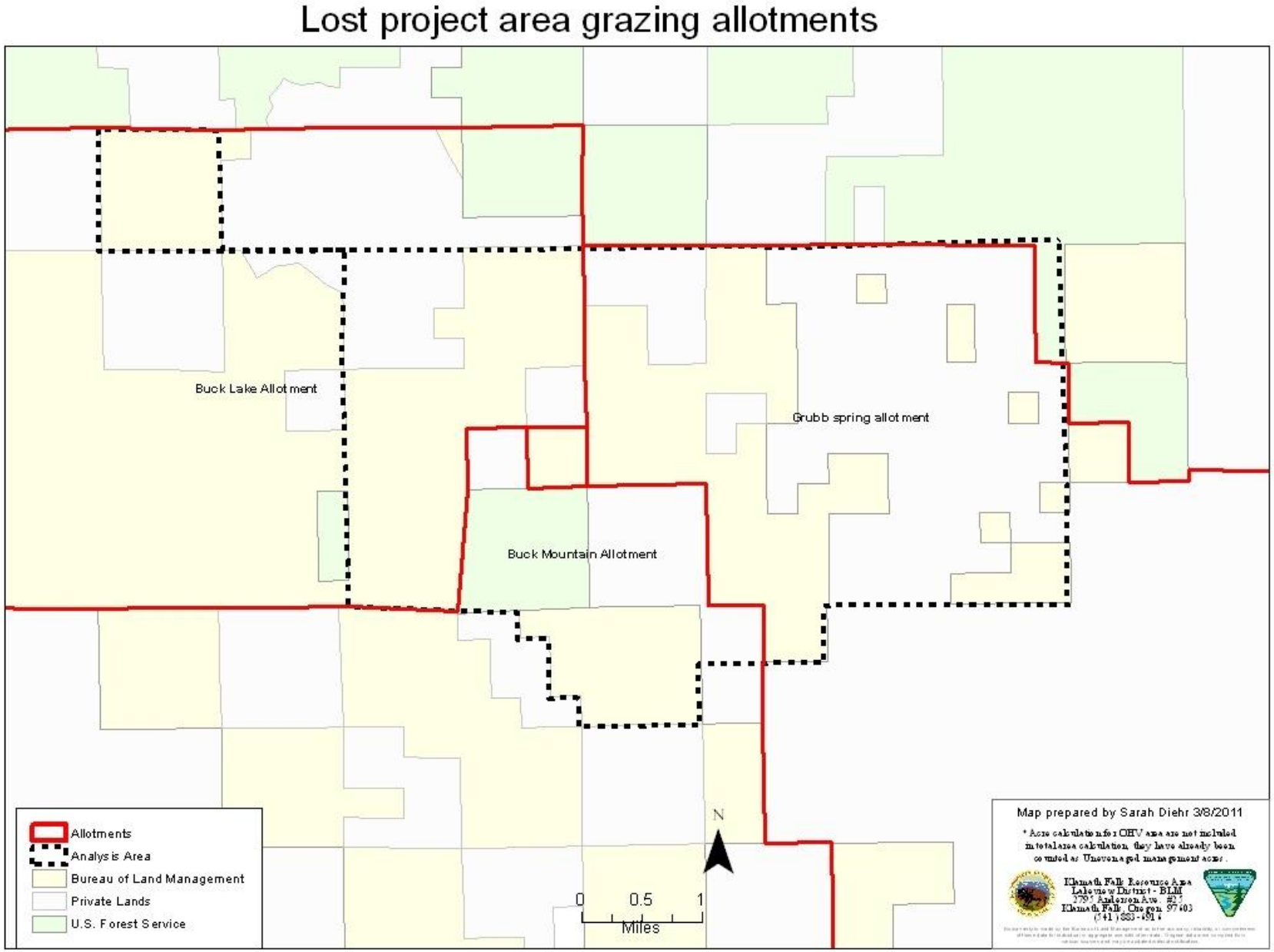
The project area is within the boundaries of three BLM livestock grazing allotments. These allotments are Buck Lake, Buck Mountain and Grubb Springs. The allotment boundaries are shown in Figure 14.

Authorized grazing use for the Buck Lake Allotment is 175 AUMs of cattle use from June 15 through September 15. There is also an Exchange-of-Use grazing authorization for 147 AUMs for intermingled private lands within the allotment.

Authorized grazing use for the Buck Mountain Allotment is 204 AUMs of cattle use from May 15 through September 1. There is also an Exchange-of-Use grazing authorization for 759 AUMs for intermingled private lands within the allotment.

Authorized grazing use for the Grubb Springs Allotment is 130 AUMs of cattle use from May 1 through September 30. There is also an Exchange-of-Use grazing authorization for 655 AUMs for intermingled private lands within the allotment.

Figure 14: Lost project grazing allotment boundaries



Grazing Management - Environmental Consequences

No Action

Implementation of the No Action Alternative would have no effect on livestock management or forage production.

Alternatives 1, 2, and 3

Harvesting activities as described in the alternatives would have a small, mid-term (two to ten years) positive effect on livestock grazing due to an increase of palatable, herbaceous plant species that would be more abundant once some of the over-story trees are removed. There could be a short-term (one to two 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 have indicated that cattle and wild horses make little use of the majority of these BLM administered lands in the proposed project area. Most of the grazing use in the Buck Mountain and Grubb Springs allotments is made on the lower elevation lands to the south. These lands are a mix of BLM and private lands in the Buck Mountain Allotment and mainly private lands in the Grubb springs Allotment. In the Buck Lake Allotment, livestock grazing is concentrated mainly in open areas away from the timber stands. Fencing of the aspen stands to exclude livestock grazing following treatment would have a minor negative impact to total livestock forage availability.

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 Rangeland Health Standards Assessments for the grazing allotments (Buck Lake, Buck Mountain and Grubb Springs) and the Spencer Creek Pilot Watershed Analysis, August 1995. Additional information is also found in the Klamath Falls Resource Area Resource Management Plan/EIS, Record of Decision, and Rangeland Program Summary.

Cumulative Effects

Cumulative effects are discussed in the RMP FEIS (at 4-35 to 4-137). Cumulative effects in the short term (less than two years), include a slight decrease in available forage for livestock and wild horses. The long-term cumulative effects of vegetation treatments in the area would be to improve ecological condition and provide an increase in palatable herbaceous plant species, especially in overstocked areas with little understory now.

Cultural Resources – Affected Environment

Native American use of the area spans many millennia. The project area is in traditional homelands of The Klamath Tribes. The Klamath Tribes consist of the Klamath, Modoc, and Yahooskin people. Within these high elevation areas, the Klamath people focused on resource procurement during the summer months. The Klamath gathered plant resources, such as roots and berries, fished Spencer Creek, and hunted. Permanent villages were occupied during the winter months at lower elevations (Spier 1930). Along with the Klamath and Modoc, Shasta and Takelma peoples likely utilized this area as well (Ray 1963).

Historic contact between the Native American tribes and Euro-Americans began around the 1820s and culminated with the Klamath Lake Treaty of 1864 in which lands around the project area were ceded to the United States by the Klamath Tribes (Minor et al. 1979).

The Euro-American exploration of the area began in 1826-27 with the arrival of Peter Scene Ogden's Hudson Bay Company expedition. Ogden's party traveled along the western rim of the Klamath River Canyon before turning southwest to cross the Pokegama Plateau (KFRA 1990).

The Applegate Trail was blazed by Levi Scott and brothers, Jesse and Lindsey Applegate, in 1846. Driven by personal tragedy, they wanted to find an alternative route for wagon traffic on the Oregon Trail to bypass the difficult passage through the Snake and Columbia River segments (Fagan et al. 1993). The trail connected

southwestern Oregon with Fort Hall. Increasing Indian hostilities, the challenging and sometimes dangerous terrain for wagons along the Ashland-Klamath Basin segment over the Cascades, and the creation of new roads driven by gold discoveries in the 1850s – 1860s, made the Applegate Trail obsolete (Fagan et al. 1993). No all-season route existed through the area and the Applegate Trail was in poor condition. Consequently, Orson A. Sterns petitioned for the Oregon Wagon Road, the precursor of State Highway 66. In 1872, the county appropriated $25,000 for the survey and construction of a wagon road. The road was completed in 1873 (Fagan et al.1993). This road was the primary east-west route through southwestern Oregon into the 20th Century when construction of the Green Springs Highway (1919) improved the older route for automobile use (Fagan et al.1993).

In 1860, Company L. 3rd Artillery of the U.S. Army established a camp, called Camp Day, near the confluence of Spencer Creek and the Klamath River. The camp was established to protect emigrant wagon trains from Indian attacks as they followed the Applegate Trail (Vaughan 1968).

Permanent Euroamerican settlement did not occur until the late 1860s, when Rogue Valley land became scarce and the Treaty of Klamath Lake was signed in 1864. Earlier settlement was avoided due to poor transportation routes, lack of fertile soil, and Indian hostilities. Settlement remained sparse until after the Modoc War (Fagan et al.1993).

A rural community known as Spencer Creek, Oregon was established in the Spencer watershed west of Keno. O.T. Brown appears in Spencer Creek in the 1860s as an early rancher/homesteader. Early mills in the region include the water powered sawmill on Spencer Creek that Hiram and Mary Spencer took over in 1871 from O.T. Brown. A larger mill was run on lower Spencer Creek where many families lived and even had a school for several years at this location. Spencer Station (formally known as the Brown Station) was a stage stop between Linkville (Klamath Falls) and Ashland (Beckham 2005). Post-1846, after the establishment of the Applegate Trail, the analysis area was used primarily for logging and ranching. Logging began in the 1860s with a few small enterprising sawmills. The lumber industry boomed in the early twentieth century both in and around the project area after the introduction of railroads; Weyerhaeuser Timber Company arrived in 1923 and began constructing logging railroads (Bowden 2003). Today logging and ranching continue to be prominent in the area.

Additional information about cultural resources in the analysis area may be found in various overviews of the history and prehistory of the region (Anderson 1994, Beckham 2005, Follansbee and Pollack 1978, Minor 1979, Ray 1963, and Spier 1930).

A file search was performed at the Klamath Falls Resource Area on February 25, 2011. The results of this review showed the project area has partial inventories and areas that needed cultural inventory have been surveyed and any identified new sites have been marked for avoidance prior to any ground disturbing activities. Three previously known sites are within the proposed project area and all known cultural locations will be avoided from project activities prior to project implementation.

Cultural Resources – Environmental Consequences

No Action

Implementation of the No Action Alternative would have no effect on cultural resources.

Alternatives 1, 2, and 3

Implementation of the action alternatives would have no direct effects on cultural resources, as all known sites would be avoided by project activities.

Cumulative Effects

Long term cumulative effects include creating areas for recreation that were not present before. This could increase the public use of the area, which could lead to secondary adverse effects to cultural resources in the form of illegal excavation and/or vandalism.

