SPENCER CREEK TREATMENTS
ENVIRONMENTAL ASSESSMENT (EA) # OR-014-08-09

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

ABSTRACT:
This environmental assessment analyzes a variety of land treatments in the Spencer Creek 5th field watershed including vegetation treatments, road actions, and riparian restoration treatments.

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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

Proposed Action

This environmental assessment analyzes a variety of land treatments in the Spencer Creek 5th field watershed including vegetation treatments, road actions, and riparian restoration treatments. Some vegetation treatments would result in use of biomass including via a commercial timber sale. The Klamath Falls Resource Area (KFRA) began the process of preparing the Spencer Landscape Management Environmental Assessment (EA) to analyze the impacts of proposed forest management activities on the human environment in the Spencer Creek watershed in April 2008. The proposed actions were anticipated to be implemented over a five to ten year period. The actions and alternatives for the EA were in part designed to comply with the *2007 Final Supplement to the 2004 FSEIS (Amending Resource Management Plans for Seven Bureau of Land Management Districts and Land and Resource Management Plans for Nineteen National Forests Within the Range of the Northern Spotted Owl) to Remove or Modify the Survey and Manage Mitigation Measure Standards and Guidelines*.

On February 23, 2010, the KFRA received direction (Instruction Memorandum No. OR-2010-017) in consideration of a December 17, 2009 order by the District Court for the Western District of Washington regarding Survey and Manage species. This guidance specifies that at this point projects within the range of the northern spotted owl can only move forward if they are in compliance with the *2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures, Standards and Guidelines* (hereinafter referred to the 2001 S&M ROD) or fit at least one of the four exemptions listed in the October 11, 2006, modified injunction in Northwest Ecosystem Alliance et al. v. Rey, Case No. 04-844-MJP (W.D. Wash.).

Management direction for Survey and Manage species is to protect the microsite of the habitat feature following surveys (USDA/USDI 2001). Protection of the microsite of the habitat feature through implementation of Project Design Features or PDFs is described in the wildlife section of Appendix B (PDF's). Many of the original actions proposed in the Spencer Landscape Management EA comply with this direction, and the need exists to complete those treatments in the near future. This EA analyzes the effects of actions that do meet the current direction.

Some project areas proposed for treatment under this EA have not been specifically surveyed for S&M terrestrial mollusks. The terrestrial mollusk protocol (USDA/USDI 2003) identified priority habitat for surveying for specific species. Using this protocol the Bureau of Land Management (BLM) identified priority habitat for the species, and will avoid the habitat to prevent impacts. Priority habitats will be identified, buffered and removed from the proposed vegetation treatments that would be considered habitat disturbing (i.e. timber harvest). This methodology to identify habitat and avoid disturbance meets the intent of the 2001 S&M ROD by assuming occupancy within priority habitat and protecting its microsite characteristics.

All other proposed actions that are not considered habitat disturbing (USDA/USDI 2003) would be compliant with the Standards and Guidelines in the 2001 S&M ROD or survey and manage project exemptions (Appendix D) and habitat protection would not be required. Habitat disturbing activities are defined as those disturbances likely to have significant negative impact on species habitat, its life cycle or life support requirement (USDA/USDI 2001). The projects listed as non-habitat disturbing are those listed because they are not considered habitat for the S&M terrestrial mollusks.

Some areas or types of treatments originally proposed do not currently comply with the direction and need additional surveys before they can be considered for analysis and possible implementation. The BLM is not currently planning to implement these projects until appropriate surveys can be completed. It is expected that it will be at least 18 months before survey protocols are met, and then projects would have to be designed to manage for known sites if any survey and manage species exist.

As a result of this direction, the scale of actions for this environmental assessment has been reduced from the original Spencer Landscape Management EA, and less land treatment is proposed at this time. It is anticipated that following completion of surveys the BLM would undertake additional site-specific analysis, to determine if those actions would be implemented. So, although there is no intent to analyze those projects in this EA, it is reasonably foreseeable that those actions would occur in the future. While not ripe for a decision at this time, all of the original actions are considered in this Spencer Creek Projects EA and discussed in the cumulative effects sections.