Recreation Resources - Affected Environment

The analysis area provides opportunities for dispersed recreation such as hunting, fishing, off-highway vehicle driving, camping, sightseeing, cycling, snowmobiling, and cross-country skiing. Recreation facilities with some level of development include a small campground and part of a snowmobile trail network.

Surveyor campground is a small campground with limited facilities set in a grove of old growth conifers, near the headwaters of Johnson Creek, adjacent to the planning area. There are three segments of designated, groomed snowmobile trails, a total of 20 miles, that travel over the Keno Access road, the Spencer Creek Hookup road, and roads on Surveyor Mountain (USDI-BLM and USFS, 2006). These trails are maintained and groomed by local snowmobile clubs.

The analysis area currently receives light dispersed recreation use most times of the year. The Klamath Falls Resource Area Record of Decision and Resource Management Plan (ROD/RMP) identifies several potential recreation developments in the Spencer Creek area including the rock crawl area that is proposed in this EA.

For additional information about recreation resources in the analysis area, refer to the Spencer Creek Watershed Analysis, pages 4-4 through 4-8 or the Klamath Falls RMP/ROD pages 47-53, and RMP maps 2-8 and 2

Recreation Resources - Environmental Consequences

No Action

Under the no action alternative, no impacts to existing recreation resources would be expected. Existing snowmobile trails would continue to be maintained and groomed by local snowmobile clubs. The area would continue to receive light dispersed recreation use throughout the year. OHV users would not have a managed, designated area to participate in rock crawling.

Vegetation Treatments—All Action Alternatives

Under all action alternatives, only temporary, minor disruption to recreational uses would occur during forest treatment activities. Short-term disturbances to recreationists from truck traffic, equipment noise, dust and smoke associated with treatment activities would be expected. Opportunities for firewood cutting and mushroom gathering would be expected to increase under these alternatives, as a result of soil disturbance and an increase of post- harvest firewood availability.

Road Management--All Alternatives

A number of roads in the analysis area that are currently closed to public travel would be opened for the timber sale, and then closed again to public travel. This temporary change in travel management has the potential to disrupt primitive camping or other non-motorized recreation activities that may be occurring on or adjacent to the affected roads. The non-motorized recreation setting may be temporarily disrupted, but would be reestablished following the timber sale or other vegetative treatment actions.

The re-establishment of road closures on six miles of roads would potentially negatively affect the public that has been improperly using those road sections. While those roads have been administratively closed for a number of years, once the vehicle barriers and closure signs are illegally removed, in many cases they appear to the casual user to be open roads. Members of the public may mistakenly perceive that BLM is initiating a number of new road closures under this project, which may lead to resentment, frustration, and a perception

that BLM is attempting to close all of the public lands to all public vehicular traffic. A positive effect from re-establishing the road closures would be the expanded mileage of closed roads available for non-motorized recreation activities, such as hunting, hiking, or mountain biking.

Plowing snow off roads for winter timber harvesting activities would potentially cause negative impacts to snowmobilers if truck hauling occurred on the designated, groomed trails that run over the Keno Access, Spencer Creek Hookup, and roads on Surveyor Mountain. The plowing would temporarily decrease the available length of the affected trail, and may also disrupt some of the commonly used snowmobile parking/staging areas in and adjacent to the analysis area.

Construction of OHV Rock Crawl Recreation Site - Alternatives 1&2

The construction of a designated, managed OHV rock crawl area would have the positive effect of providing a designated, managed area for managing OHV rock crawling use and allowing it to occur in a controlled setting in an environment that would not be degraded by this activity. Rock crawlers from the local area currently have no sanctioned developed public recreation site to practice this activity in the Klamath County area.

The development of the Clover Creek quarry into a OHV rock crawling site would potentially have indirect impacts related to a general increase in recreational use of the area both immediately surrounding the pit, plus on roads and trails for miles around the site. Initiated or increased behaviors could occur such as creating new unauthorized OHV trails, dumping of litter and trash, illegal extended camping, noise disturbance caused by rock crawling, increased possibility of human caused wildfire, road damage caused by driving on roads during wet, muddy conditions, and similar human caused resource impacts. Based on input from rock crawling enthusiasts, this is often a family or group activity. It is expected that casual hiking and exploring on foot would occur immediately adjacent to the site. It is expected that user groups may bring other OHVs that are not suitable for rock crawling such as All-Terrain Vehicles (ATVs) and would look for opportunities to ride OHVs in the surrounding area. Therefore it is expected that OHV use of surrounding roads and trails would increase. The amount of this increased use cannot be estimated at this time; however, it is expected to be low due to the relatively low capacity of the developed site.

Design elements that would serve to eliminate or minimize these issues include fencing, signing, active user involvement in developing and managing the recreation site, and limiting the size and scope of the recreation site to a single activity, rock crawling, and taking place in a small, discrete, well defined area that is isolated from residential areas and areas of other concentrated human uses and similar management actions. The area would also be periodically monitored by BLM recreation staff and law enforcement officers.

Cumulative Effects

Cumulative effects from the three action alternatives are expected to be negligible, except in the event of a large scale wildfire or insect caused tree mortality, that would dramatically affect recreation use. Potential future harvesting, fuels treatments, and road actions on BLM lands would cause temporary impacts to recreationists, but would be normal for a managed landscape. The impacts associated with the proposed forest treatment activities, described in Alternatives 1 and 2, would not approach or exceed those described in the Klamath Falls Resource Area Final RMP (pages 4-104 through 4-108).

Visual Resources - Affected Environment

The BLM has a basic stewardship responsibility to identify and protect scenic 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 landforms and scenic/aesthetic qualities. The analysis area contains lands that are managed under the following BLM Visual Resources Management (VRM) Classes:

VRM Class II: The BLM lands within 1/4 mile of Spencer Creek in the analysis area. 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 of the casual observer.

VRM Class III and IV: The rest of the analysis area is comprised of VRM Class III and IV lands. 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. 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 by designing and implementing the project to repeat the basic elements of form, line, color, and texture found in the landscape. For additional information about scenic resources in the analysis area, refer to the Klamath Falls RMP/ROD pages 43-44, and RMP maps 2-5. The viewshed in the analysis area, especially on private timber lands, has been modified by periodic industrial timber harvest activities.

Visual Resources - Environmental Consequences

No Action Alternative

The visual/scenic resource would remain unchanged except for gradual changes as the forest stands age and additional trees die from insects and disease. No short term effects on visual resources would be expected, however with a lack or vegetative management in the area, there is a greater likelihood of widespread insect mortality and greater intensity wildfires, which would potentially have a significant negative effect on scenic resources.

Cumulative Effects of the No Action Alternative

Cumulative effects of the No Action Alternative are expected to be negligible, except in the event of a large scale wildfire, which would alter visual resources.

Alternatives 1, 2, and 3

Under all action alternatives, proposed treatment activities would have minimal negative impacts to visual resources. The use of density management, group selection and thinning will reduce the impacts to visual resources from timber harvesting activities. Maintaining an uneven-aged, multi-strata stand structure and reducing competition and stress to reserve trees, will reduce the impact to visual resources. The viewshed in the analysis area, especially on private timber lands, has been modified by ongoing industrial timber harvest activities. Generally, viewsheds that are noticeably altered by human activity can be further modified with fewer adverse visual impacts than viewsheds which are relatively unaltered. The proposed OHV rock crawl area is expected to have no, to little effect to visual resources, as the area is limited in size (<5 acres of new ground disturbance), was previously disturbed and modified when the site was used as a rock quarry, and is surrounded by stands of Ponderosa Pine, which serve to effectively screen potential visual impacts.

Long-term, visual resources within the analysis area would potentially be positively impacted by the proposed treatments, if they serve to deter high intensity wildfires or severe outbreaks of insect caused tree mortality within the treated areas.

Cumulative Effects of Alternatives 1, 2, and 3

Cumulative effects of the action alternatives combined with all other actions on the landscape are expected to be negligible, except in the event of a large scale wildfire or severe tree mortality due to insect infestation, which would drastically alter visual resources. Actions such as potential future harvesting, fuels treatments, recreation improvements and road actions are designed to meet the Visual Resource Objectives within the different VRM classes.

Climate Change/Greenhouse Gas Emissions – Affected Environment

Climate change is a phenomenon that has been occurring on earth for the past four billion or so years. The climate has cooled and warmed as evidenced by ice ages, warm periods, changing sea levels and distribution of vegetation and human populations. Currently, there is general consensus that the climate is warming and has been generally warming with various warmer and colder periods for the past 10,000 or so years (Singer, F. S. and Avery, D. T. 2008.). Greenhouse gases (GHG), in particular, carbon dioxide, may be contributing to the warming. Uncertainty about the nature, effects and magnitude of the greenhouse gases and global climate change interrelationship is evident in a wide range of conclusions and recommendations in the literature reviewed.

The spatial scale for analysis of carbon, greenhouse gasses and climate change is global, not local, regional, national or continental because climate change is inherently a global issue and carbon cycling is only an issue as it relates to contributing to greenhouse gasses as they potentially contribute to climate change. The U.S. Geological Survey, in a May 14, 2008 memorandum to the U.S. Fish and Wildlife Service, summarized the latest science on greenhouse gases and concluded that it is currently beyond the scope of existing science to identify a specific source of greenhouse gas emissions or carbon sequestration, and designate it as the cause of specific climate impacts at a specific location (USGS 2008).

Climate change may affect the condition of local forests through changes in temperature and precipitation patterns. Vegetation ranges may change in both elevation and associations between plants. These changes are difficult to predict and current climate and vegetation models vary widely on what changes are expected. For example, in a recent (January 2010) collaborative report from The Climate Leadership Initiative, the global climate models used predicted both decreases and increases in precipitation in the Klamath River Basin (Barr 2010).

The proposed project area is a very small part of a global carbon cycle. As forests grow, trees, other vegetation, and soils accumulate carbon from the atmosphere (CO_2). The carbon is stored in all vegetative parts including leaves, roots and stem, tree boles, and soils. The faster the vegetation grows, the more carbon it stores. For vegetation, the carbon remains stored, or sequestered, until the plant dies and decomposes, is consumed by fire releasing carbon back into the atmosphere, or is utilized for forest products or burned for energy. Some important parts of any analysis of carbon sequestration, GHG emissions and forest management is that results depend greatly on the forest type, the forest's location on the planet, the origin and type of forest soils, past management, and whether the harvested product is manufactured into a long lasting wood product used for energy. Temperate forests in the Pacific Northwest are not directly comparable to tropical forests on the equator in terms of GHG sequestration and emissions (Sierra Pacific Industries THP 2007).

The forests in the proposed project area generally exist in overcrowded stand conditions with reduced growth rates resulting from excessive competition for light, water and nutrients. Mortality resulting from factors associated with crowded growing conditions has been observed in the area (BLM stand exams 2010). These stands average 16.9 mbf (thousand board feet) per acre and are estimated to store on average 41 tonnes of carbon per acre (FVS output)..

Local Climate

The area of the proposed project is on the east slope of the Cascade mountain range at elevations ranging from 4,000 to 5,700 feet. The area is above the transient snow zone meaning snow typically accumulates and remains on site for some time period during the winter. Winter conditions vary from year to year but typically include snow accumulations of two to six feet with snow persisting through early June in most years. In the early 1990s, record snow falls in the Klamath Basin resulted in accumulations in the proposed project area of between six and ten feet. In the relatively low snow year of 2009-2010, snow accumulations in the proposed project area were between two and four feet. Summers are typically warm and dry with little precipitation on average years from June through October.

Climate Change/Greenhouse Gas Emissions – Environmental Consequences

The following assumptions are made in assessing impact on greenhouse gases and carbon storage:

- 1 Gallon of Diesel = 22.2 lbs/gal of carbon dioxide emissions (ESA website)
- 14,500 lbs/acre of carbon dioxide emissions from pile burning
- 37,098 lbs/acre of carbon dioxide emissions from underburning.
- 1 short ton (2000lbs) = 0.907184 tonnes (metric tons). Everything is reported in metric tonnes.
- Carbon per acre measurements include all living and dead biomass on the acre, including in the soil.

All figures within this section are approximations calculated using estimates to be used only to compare the relative impact of the alternatives. Modeling was done using the Forest Vegetation Simulator program, South Central Oregon and Northeast California (SO) Variant (USDA2008, FVS). More detailed information on calculations can be found in the project record and in the FVS output.

No Action Alternative

Under the No Action Alternative, continued forest growth would result in an increase in stand volume, which equates to an increase in storage of carbon. Carbon dioxide emissions associated with stand treatments would not occur. However, continued forest growth can also result in excessive stocking levels which in turn could result in decreased growth rates and associated decreased carbon storage. Further, excessive forest and woodland growth can also contribute to fuels build up that can contribute to intense wildfires. Such a release would result in immediate emissions of large amounts of the carbon currently stored in living and dead biomass. Such releases would be expected to be temporary if the stands were replanted.

Vegetative Treatment Alternatives 1, 2, and 3

The following analysis is based on the BLM's forest vegetation simulator (FVS) models of commercial harvest stands in all three alternatives.

The Proposed Action would include density management through the use of commercial and precommercial thinning of stands. Logging refuse would either be removed as biomass and utilized for energy production or burned to reduce fuels. All of these activities would release carbon into the atmosphere through a variety of mechanisms including burning of fossil fuels by heavy equipment, vehicles and power tools, decomposition of slash and forest products, and possible burning of slash and forest residue. For example, hauling logs from the project area to the nearest mill is assumed to release approximately 0.06 tonnes of CO_2 round trip.

Table 28: Volume harvested and carbon removed from all action alternatives

	Acres considered in calculation	Alternative 1	Alternative 2	Alternative 3
Volume harvested (mbf)/ac	NA	3.1	3.7	2.8
Carbon tonnes pre-harvest/ac	769*	41.0	41.0	41.0
Carbon tonnes post-harvest/ac	769*	39.6	38.5	40.0
Total carbon reduction tonnes	769*	1,076.6	1922.5	769.0
* The number of acres considered in calculations is different than the total "treated" acres in the alternatives. This number includes multiple different prescriptions				

The Table 28 above shows the approximate amounts of carbon removed from the vegetative treatments in all three action alternatives. The volume harvested calculations in Table 28 are based on the SO FVS variant (USDA 2008, FVS) and were calculated using a different sideboards for what is considered merchantable timber, than what the BLM uses. These volume estimates are not considered accurate by the BLM. Alternative 2 would remove the most amount of carbon from the stand and Alternative 3 would remove the least amount of carbon from the stand. The numbers are similar due to the fact that roughly the same amount of acres will be treated under each alternative; the main variance is in the prescription. Alternative 2 tends to remove more volume of merchantable trees than the other two alternatives.

Trees that are harvested would cease to sequester carbon, while slash created and left on site by the harvest would begin to decompose. Much of the wood removed for products such as lumber, plywood, hardboard, and post and poles would retain carbon in fairly stable condition. Overall, these stable materials would be expected to retain the majority of their sequestered carbon for up to 100 years (Sierra Pacific Industries THP, CEQA Analysis, 2007). Other products, such as hog fuel material for biomass facilities and firewood would be expected to be burned and release carbon fairly quickly. As noted above, any residual forest residue including limbs, leaves, needles, cull logs left on site and those not yarded to the landing would also begin to decompose and slowly release carbon.

The 20 to 40% of the trees on the landscape that would be harvested would immediately cease to sequester carbon. However, the remaining 60 to 80% (the residual trees) should experience increased growth rates and carbon sequestration rates as a result of less crowded growing conditions. Forest growth, and therefore carbon sequestration amount, varies with species, elevation, soils, treatment prescriptions, etc. It will take up to10 years (FVS output) for all stands to reach pre harvest carbon levels. This also means that when these stands are re-entered for harvest, which will be in more than 10 years, the carbon sequestration levels will be higher than they currently are.

Fuels Treatment Alternatives 1, 2, and 3

Table 29: CO_2 emissions from fuels treatments

	Acres considered in calculation	Alternative 1	Alternative 2	Alternative 3
Underburn emissions (total tonnes CO_2)	150	2,524.1	2,524.1	2,524.1
Pile burn emissions (total tonnes CO_2)	200	1,315.4	1,315.4	1,315.4

The fuels treatments are the same in all three action alternatives; therefore, they should produce the same amount of CO_2 emissions as shown in Table 29. The treatment of forest fuels, primarily logging slash and existing hazardous fuel accumulations, would accelerate carbon emissions compared to natural mortality and decay processes. Burning slash piles and underburning timber stands would contribute CO_2 directly to the atmosphere. The calculations did not take into account the equipment or vehicle carbon dioxide emissions that would result from the construction of dozer line and the transport of people and equipment to the project area. For analysis purposes, it is assumed that nearly all of the biomass in standing trees would be left intact and 53% of the biomass in understory vegetation, slash, and landing piles would be consumed.

Pile burn emissions include both handmade piles and mechanically made piles. At the most, approximately 200 acres of piled wood could be burned including landing piles from commercial harvest. This assumes that none of the landing piles or mechanically made piles are utilized for energy production instead of burned.

The amount of slash openly burned would be reduced if forest residue (landing slash) is chipped or ground up and used for energy production. Depending upon the biomass energy generating facility, the amount of PM10, CO, NMOC, CH_4, NOx, SOx emissions could be substantially less than any open pile burning (TSS Consultants2008). However, the reduced emission of carbon dioxide through carbon storage in wood products could be offset by the burning of the additional fossil fuels to yard, chip, transport, and process the material. Utilizing biomass to produce electricity would potentially preclude the need to generate electricity with other fossil fuels.

Cumulative Effects

The effects of proposed actions authorized under the KFRA RMP are analyzed in the FEIS (at 4-7 to 4-10 and in Appendix T). The primary factors leading to the expectation of global warming are substantial increases in

atmospheric carbon dioxide, nitrous oxide, methane, chlorofluorocarbons, and other trace gasses. The BLM's proposed land management activities in this analysis area would primarily only affect the amount of carbon dioxide in the atmosphere. The action alternatives would have direct impacts related to harvest of growing trees and release of greenhouse gases through burning of forest residue and fossil fuels, and through equipment emissions. Emissions from the proposed action including underburning/pile burning, and removal of carbon through thinning would roughly be greater than 4916 tonnes of CO2 for Alternative 1, 5762 tonnes of CO2 for Alternative 2 and 4608 tonnes of CO2 for Alternative 3. Greenhouse gas emissions from any of the action alternatives would be minor as compared to emissions on a large geographic scale. Project related emissions only constitute 0.000000868% or 8-10 millionths of a percent of 2009 global emissions, which were 6,633 million metric tonnes of greenhouse gas emissions, including CO2,CH4, N2O,HFC's,PFC's and SF6 (www.epa.gov, ES report).

Air Quality – Affected Environment

Air quality is a sensitive issue in the Upper Klamath Basin primarily because of the recent designation of part of Klamath County as nonattainment for PM2.5 (Particulate matter 2.5 microns). This area of non-attainment is located 18 miles east of the analysis area. Potential air quality consequences are important for the preservation of high quality visual values for the region. National Ambient Air Quality Standards (NAAQS) were established by the 1970 Clean Air Act and subsequent amendments to protect the public health and welfare from adverse effects associated with the presence of pollutants in the ambient air. In 2006, EPA revised the 24-hour NAAQS for PM2.5 downward from 65 to 35 µg/m3. If the particulate matter for NAAQS is exceeded, the EPA is required to designate the area as a "nonattainment" area. Air pollutants are emitted from a variety of sources in the Basin including woodstoves, open burning, industrial plants, and internal combustion engines. Woodstoves contribute greatly to particulate matter during the winter. Agricultural and forestry burning operations are substantial sources in the spring & fall. With the emphasis on reducing risk of wildfire, fuels reduction projects using prescribed fire are also a common source of pollutants that can contribute to reduced air quality. This is a Class II airshed, with the closest Class I airshed, Mountain Lakes Wilderness, located approximately five miles to the north. To comply with air quality standards and minimize impacts to either the non-attainment area of Klamath Falls or the nearby Class I airshed, the KFRA reports to the Oregon Department of Forestry (ODF) an estimate of the tonnage it expects to consume for each proposed burning project. Burn days are selected in coordination with the ODF Smoke Management to minimize the probability of sending smoke into these smoke sensitive areas.

Air Quality – Environmental Consequences

The following assumptions are made for smoke emissions, based on FOFEM and CONSUME modeling:

- Underburning: 364 lbs PM2.5 / acre
- Wildfire: 522 lbs PM2.5 / acre
- Biomass Plant: 5 lbs PM2.5 / acre
- Hand Pile burning: 95 lbs PM2.5 / acre

This air quality analysis has assumed that acres treated by density management, patch cuts and thin from below will require handpiling and burning of residual slash. Since thinning will be done using whole tree yarding followed up with biomass utilization of residual landing slash, it is anticipated there will be limited slash left on the ground and landings, so these emission estimates will result in an over-prediction of smoke production.

No Action

This alternative would not directly produce any PM2.5. However, the potential for subsequent wildfires that would produce large quantities of PM2.5 would continue to increase as surface and ladder fuels accumulate. A single 1,000 acre wildfire would result in approximately 261 tons of PM2.5, which would occur under unknown dispersal conditions, in a short period of time, and quite likely affect one or more smoke sensitive receptors.

Alternatives 1, 2, and 3

For Alternatives 1 and 3, the proposed underburning would occur on 146 acres and on 150 acres in Alternative 2, which would produce a total of approximately 26.5 tons of PM 2.5 and the number of acres of possible pile burning would be 637 acres which would produce a total of approximately 30 tons of PM 2.5. Both pile burning and underburning would occur under favorable weather conditions to maximize smoke dispersion. The acres of pile burning would be reduced if the material in the piles is utilized.

Cumulative Effects

It is anticipated that regional emissions would remain at the current level, and that these actions would have a short-term additive effect, lasting for several days at a time. It is likely that other prescribed burning in the region would occur concurrently which is mitigated through the smoke management process described in the Affected Environment section above.

Socioeconomics – Affected Environment

The proposed action lies within an area that is utilized by a variety of the public for hunting and other recreational uses as described above. Recreationists traveling to and staying on BLM lands contribute to local economies through purchases of goods and services. In addition, the forested stands contain commercially valuable trees of several conifer species. The mixed conifer timber lands in the proposed project area have historically contributed to logging, manufacturing and related employment in the Klamath Basin and adjacent communities. The tree species in this area have been utilized for lumber, firewood, post/poles, chips and biomass. As a general guideline, for every million board feet of timber harvested and processed in Oregon, approximately ten jobs are generated, eight in the lumber and plywood industry and two in the logging industry (Charnley, S., ed. – In press). Other related goods and service jobs that equal approximately 100 per MMBF are also generated by logging activities.

Socioeconomics – Environmental Consequences

No Action

The No Action Alternative would affect local businesses primarily dependent upon the production of forest products, as no timber harvesting or fuels treatments of smaller material would be completed. The No Action Alternative would not contribute to creating timber related jobs. It would not result in any detectable socioeconomic change in regards to current recreation uses. Hunting and other recreational uses are expected to continue at present levels.

The 1995 RMP states that the annual sale quantity for the KFRA from matrix lands is approximately six million board feet (6 MMBF). Processing facilities are dependent upon a stable, sustainable, and reliable supply of timber. Under the No Action Alternative the BLM would be hard pressed to meet the annual sale quantity and their obligations under the O&C act.

Alternatives 1, 2, and 3 and Cumulative Effects

The commercial harvesting and other contracted work under Alternative 2 would provide the most forest products to local businesses at roughly 1.5 million board feet of timber (MMBF), from a commercial timber sale, and result in the creation or retention of approximately 15 related jobs for the duration of the project. Alternatives 1 and 3 would each provide less forest products to the local businesses than Alternative 2, 86% and 32% of the projected volume, respectively. The decrease in timber harvested would also cause a decrease in created and retained jobs, producing approximately thirteen jobs for Alternative 1 and five jobs for Alternative 3. All three action alternatives would also be expected to provide a smaller amount of merchantable volume from non-commercial projects, such as stewardship contracts. These along with other service work planned would also provide wood products to the local area as well as the jobs of performing the contract work and processing the material. The local area processes a considerable amount of timber. Timber expected from the proposed action is only a small percentage of that volume. The 1995 KFRA FEIS describes

socioeconomic impacts of RMP implementation (pages 4-120 to 4-132) with up to 3,930 jobs created. It is expected the changes from future actions are expected to be within that range.

The action alternatives could also result in an increase of morel mushroom picking opportunities in the area resulting in some socioeconomic benefits. Morel mushrooms seem to favor areas with a certain amount of disturbance, especially burning disturbance that would be provided through the action alternatives. This additional area for mushroom harvesting could in turn help provide economic benefit to local commercial harvesters and sellers.

Alternatives 1 and 2 would result in the development of a designated rock crawling area. This new recreation feature has the potential to provide a boost in the economy for businesses that cater to automotive and off-road interests. The rock crawling area could also become a popular destination and contribute to Klamath County's current efforts to increase tourism and promote recreation opportunities. Alternative 3 would not provide any of these potential socioeconomic benefits, since the rock crawl area would not be developed.

CHAPTER 4 – CONSULTATION

Endangered Species Act (ESA) Consultation

Consultation with the U.S. Fish and Wildlife Service and conferencing on the effects of the Lost Project on proposed critical habitat for the northern spotted owl has been initiated for the proposed action and will be completed prior to implementation. For the Lost Project, a determination of "**May Affect, Likely to Adversely Affect**" was made by the BLM because the Lost Project would downgrade nesting, roosting, foraging habitat to dispersal habitat and downgrade nesting/rooting habitat to foraging habitat. There is no designated spotted owl critical habitat within the Lost Project area. Therefore a "**No Effect**" determination was made by the BLM on designated spotted owl critical habitat for the Lost Project. The BLM has determined that the Lost Project "**May Affect, Likely to Adversely Affect**" 2012 proposed critical habitat.

The BLM has made a determination of "No Effect" on the Lost Project with regard to ESA listed, proposed or Candidate species other than the northern spotted owl.

Consultation with The Klamath Tribes is on-going.

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APPENDIX B – BEST MANAGEMENT PRACTICES AND PROJECT DESIGN FEATURES

Appendix D of the 1995 RMP (pages D-1 to D-46) describes the Best Management Practices (BMPs) that are "designed to achieve the objectives of maintaining or improving water quality and soil productivity and the protection of riparian-wetland areas". Best management practices are defined as methods, measures, or practices selected on the basis of site-specific conditions to ensure that water quality will be maintained at its highest practicable level (page D-1). Best management practices are a type of water pollution control. This section defines the best management practices (i.e., methods and measures) that were developed for the lands within the western Oregon planning area to comply with the requirements of the Clean Water Act. This EA appendix includes relevant BMPs from the 1995 RMP unless otherwise noted.

In addition to BMPs that focus on water quality and soil production, the interdisciplinary team also develops Project Design Features (PDF) with the objective of meeting other resource goals. For instance, the PDFs listed below under Wildlife and Vegetation are designed to meet resource objectives associated with these resources and not necessarily water quality. The PDFs listed under Recreation and Visual Resources are designed to meet objectives stated in the RMP for these respective resources. The list below is not an exclusive list of BMPs or PDFs. It is a list of the BMPs and PDFs that the interdisciplinary team found to be most pertinent for the proposed action. All of Appendix D of the 1995 RMP as well as the KFRA's Annual Program Summary and Monitoring Reports are used when developing the final operational specifications for a treatment.

Upland Forest Vegetation - Harvest Prescription

Density Management Harvests

- For uneven-aged stands, maintain a multi-strata stand structure.
- Thin around large old growth trees to improve vigor and reduce hazardous fuels risk.
- Generally retain trees that are full crowned, vigorous, and disease free.
- Species selection for retention priority: Sugar pine (highest), western white pine Ponderosa pine, , Douglas-fir, Incense cedar, Shasta red fir, White fir (lowest).
- Retain a range of one to five percent of the unit (no thinning) in isolated thermal clumps to provide variability in spacing and structure.
- Retain older trees. These can be identified by looking at bark and crown characteristics (Van Pelt 2008)

Patch Cuts

- Patch Cuts would not exceed five acres in size and would cumulatively comprise no more than 15% of the acreage of any treatment unit
- Patch cuts would include retention of five to ten large trees per acre selected based on the species selection prioritization (above).

Roads

In 2011, the Klamath Falls Resource Area RMP (1995) was maintained to update Best Management Practices to reduce sediment delivery from BLM roads in Oregon as per Instruction Memorandum No. OR-2011-074. The complete updated list of Western Oregon Road BMPs can be viewed on the BLM website at: http://www.blm.gov/or/districts/lakeview/plans/files/BMPPlanMaintMemo1995_120109.pdf

Soil Resources

All BMPs reference the 1995 RMP.

- Limit detrimental soil conditions to less than 20 percent of the total acreage within the activity area. Use current soil quality indicators to monitor soil impacts. Sites where the 20 percent standard is exceeded by past management activities or natural events will require pre-treatment, such as ripping, backblading or seeding.
- 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 (normally between October 15 to May 1).
- Limit mechanical cutting and yarding operations to periods when the soil moistures is below 20 percent at a six inch depth. Even lower soil moisture levels are preferable on fragile soils.
- Permit logging activities during periods when ground is frozen or there is sufficient snow present to prevent compaction and rutting. This is normally when snow depths are in excess of twenty (20) inches in depth but snow depths may vary as approved by authorized personnel.
- To protect soil resources and water quality, close unsurfaced roads during the wet season (October 30 to June 1) unless waived by authorized personnel.
- Residual slash will be placed upon skid trails upon completion of yarding.
- Avoid placement of skid trails in areas with potential to collect and divert surface runoff, such as the bottom of draws and ephemeral drainages.
- Retain and establish adequate vegetative cover in accordance with RMP BMP's to reduce erosion.
- Retain enough small woody (dead and down) material to sustain soil nutrients. See RMP BMP's for specifications. In ponderosa pine forest land, 9 tons per acre of duff and litter (approximately ½ inch deep).
- Seed and/or mulch exposed and disturbed soil surfaces with native seed when seed is available.
- Construct fireline by hand on slopes greater than 35 percent.
- For fragile groundwater soils (meadows and wetland areas):
    - Avoid machine piling or ripping
    - Limit the use of tractors and other major surface-disturbing activities
    - Commence rehabilitation promptly by seeding or planting of native species or species that will quickly establish desired ground cover conditions
    - on completion of restoration project, block unsurfaced roads to prohibit motorized vehicle use
- For units 22-1 and 27-1:
    - Conduct soil disturbance monitoring for effectiveness and implementation, both pre- and post-treatment.
    - Consider replacing topsoil and organic matter (logging slash) if monitoring indicates exceedance of RMP standards.

Hydrology & Riparian Reserve Treatments

Timber Harvest

- Delineate Riparian Reserve widths as described in the 1995 RMP (pg F-8, ROD pgs C-30 to 31). Refer to Table B-1 below.
- For vegetation treatments within Riparian Reserves, limit the use of mechanical equipment to the outer one-half of the Riparian Reserve.
- 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.
- Avoid placement of skid trails and landings in areas with potential to collect and divert surface runoff such as the bottom of draws and ephemeral drainages.
- 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 for harvest within Riparian Reserves. Use of the 20-foot radial arm on the mechanical harvester to reach toward the boundary line of Riparian Reserves would occur wherever possible.

- Thin to a higher basal area (100-160 square feet per acre), favoring larger trees for shading and removing competing conifers around dominant pines.
- No new 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).
- Yarding/skidding corridors that pass through Riparian Reserves would be designated prior to project implementation, would have a minimum spacing of 300 feet and be oriented perpendicular to streams, would have minimal relative slope, and would be revegetated following project implementation (as needed). Stream crossings would be selected at stable, naturally armored locations or would be armored with slash before being used as a corridor.
- Use of existing roads and landings within Riparian Reserves would be reviewed and approved by the Klamath Falls Resource Area interdisciplinary team.
- Mechanical treatments would be allowed in aspen stands only during periods when detrimental soil effects would be least likely to occur.

Table B-1: Alt 1 and 3 Riparian reserve types and widths from the 1995 KFRA RMP ROD, Page 13.

Riparian Reserve Type	Reserve Width** (for each side of streams/wetlands)
Fish-bearing streams	Riparian Reserves will consist of the stream and the area on each side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of the riparian vegetation, or to a distance equal to the height of two site potential trees (320 feet), or 300 feet slope distance (600 feet total, including both sides of the stream channel), whichever is greatest.
Perennial, non-fishbearing streams	Riparian Reserves will consist of the stream and the area on each side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to the outer edges of the riparian vegetation, or to a distance equal to the height of one site potential tree (160 feet), or 150 feet slope distance (300 feet total, including both sides of the stream channel), whichever is greatest.
Intermittent (seasonal) streams, wetlands less than one acre, and unstable and potentially unstable areas	This category applies to features with high variability in size and site-specific characteristics. At a minimum the Riparian Reserves will include: - the extent of unstable or potentially unstable areas, - the stream channel and the area extending to the top of the inner gorge, - the stream channel or wetland and the area from the edges of the stream channel or wetland to the outer edges of the riparian vegetation; and - the area extending from the edges of 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.
Constructed ponds and reservoirs, and wetlands greater than one acre	Riparian Reserves will consist of the body of water or wetland and the area to the outer edges of the riparian vegetation, or the extent of seasonally saturated soil, or the extent of unstable or potentially unstable areas, or to a distance equal to the height of one site-potential tree (160 feet), or to 150 feet slope distance from the edge of the wetland greater than one acre or the maximum pool elevation of constructed ponds and reservoirs, whichever is greatest.
Lakes and natural ponds	Riparian Reserves will consist of the body of water and the area to the outer edges of the riparian vegetation, or the extent of seasonally saturated soil, or the extent of unstable or potentially unstable areas, or to a distance equal to the height of two site-potential trees (320 feet), or 300 feet slope distance (600 feet total, including both sides of the stream channel), whichever is greatest.
Springs	Reserve widths vary according to the size of the associated wetland (see above).
*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 Lost Forest Health Treatments project area, the site potential tree height was determined to be approximately 160 feet. **"Riparian reserve widths should have variable widths,…avoid straight ,uniform Riparian Reserve Boundaries" (refer to KFRA RMP/FEIS p.F-9)	

Fuels Treatments (including post-harvest fuels treatments)

<u>Mechanical fuels treatments in Riparian Reserves:</u>

- Treatment methods that would disturb the least amount of soil (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.

- No ripping, piling, or mechanical site preparation (except for designated skid trails crossings, roads, or yarding corridors) would occur in Riparian Reserves.
- A no-mechanical-entry spacing for treatments would occur from the natural topographic break to the edge of the riparian area within the Riparian Reserve. In areas where a topographic break is not evident the following guidelines would be implemented: On perennial, intermittent, and/or fish bearing streams with slopes less than 20%, a 25-foot no entry buffer would be established from the edge of the riparian area and on slopes greater than 20%, a 50-foot no entry buffer would be established from the edge of the riparian area. In wetland areas, a 50-foot no entry buffer would be established from the edge of the riparian area.
- Stream crossings would be designated prior to project implementation, would have a minimum spacing of 300 feet and be oriented perpendicular to streams, would have minimal relative slope, and would be revegetated following project implementation (as needed). Stream crossings would be selected at stable, naturally armored locations or would be armored with slash before being used as a corridor.
- Hand treatments would be recommended within the no-mechanical-entry zones in order to meet fuel management objectives.

Ignitions within Riparian Reserves:

- Ignition of broadcast fires should not occur within a minimum of 50 feet from the stream channel within the Riparian Reserves. The specific distance for lighting fires within the RR will depend on topography, habitat, ignition methods, and fuel moisture.
- Ignition line location nearest the stream should be based on topography and ignition methods and should be sufficient to protect water quality, CWD, and stream overhead cover. No ignition of CWD directly touching the high water mark of the stream, or of CWD that may be affected by high flows, should occur. Where there is thick vegetative cover that extends out from the stream, ignition lines should be located in the forest stand, away from the stream.
- Ignition lines near large open meadows, associated with the stream channels should be located at the toeslope above the meadow elevation as much as possible to protect meadow vegetation.
- Increased ignition spacing from the stream should occur when igniting fuels on the lower end of the window of moisture content to protect CWD and overhead cover components.

Roads and temporary fire trail access in Riparian Reserves:

Use of existing roads and landings within the RR will be reviewed and approved by the resource advisor.

Streamside pumping sites:

- Pumping on small streams should not reduce the downstream flow of the stream by more than half the flow.
- If possible avoid the construction of temporary pump chances, when necessary use temporary plastic dams to create chances and remove these dams when not actively pumping.
- All pumping located on fish bearing streams must have a screen over the intake to avoid entrainment of small fish.
- Recommend that pump intake be suspended near the thalweg (deepest/highest quantity of flow) of the stream. Avoid placing pump intakes on the substrate or edges of the stream channel.

Post-fuels treatments for access roads and temporary fire trails:

- Install drainage dips, or water bars, in accordance with RMP BMPs to reduce surface run-off.
- A layer of duff (average of ½ inch after final burn) will be retained to protect soil from erosion during the wet season.
- Mulch and seeding or other methods of soil stabilization are to be applied to any exposed soil surfaces prior to the wet season to reduce surface erosion.

- Surfacing roads in accordance with RMP BMPs *(Roads C-1-8)* is recommended for all naturally surfaced roads not proposed for decommissioning or closure.
- Design blockages (close or decommission) upon completion of treatments to minimize non-authorized use of roads and trails within treatment areas.
- Place residual slash on trails upon completion of mechanical treatments.

Aspen Restoration

- Mechanical treatments would only be allowed in aspen stands during periods when detrimental soil effects would be least likely to occur.
- Consider leaving some downed trees in aspen treatment areas as a natural barrier for deer, elk and livestock.
- Leave conifers along cut banks from past logging activity for stability.

Wildlife Terrestrial Species

Snag Retention

Approximately 2.4 snags per acre will be retained with a minimum diameter at breast height (DBH) of 16", or largest available if less than 16" (1995 RMP/ROD, Page 26-27).

Snag Retention for Special Status Species

Provide 2.5 snags/acre as per the NWFP and 1995 KFRA RMP for white-headed woodpecker, black-backed woodpecker, pygmy nuthatch, and flammulated owl. Under Alternative 2, there is no snag provision requirement except in the UMLSR.

Coarse Woody Debris (CWD)

Approximately one hundred and twenty (120) linear feet of down logs per acre will be retained. Logs shall be greater than or equal to sixteen (16) inches in diameter and sixteen (16) feet long (1995 RMP/ROD, Page 22).

Seasonal Restrictions

Seasonal restrictions will be required where the following wildlife species are actively nesting: bald eagle, northern spotted owl, northern goshawk, osprey, and special status species. Seasonal restrictions for specific species can be found on pages 231-240 of the 1995 KFRA FEIS RMP ROD.

Nesting Areas

Protect nesting areas as described on page 38 of 1995 KFRA RMP.

For Fuel Treatment Units Adjacent To Or Containing Bald Eagle Nest Sites (applies to unit 27-2 under all action alternatives):

- 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.
- Smoke management will be planned in such a way to avoid adverse effects of residual smoke on nest sites adjacent to burn units.
- 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.
- 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).

- 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.

In order to reduce fire activity 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:

- Pull back of 10 and 100 hour fuels 30' from the base of the nest trees/ perch trees.
- Construct fire line around the nest trees/perch trees.
- Use foam, water, or other retardants to protect the nest tree (unless in a riparian zone).
- Ladder fuels would be removed from the dripline (30ft.)
- 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.
- 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.
- 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.
- 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)

For units adjacent to or containing spotted owls or NRF habitat:

- Burn prescriptions will require proper fuel moisture and atmospheric conditions so adequate large woody debris will be retained for prey habitat. 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.
- 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.
- During prescribed fire activities create a mosaic of burned and unburned areas to maintain a diversity of species and age classes of understory vegetation.
- Maintain habitat connectivity and corridors.

Forest Stand Structural Diversity

In stands treated with any density management prescriptions, or commercial thinning prescriptions, retain untreated patches up to five acres in size, and cumulatively comprising up to 5% of the total unit acreage. These patches (thermal clumps) would be selected and delineated around areas of important and limited structural features such as snag patches, patches of unusually high tree density, rock outcrops, high concentrations of CWD, etc. Units treated with patch cuts only would not be subject to this PDF.

Noxious Weeds

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

- Mow noxious weeds in the immediate area of yarding operations to ground level prior to seed development.
- Conduct monitoring activities related to proposed treatments as described in the Klamath Falls ROD.
- 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.

Special Status Species – Vascular Plants

Under all alternatives provide a 30m buffer around the location of the single *Cypripedium montanum* location. This will maintain the current microclimate conditions of the habitat by avoiding direct mechanical damage to plants, avoiding changes in soil moisture and temperature as well as the nature of the duff layer.

Cultural Resources

- Follow procedures for cultural protection and management outlined in the KFRA ROD/RMP (page 43), and protect identified sites by buffering.
- In accordance with guidelines and directives in the Klamath Falls Resource Area RMP, BLM regulations, and the National Historic Preservation Act, areas not included in previous archaeological surveys will be surveyed before any ground-disturbing action is undertaken.

Visual Resources

- Retain a variety of size classes of trees including large Ponderosa pine, Douglas fir and Incense cedar.
- Avoid creating large landings, log decks, and obvious skid trails near major roads or other frequent viewing areas.
- Mechanical shearing and chainsaw cutting of small trees should be done as close to ground level as practical, to reduce negative visual impacts.
- Where possible, maintain visual screening along roadways.

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

- Cut stumps close to ground (less than 4 inches if possible).
- Disperse small (hand) piles of slash for firewood use. Minimize use of tree marking paint on trees identified for harvest.
- Do not create large landings.
- Minimize number of skid trails and amount of ground disturbance.
- Minimize damage to residual trees through careful timber falling.
- Use multiple prescribed fire treatments over time to maintain the desired character of the landscape and to limit the level of change at each treatment so that it does not attract the attention of the casual observer.
- Where possible, provide a mosaic of vegetative treatments along roadways, including providing openings and areas where visual screening is maintained.
- Minimize the use of tree marking paint in marking unit boundaries or other layout along major roads.
- Design vegetation and fuel treatment areas to have feathered, irregular edges and shapes. They should mimic naturally appearing shapes, forms, and textures of the surrounding landscape.
- All treatments will meet appropriate Visual Class objectives specified in the KFRA ROD/RMP (page 44).

Recreation Resources

- Ensure that purchaser signs haul routes to alert recreationists to truck traffic in the area.

- Ensure that dust abatement and frequent grading occurs on haul routes, especially near more popular recreation areas.
- During any winter harvesting operations, coordinate and communicate plans and operations between the contractor, BLM, and winter sports activities (trail grooming and snowmobiling) to minimize hazards and operational conflicts.

APPENDIX C – KFRA LANDSCAPE ANALYSIS

Shortly after the 2012 Critical Habitat proposed rule was issued, the KFRA essentially stopped work on the Lost EA and undertook an analysis of all KFRA administered lands in ECS-1 using a landscape assessment approach as described in the 2012 proposed rule for critical habitat (USFWS 2012, pg. 270-271). The analysis was conducted without regard to the proposed Lost project units. That is, areas were identified for potential deferral or potential availability for treatment in order to meet the intent of proposed critical habitat without regard as to if they were inside or outside of proposed Lost project units. In this section, the term "risk" is in reference to the risk of a stand being lost to fire, insect outbreak, disease, or drought, or experiencing sufficient tree mortality as a result of one or more of those factors that NSO habitat quality of the stand would be substantially degraded. It is NOT referring to risk of the stand being harvested.

Analysis Methodology Summary

Scale: All KFRA lands within ECS-1.

Data Sources:

- Updated KFRA spotted owl habitat GIS layer
- KFRA timber harvest units since 1995 GIS layer
- Interagency spotted owl habitat GIS layer (GNN, Davis et al.)
- USFWS relative habitat Suitability GIS layer (RHSI)
- BLM stand inventory plot data
- USFS insect and disease tree mortality survey flight data
- BLM root rot pocket inventory data
- Oregon Dept. of Forestry wildfire fuels GIS coverage (PVT and Federal lands)
- National Weather Service fire weather observations from local stations
- USFS tree pathologist draft risk assessment for Spencer Creek watershed
- National Weather Service precipitation contour GIS coverage
- Historic vegetation data from 1900-1910.
- BLM spotted owl site location data (including High Priority sites as per 2011 recovery plan RA 10 Interim guidance).
- Spotted owl radio telemetry data from 5-year study by national Council for Air and Stream Improvement (NCASI) covering most but not all owl sites in the analysis area.

Strategy: Develop a model that assigns a comparative weighted average "risk" value to each 30 meter pixel in the analysis area based on risk of loss to fire (model-predicted flame length), precipitation zone, occurrence in a root rot or insect/disease pocket, relative departure from historic vegetation conditions, and unsustainable V.S. sustainable tree stocking density based on plant association.

Operations: A model was constructed to assign each pixel a weighted average risk score based on its susceptibility to the risk factors listed above. The pixels and their risk scores were then converted to a GIS raster dataset and displayed along with the updated NSO habitat polygons, NSO sites, and NSO telemetry data.

With all of this data displayed, the KFRA wildlife biologists identified areas that were both comparatively important to spotted owls (based on proximity to NSO sites, as well as habitat quality), and at comparatively low risk. These areas were identified for potential deferral from timber harvest.

As a quality check, after potential deferral areas were initially identified and mapped, the USFWS RHSI layer was compared to the potential deferral areas. This was done to see if any substantial areas of relatively high importance to NSO's shown on the RHSI layer were not covered by the potential deferral areas. Some areas were uncovered, but those areas had been subject to timber harvest since the data used to generate the RHSI map was collected, thus the RHSI map was outdated. In general, the potential deferral areas were covering the important habitat areas identified on the RHSI map.

The data sources, assumptions, models, and processes used in the analysis will be discussed in detail in a write up that is being drafted as of this writing, and will be on file at the KFRA.

Analysis Results

The landscape analysis resulted in the identification of approximately 30% of the KFRA lands within proposed ECS-1 for potential deferral from timber harvest. This 30% figure was not set as a target number of acreage at the start of the process, but was the outcome of the KFRA wildlife biologists identifying areas that the analysis showed as making sense to defer in order to comply with proposed critical habitat objectives, and based on comparative risk of loss and value to NSO's. Internal KFRA discussions on the topic have suggested that these areas might be deferred from harvest until BLM completes its on-going Resource Management Plan development process scheduled to be completed in 2015 and that will address the 2011 revised NSO recovery plan and designated NSO CH. The decision record for the Lost project EA will address these areas specifically including their geographic extent, anticipated period of deferral from harvest, and potential reasons for ending the deferral.

2012 KFRA NSO Habitat Re-Classification Discussion

Stands were reclassified by the KFRA wildlife biologists using the KFRA GIS system with the help of the KFRA GIS specialist. The 1994 NSO habitat layer was the base layer that was edited to create the 2012 layer. This 1994 layer covers all KFRA lands within the geographic range of the NSO; and every acre in that area is assigned a habitat suitability code in the GIS layer. In the GIS system, stands are represented by polygons which can be split, reshaped, re-coded and merged. The general approach was to change polygon shapes freely as indicated by the conditions on the ground as seen on air photos, but to change a polygon's habitat value coding less freely. For example, if a polygon was coded as roosting habitat in the 1994 classification but looked like it should actually be dispersal habitat on the 2011 air photo, but there was no history of management indicating that something had happened to the stand to change its habitat quality, it was generally left as roosting habitat in the 2012 classification.

Creation of Homogeneous polygons from previous heterogeneous polygons

The 1994 classification used the KFRA Forest Operations Inventory (FOI) GIS layer as the basis for its polygons. The FOI polygons were not homogeneous with regard to spotted owl habitat quality. That is, some of the individual FOI polygons contained more than one type of NSO habitat. For example a polygon might contain 5 acres of Nesting habitat and 10 acres of Dispersal habitat. But the polygon as a whole could only have one score assigned to it, either an N or an F. To deal with this, the KFRA came up with the "55 %" rule whereby if an FOI polygon was more than 55% one type of habitat the entire polygon was coded as being the dominant type. In our example, the polygon would have been coded as 15 acres of Dispersal habitat in the 1994 classification despite it containing some nesting habitat. In the 2012 reclassification the individual FOI polygons were broken up and merged as necessary to create polygons of homogeneous habitat ratings—no more 55% rule. In the 2012 re-classification our example polygon would be split and shown as 2 polygons, one containing 5 acres of N habitat and another one containing 10 acres of Dispersal habitat.

Management induced habitat changes

The new classification takes into account the changes in habitat quality brought about by management activities on KFRA lands since 1994- predominantly timber harvest in accordance with consultation with the Service as required.

Changed habitat functional grouping

This change applies only to how polygons that are roosting quality habitat are coded. Both classifications use a 4 code system to describe habitat quality (1 through 4). In the 1994 classification the roosting habitat was grouped with the foraging habitat (RF). In the 2012 classification the roosting habitat is grouped with the nesting habitat (NR). Thus the functional groupings are as follows:

Table C-1: Changes to NSO habitat classification

CODE	1994 CLASSIFICATION	2012 CLASSIFICATION
1	N	NR
2	RF	F
3	D	D
4	Non	Non

N= Nesting, R= Roosting, F= Foraging, D= Dispersal, Non= Non habitat.

Potential ingrowth of habitat

This factor is very hard to assess and manifested itself in changes in the classification process only when stands visually looked different on the air photos than their code in the 1994 classification suggested. In these cases it is not known if the stand had been misclassified originally back in 1994, or if the stand had just grown into higher quality habitat since 1994.

Correction of classification of polygons

No classification is 100% correct. The 1994 classification had some polygons obviously misclassified. When these misclassifications were encountered during the reclassification process the appropriate corrections were made.

Which of the five factors listed above accounted for the most change in acreage between the habitat classes is not known and would be extremely difficult to determine. For example, it is not possible to determine how much of the change in Class 3 is attributable to habitat ingrowth in stands previously classified as Class 4.

APPENDIX D – ADDITIONAL TABLES

Table D-1: Proposed Treatments by Unit for Alternative 1

Unit #	Acres	Approximate BA target	Alt 1 vegetation treatment	Alt 1 fuels treatment	Alt 1 riparian reserve treatment	Alt 1 roads	Alt 1 recreation treatment
15-1	14.5	NA	3-7" thin mechanical	utilize biomass or pile & burn if inaccessible	NA	NA	NA
19-1	29	NA	mech. thin up to 20" for PP, LP, DF. No diam. limit on WF.			NA	NA
19-1R	18	NA		burn piles in inner 100ft of riparian	**Outer 60ft**: mech. thin up to 20" for PP, LP, DF. No diam. limit on WF. **Inner 100ft**: manual cut, and pile with a 12" diam. limit		
21-1	100	100	Density management, all diam, mech, focus on small diameter trees	utilize/pile burn what is inaccessible		NA	NA
21-1R	11	100		pile and burn material where manually treated	Intermittent stream - Mech. understory thin outer 80ft up to 10" dbh. Equipment will cross the ephemeral stream in two places for utilization reasons. Spencer Creek - Manual understory thin outer 160ft up to 10" dbh		
21-2	119	120	density management, all diam, mechanical, all species	utilize or pile & burn what is inaccessible		NA	NA
21-2R	14	120		burn piles	Outer 160ft - manual thin <10"dbh. Inner 160ft no treatment		
22-1	34	100-120	Trees > 8" DBH: Thin mixed species clumps to 100 sq ft of basal area. Thin 100% WF clumps to 120 sq ft of basal area. Understory Plantation Trees and Natural Regeneration Trees 3"-8" DBH: Thin to 100-150 trees/ac. Maintain at a minimum 40% CC.	utilize or pile and burn what is inaccessible		NA	NA
22-1R	2	NA		burn piles	Outer 160ft - Manually culture around priority trees, pile material. One landing may be constructed in the outer riparian area. Inner 160 - no treatment		
23-1	72	100	Density management, mechanically thin all diam. all species	utilize or pile and burn what is inaccessible	NA	NA	NA
25-1	25	NA	manually cut and pile 3-7" dbh	burn piles		NA	NA
25-1R	3	NA		burn piles	manually cut and pile 3-7" dbh		
25-2	8	NA	manually cut and pile 3-7" dbh	burn piles		NA	NA
25-2R	2	NA		burn piles	manual thin and pile <7"dbh		
25-3	15	NA	3-7" dbh thin mechanical	utilize or pile and burn what is inaccessible	NA	NA	NA
26-1	41	100	density management, all diam, mech, all species		NA	NA	NA

Unit #	Acres	Approximate BA target	Alt 1 vegetation treatment	Alt 1 fuels treatment	Alt 1 riparian reserve treatment	Alt 1 roads	Alt 1 recreation treatment
27-1	60	120	density management all diam, all spp. mechanical , patch cuts>60% canopy closure and/or 120BA			NA	NA
27-1R	18	NA		inner 160ft: burn hand piles	outer 160ft: mech. thin understory, culture pine. inner 160ft: manual cut/pile 3-7"dbh		
27-2	2	NA	manually thin 3-10" dbh and pile (eagle restriction)	Burn piles		NA	NA
27-2R	7	NA		Both outer and inner 160ft: burn hand piles	outer 160ft: manually thin 3-10"dbh and pile. inner 160ft: manually cut/pile 3-10"dbh		
30-1	29	NA	3-7" thin mechanical	utilize or pile and burn what is inaccessible	NA	NA	NA
33-1	9	NA	3-7" mechanical thin	utilize or pile and burn what is inaccessible		NA	NA
33-1R	3	NA		burn piles	manually thin and pile <7"dbh		
33-2	10	140	density management, all diam, mech, all species to BA 140 w/ CC 60			NA	NA
33-2R	9	140			density management, all diam, mech, all spec. to BA 140 w/CC 60		
35-1	41	100	density management all diam, mech, all species	broadcast under burn	NA	NA	NA
35-2	40	80	density management all diam, mech, all species	broadcast under burn	NA	NA	NA
35-3	65	100	density management all diam, mech, all species	broadcast under burn		Perm. open 0.2 mi of old logging road	OHV less develop, block road at Clover Ck
35-3R	5	100		broadcast under burn	density management all diam, mech, all species		
35-4	1.6	100	ROCK PIT	ROCK PIT	ROCK PIT	build road access	OHV less developed
4-1	68	140	density management, all diam, mech, all species to BA 140 w/ CC 60			NA	NA
4-2	142	120	density management, all diam,all species, mech			NA	NA
4-1R	8	140			density management, all diam, mech, all spec. to BA 140 w/CC 60		
6-1	78	NA	small patch cuts complying with 60%CC	utilize or pile and burn what is inaccessible	NA	NA	NA
6-2	38	80	density management, all diam,all species mech	utilize or pile and burn what is inaccessible	NA	NA	NA
6-3	8	NA	mech thin up to 20" for PP,LP,DF. No diam limit on WF. Retain smaller rare species	utilize if necessary	NA	NA	NA

Table D-2: Proposed Treatments by Unit for Alternative 2

Unit #	Acres	Approximate BA target	Alt 2 vegetation treatment	Alt 2 fuels treatment	Alt 2 riparian reserve treatment	Alt 2 roads	Alt 2 recreation treatment
15-1	14.5	NA	same as Alt 1	same as Alt 1	NA	NA	NA
19-1	41	NA	manual thin up to 20"dbh for PP,LP,DF. No Diam. limit on WF. Pile small diameter cut trees	same as Alt 1		NA	NA
19-1R	7	NA			outer 60ft same as 19-1, treat inner 100 ft same as Alt 1		
21-1	111	100	same as Alt 1	same as Alt 1		NA	NA
21-1R	0	NA			Intermit. stream - same as 21-1 Spencer Creek - no treatment		
21-2	107	120	Density management, all diam. all spp., acres reduced b/c deferred in this alt	same as Alt 1		NA	NA
21-2R	0	NA			outer 160ft same as 21-2, don't treat inner		
22-1	39	100-120	same as Alt 1	same as Alt 1		NA	NA
22-1R	0	NA			outer 160ft same as 22-1, don't treat inner		
23-1	72	100	same as Alt 1	same as Alt 1	NA	NA	NA
25-1	28	NA	same as Alt 1	same as Alt 1		NA	NA
25-1R	0	NA			same as 25-1		
25-2	10	NA	same as Alt 1	same as Alt 1		NA	NA
25-2R	0	NA			same as 25-2		
25-3	15	NA	same as Alt 1	same as Alt 1	NA	NA	NA
26-1	41	100	same as Alt 1	same as Alt 1	NA	NA	NA
27-1	72	100	density management to 100 BA all diam, all diam, all spp. mechanical , patch cuts			NA	NA
27-1R	6	NA		inner 160ft: burn hand piles	outer 160ft: same as 27-1 Inner 160ft: manually cut/pile 3-7" dbh		
27-2	6	NA	manually thin 3-10" dbh	Burn piles		NA	NA
27-2R	3	NA		inner 160ft: burn hand piles	outer 160ft. same as 27-2Inner 160ft: manually cut/pile/3-10"dbh		
30-1	29	NA	same as Alt 1	same as Alt 1	NA	NA	NA
33-1	12	NA	same as Alt 1	same as Alt 1		NA	NA
33-1R	0	NA			same as 33-1		
33-2	19	120	density management, all diam, mech, all species to BA 120	same as Alt 1	NA	NA	NA
33-2R	0	120			same as 33-2		
35-1	41	100	same as Alt 1	same as Alt 1	NA	NA	NA
35-2	40	80	same as Alt 1	same as Alt 1	NA	NA	NA

Unit #	Acres	Approximate BA target	Alt 2 vegetation treatment	Alt 2 fuels treatment	Alt 2 riparian reserve treatment	Alt 2 roads	Alt 2 recreation treatment
35-3	70	100	density management all diam, mech, all species	same as Alt 1		Perm. open 0.2 mi of old logging road	OHV more developed
35-3R	0	100			same as 35-3		
35-4	1.6	100	ROCK PIT	ROCK PIT	ROCK PIT	build road access	OHV more developed
4-1	76	see alt.	density management, all diam, mech, all species to BA 120	same as Alt 1		NA	NA
4-2	142	120	density management, all diam,all species, mech			NA	NA
4-1R	0	NA			same as 4-1		
6-1	21	NA	same as Alt 1, Acres reduced due to deferment	same as Alt 1	NA	NA	NA
6-2	38	80	same as Alt 1	same as Alt 1	NA	NA	NA
6-3	8	NA	same as Alt 1	same as Alt 1	NA	NA	NA

Table D-3: Proposed Treatments by Unit for Alternative 3

Unit #	Acres	Approximate BA target	Alt 3 vegetation treatment	Alt 3 fuels treatment	Alt 3 riparian reserve treatment	Alt 3 roads	Alt 3 recreation treatment
15-1	14.5	NA	same as Alt 1	same as Alt 1	NA	NA	NA
19-1	29	NA	NA	same as Alt 1	Burn piles	NA	NA
19-1R	18	NA			same as Alt 1		
21-1	100	100	Density management, all diam, mech w/diam limit	same as Alt 1		NA	NA
21-1R	11	NA			same as Alt 1		
21-2	119	120	same as Alt 1 but with diameter limit	same as Alt 1		NA	NA
21-2R	14	NA		same as Alt 1	same as Alt 1		
22-1	34	100-120	same as Alt 1 but with diameter limit	same as Alt 1		NA	NA
22-1R	2	NA		same as Alt 1	same as Alt 1		
23-1	72	100	same as Alt 1 but with diameter limit	same as Alt 1	NA	NA	NA
25-1	25	NA	same as Alt 1	same as Alt 1		NA	NA
25-1R	3	NA		same as Alt 1	same as Alt 1		
25-2	8	NA	same as Alt 1	same as Alt 1		NA	NA
25-2R	2	NA		same as Alt 1	same as Alt 1		
25-3	15	NA	same as Alt 1	same as Alt 1	NA	NA	NA
26-1	41	100	same as Alt 1 but with diameter limit	same as Alt 1	NA	NA	NA
27-1	60	120	density management w/ diam. limit, all spp. mech , patch cuts (match LSRA) retain >60% canopy closure and/or 120 BA			NA	NA
27-1R	18	NA		same as Alt 1	same as Alt 1 but with diameter limit		
27-2	2	NA	same as Alt 1	same as Alt 1		NA	NA
27-2R	7	NA		same as Alt 1	same as Alt 1		
30-1	29	NA	same as Alt 1	same as Alt 1	same as Alt 1	NA	NA
33-1	9	NA	same as Alt 1	same as Alt 1		NA	NA
33-1R	3	NA		same as Alt 1	same as Alt 1		
33-2	10	see alt.	same as Alt 1 but with diameter limit			NA	NA
33-2R	9	140			same as 33-2, but with diameter limit		
35-1	41	100	same as Alt 1 but with diameter limit	same as Alt 1	NA	NA	NA
35-2	40	80	same as Alt 1 but with diameter limit	same as Alt 1	NA	NA	NA
35-3	65	100	same as Alt 1 but with diameter limit	same as Alt 1		NA	No rock crawl area
35-3R	5	100		same as Alt 1	same as Alt 1 but with diameter limit		
35-4	0	100	ROCK PIT	ROCK PIT	ROCK PIT	build road access	OHV more developed
4-1	68	see alt.	same as Alt 1 but with diameter limit	same as Alt 1		NA	NA

Unit #	Acres	Approximate BA target	Alt 3 vegetation treatment	Alt 3 fuels treatment	Alt 3 riparian reserve treatment	Alt 3 roads	Alt 3 recreation treatment
4-2	142	120	same as Alt 1 but with diameter limit			NA	NA
4-1R	8	NA			same as 4-1, but with diameter limit		
6-1	78	NA	same as Alt 1 but with diameter limit	same as Alt 1	NA	NA	NA
6-2	38	80	same as Alt 1 but with diameter limit	same as Alt 1	NA	NA	NA
6-3	8	NA	same as Alt 1	same as Alt 1	NA	NA	NA

Table D-4: Stand Exam Data for All Units

	Species	Pre Harvest BA	QMD (all trees)	QMD (merch trees)	Canopy Closure	CWD	CWD >20" (ROD)	Snags/ ac	Snags /ac	SDI	Total Volume	TPA (merch)	Plant Assoc.
Unit #		**(sq ft/ac)**	**(in)**	**(in)**	**%**	**ft/ac**	**ft/ac**	**<20"**	**>20"**	**(MS)**	**MBF/ac**		**(Simpson 2007)***
4-1	DF,WF,SP, PP, SRF	50-165	6.2	18.2	81	399	228	4.8	2.3	280	18.8	63	ABCO-ABGR/CACH
6-1	WF,WWP,SRF, DF	140-265	6.5	18.4	84	782	586	1.4	3.5	497	31.2	107	ABCO-ABGR/CACH
6-2	PP,SRF, WF,DF	50-175	7.2	12.5	75	274	0	0.0	0.0	258	9.0	132	ABCO-ABGR/CHUM
6-3	WF,LP, QA,PP,WWP	104	7.1	11.5	n/d	n/d	n/d	n/d	n/d	343	10.3	143	-
19-1	LP,WF,PP, QA,WWP	87	6.5	12.3	58	n/d	n/d	n/d	n/d	277	9.3	104	-
21-1	WF,PP,DF, SF, IC, SP	102	7.2	12.5	70	249	249	0.0	0.0	284	10.3	120	ABCO-ABGR/CHUM
21-2	WF,WWP,SP, PP,SRF,DF	90-170	4.8	16.4	83	411	137	0.0	2.5	312	23.6	84	ABCO-ABGR/CACH
22-1	DF,PP,WF	20-160	7.8	11.6	78	782	391	3.5	0.0	248	8.1	125	ABCO-ABGR/CACH
23-1	WF,DF,SP, PP,IC	50-120	7.9	15.7	65	977	391	1.8	1.2	194	8.6	61	ABCO-ABGR/CACH
26-1	DF, PP,WF,SP,IC	80-140	9.2	13.9	60	821	547	2.3	0.0	217	13.9	102	ABCO-ABGR/CACH
27-1	DF,PP, WF,SP	80-230	6.7	13.9	89	1521	456	6.6	0.8	374	22.1	146	ABCO-ABGR/CHUM
27-1	DF,PP, WF,SP	100-230	8.1	13.5	88	1368	456	9.9	1.1	424	26.4	179	ABCO-ABGR/CHUM
27-1	DF,PP, WF,SP	55-160	5.3	15.7	90	912	456	0.0	0.0	325	13.6	79	ABCO-ABGR/CHUM
33-2	WF,DF, SP,WWP	90-180	7.6	16.7	86	547	0	0.0	0.0	312	22.9	89	ABCO-ABGR/CACH
35-1	DF,WF ,SP,PP	40-90	9.9	13.9	54	342	0	0.0	0.0	131	7.3	61	ABCO-ABGR/CEPR
35-2	PP, WF	0-165	13.5	16.7	48	0	0	0.0	0.0	131	9.4	53	ABCO-ABGR/CEPR
35-3	PP,DF,WF	40-135	4.5	12.9	75	456	456	0.0	0.0	263	8.7	102	ABCO-ABGR/CEPR
35-4	PP,DF,WF	40-135	4.5	12.9	75	456	456	0.0	0.0	263	8.7	102	ABCO-ABGR/CEPR

QMD= Quadratic Mean Diameter
CWD=Coarse Woody Debris
SDI= Stand Density Index
TPA=Trees per Acre

Table D-5: Road work, closures and improvements in Lost Analysis Area

Road Number	Miles	Treatment	Method	note
38-5E-15.3	0.45	Decommision	Natural Barrier	
38-5E-14.0	0.18	Decommision	Natural Barrier	
38-5E-24.2	0.2	Decommision	Natural Barrier	
38-5E-25.1	0.15	Decommision	Natural Barrier	
38-5E-25.2	0.41	Decommision	Natural Barrier	
38-6E-30.4	0.22	Decommision	Natural Barrier	
38-6E-30.4	0.19	Full Decommision	Rip Road	
38-6E-29.2	0.2	Decommision	Natural Barrier	
38-6E-29.0	0.62	Decommision	Natural Barrier	
38-6E-20.0	0.16	Decommision	Natural Barrier	
38-6E-33.8	0.29	Decommision	Natural Barrier	
38-6E-28.0	0.67	Decommision	Natural Barrier	
38-6E-33.6	0.39	Decommision	Natural Barrier	
38-6E-33.7	0.47	Decommision	Natural Barrier	
38-6E-33.0	1.2	Decommision	Natural Barrier	
38-6E-35.2	0.32	Decommision	Natural Barrier	
38S,R6ES35	0.06	Temp construction		T38S-R6E section 35, for acsess In TS. Unit.
38-6E-35.1	0.2	Permanent Reopen		Access for Rock crawl pit in alt 1 and 2 only

Table D-6 Summary of existing Right of Ways in the Lost Project Area

MDM 33, T0380S, R0050E			
BLM	Road Right of Ways 44LD513	16 Authorized	281008
FS	Cooperative Agreements	2 Authorized	281400
BLM	Road Rights of Ways Fed Facility	4 Authorized	281007
BLM/Wasser-Winters	Right of Way Road-RWA CBWR M-690	1 Authorized	281230
JWTR	Right of Way Road-RWA CBWR	1 Authorized	281210
Hugh/Charley	Road Right of Way, Reciprocal-Public land	1 Authorized	281130
MDM 33, T0380S, R0060E			
BLM	Road Right of Ways 44LD513	8Authorized	281008
Merriweather Eastern Oregon Land and Timber	Right of Way Road-RWA CBWR	1 Authorized	281230
BLM	Right of Way Road-RWA CBWR M-690	1 Authorized	281230
FS	Road Rights of Ways Fed Facility	1 Authorized	281007
JWTR	Right of Way Road-RWA CBWR	1 Authorized	281210
Klamath County Public Works	Mat Site	1 Pending	281001
MDM 33, T0390S, R0050E			
BLM	Road Right of Ways 44LD513	1 Authorized	281008
Pacific Power	Power Line Transmission	1 Authorized	285003
BLM	Road Rights of Ways Fed Facility	3 Authorized	281007
JWTR	Right of Way Road-RWA CBWR	1 Authorized	281210
MDM 33, T0390S, R0060E			
BLM	Road Right of Ways 44LD513	1 Authorized	281008
BLM	Right of Way Road-RWA CBWR M-690	1 Authorized	281230
BLM/Wasser-Winters	Right of Way Road-RWA CBWR M-690	1 Authorized	281230
JWTR	Right of Way Road-RWA CBWR	1 Authorized	281210

APPENDIX E – GLOSSARY

Administratively Withdrawn: a land use allocation term from the Western Oregon Plan Revision (WOPR) written in 2008, to describe lands withdrawn from the harvest land base for various reasons. These reasons include: areas of critical environmental concern, areas dedicated to specific purposes such as roads, buildings etc, recreation sites, sites designated for species management, and areas identified through the timber production capability classification system as withdrawn from sustained yield timber production or identified as non-forest.

Anadromous: to ascend a river from the sea for breeding or spawning

Basal area: the cross-sectional area of all stems of a species or all stems in a stand measured at breast height and expressed per unit of land area (In this document = square feet/acre)

Biomass: woody biomass (as referred to in this EA) is plant matter used to generate electricity with steam turbines & gasifiers or produce heat, usually by direct combustion. Examples include forest residues (such as dead trees, branches and tree stumps).

Canopy Bulk density: The Forest Canopy Bulk Density (CBD) layer describes the density of available canopy fuel in a stand. It is defined as the mass of available canopy fuel per canopy volume unit.

Carbon Sequestration: Carbon sequestration describes long-term storage of carbon dioxide or other forms of carbon to either mitigate or defer global warming and avoid climate change. It has been proposed as a way to slow the atmospheric and marine accumulation of greenhouse gases.

Coarse Woody Debris (CWD): is a term used for fallen dead trees and the remains of large branches on the ground in forests.

Culturing: The process of harvesting trees from around a large, older tree in order to reduce competition for water and nutrients and maintain the large older tree for a longer period of time.

Diameter at breast height (DBH): The diameter of a tree measured 4.5 feet from the ground.

District Designated Reserve (DDR): Areas designated for the protection of specific resources, flora and fauna, and other values. These areas are not included in other land use allocations nor in the calculation of the PSQ.

District Designated Reserve Buffer (DDRB): An area adjacent to a DDR (see above) that remains in the timber base or Matrix but where timber harvest is generally less intensive than in the surrounding matrix.

Dripline: the widest part of the crown of an individual tree.

Evapotranspiration: a term used to describe the sum of evaporation and plant transpiration from the Earth's land surface to atmosphere.

Growth Basal Area (GBA): The basal area at which dominant trees grow at 1.0 inch in diameter per decade at age 100. This is a metric used to estimate site potential stockability using current stand growth.

Late Successional Reserve (LSR): Lands managed to maintain and restore old-growth forest conditions. (see also Un-Mapped Late Successional Reserve [UMLSR])

Late Successional Habitat: This term has a variety of definitions but is generally meant to refer to mature and old-growth forest. For the purposes of acreage calculation for the 15% standard and guide this term is defined on BLM land as stands 80 years old and greater.

Legacy Tree: a tree, usually mature or old-growth, that is retained on a site after harvesting or natural disturbance to provide a biological legacy

Macrophyte: an aquatic plant that grows in or near water and is emergent, submergent, or floating.

Matrix (General Forest Management Area): Federal land outside of reserves and special management areas that will be available for timber harvest at varying levels.

Nesting-Roosting-Foraging (NRF): forest stands that the USFWS considers "suitable" for spotted owls. See Table 9 above in the wildlife existing conditions section for habitat definitions.

Nonattainment zone/area: The Clean Air Act and Amendments of 1990 define a "nonattainment area" as a locality where air pollution levels persistently exceed National Ambient Air Quality Standards, or that contributes to ambient air quality in a nearby area that fails to meet standards.

Non-Vascular: a general term for plants without a vascular system.

Oligotrophic: deficient in plant nutrients, or having abundant dissolved oxygen, such as lichens, moss, bryophytes.

Quadratic Mean Diameter (QMD): an average diameter of all the trees in a stand based on the quadratic mean rather than the arithmetic mean. The quadratic mean gives greater weight to larger trees and is equal to or greater than the arithmetic mean by an amount that depends on the variance within the stand.

Stand Density Index (SDI): A measure of the stocking of a stand based on the number of trees per acre and diameter at breast height of the tree of average basal area. For modeling purposes, the max SDI for each species in this area is shown below. Stand SDI would be calculated as a weighted average based on the basal area of each species.

Species	**Max SDI**
White fir	560
Shasta red fir	560
Douglas-fir	380
Ponderosa pine	365
Sugar Pine	447
Western white pine	447

Seral Stage: The series of relatively transitory plant communities that develop during ecological succession from a community with no native plants (or possibly bare ground) to the potential natural community (PNC or climax) stage in rangeland communities and to old growth in forest communities.

Socioeconomics: The use of economics in the study of society.

Soil Bulk Density: The mass of dry soil per unit of bulk volume, including the air space. The bulk volume is determined before drying to constant weight at 105 degrees Celsius.

Uneven-age Timber Management Areas: A land use allocation designated under the 2008 RMP. Land placed under this LUA has the objective of achieving continuous timber production that could be sustained through a balance of growth and harvest. Management direction can be found in the 2008 ROD/RMP (BLM KFRA p. 38)

Variable density thinning: a silvicultural technique intended to promote structural heterogeneity by developing of a mosaic of tree densities through thinning. A typical variable density thinning on the KFRA in involves harvesting trees throughout all size classes and leaving a residual stand of clumps and openings.

Unmapped Late Successional Reserve (UMLSR): a small block of forest approximately 100 acres in size designated around known spotted owl activity centers located on lands in the matrix. UMLSRs were established under the direction of the Northwest Forest Plan (NFP), but are not displayed on regional maps in the NFP. The objective for these areas is to protect and restore conditions for a variety of late successional and old growth dependent species. (See also Late Succession Reserve [LSR]):

Vascular: Plants that have specialized tissues for conducting water, minerals and photosynthetic products through the plant.

APPENDIX F – PROCEDURE FOR DETERMINING AGE ON UNEVEN-AGED STANDS IN KLAMATH FALLS

Procedure for Determining Age on Uneven-aged Stands in Klamath Falls

- Collect stand exam data as described in the BLM Ecosurvey Field User Guide. This will include separating the trees in each plot by layer based on height. The Ecosurvey handbook specifies that layer 2 be "on average less than 2/3 the average height of the top layer".
- Bore a representative tree of each layer at each plot to determine average layer age.
- When FOI unit has been completed determine the basal area made up by each layer in each plot and average them.

Plot 1	Plot 2	Plot 3
50 sq. ft. layer 1	20 sq. ft. layer 1	100 sq. ft. layer 1
70 sq. ft layer 2	100 sq. ft layer 2	20 sq. ft layer 2
10 sq. ft layer 3	10 sq. ft layer 3	0 sq ft layer 3

Average basal area/layer	
1	57
2	63
3	7

- The age of the stand will be assigned as the layer with the greatest BA for the stand. In this case the average age of layer 2 would be assigned to the entire FOI unit.