Purpose and Need for Action

Purpose

The purpose of the projects is to implement the Klamath Falls Resource Area Record of Decision (ROD)/Resource Management Plan (RMP). 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 extent to which each alternative achieves the identified objectives, or purposes, will be considered when evaluating and selecting a course of action among the alternatives; therefore, these purposes are also described as decision factors. Purposes for the Spencer Creek Projects EA include:

- Produce a sustainable supply of timber and other forest commodities on matrix lands to provide jobs, contribute to community stability (RMP, p. 22) and provide timber receipts to Klamath County by offering timber sales.
- Restore stand health and vigor and the composition of pine and Douglas-fir stands where those components have been lost (RMP, Appendix E, p. E- 9). The silvicultural prescriptions would follow those adapted by the RMP (Appendix E, p. E-7) for managing forests on matrix land. Treatments would include commercial thinning (density management and forest restoration), and selection harvest. Treatments would reduce mortality and restore the vigor, resiliency, and stability to forest stands (RMP, p. 53).
- Design a timber sale project that is economically practical (RMP, Appendix E, p. 7). The BLM's responsibility to implement the RMP and meet the annual sale quantity is contingent on being able to advertise and sell commercial timber. BLM will make an effort to design the sale to be economically viable. Some treatments or methodologies are more cost efficient than others, while some more costly ones may be needed to protect resources. The decision maker would need to balance the benefits of resource protection against the probable viability of a timber sale or vegetative treatment.
- Reduce natural and activity-based fuel hazards to protect resources and local communities through methods such as prescribed burning, mechanical or manual manipulation and utilization of forest vegetation and debris as biomass, removal of forest vegetation and debris, and combinations of these methods (RMP, p. 75).
- Manage riparian reserves to restore and maintain the ecological health of watersheds and aquatic ecosystems (RMP, pgs. 7, 12). Manage riparian reserves to restore and maintain the ecological health of watersheds and aquatic ecosystems (RMP, pgs. 7, 12).
- Provide connectivity across the landscape for forest dependant plant and animal species. Provide habitat for a variety of organisms associated with late-successional and younger stands (RMP, p. 22). Protect and enhance late-successional reserves through silvicultural and non-silvicultural treatments that are beneficial to the creation of late-successional habitat (RMP, p. 18).

Need

The BLM has a statutory obligation under Federal Land Policy and Management Act (FLPMA), which directs that "[t]he Secretary shall manage the public lands in accordance with the land use plans developed by him under section 202 of this Act when they are available . . ." The Klamath Falls Resource Area's Record of Decision and Resource Management Plan (RMP) guides and directs management on BLM lands.

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 and Coos Bay Wagon Road 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.

The need for harvest treatments in the Spencer Creek 5th field watershed is to meet the direction in the ROD/RMP to provide a sustainable supply of timber that would trend toward a forest composed of stands representing a variety of structures, ages, sizes, and canopy configurations (RMP, Appendix E, p. 9). There is a need to accomplish harvest on sustained yield basis in the Watershed 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.

Forest Stand Health 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 of primarily the overstory 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 major influence on stand health. Density-dependent mortality, crown recession, reduced individual tree vigor, shading 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 become established in what has historically been dominated by Douglas-fir (*Pseudotsuga menziesii*), ponderosa pine (*Pinus ponderosa*), and sugar pine (*Pinus lambertiana*) (Leiberg 1900, pgs. 436, 447). Areas that historically supported a higher pine and Douglas-fir component have lost vigor and presence through past harvesting and encroachment by shade tolerant species. Similarly, ponderosa pine and Douglas-fir plant series have decreased and are at risk of being replaced by white fir dominated stands.

Produce an Economically Viable Timber Sale

There is a need to implement a timber sale that is economically viable meaning that the products produced are worth more than the logging costs and costs to get the products to processing facilities. Some costs to the purchaser include: road construction and maintenance, cutting, yarding and hauling. Sufficient quality and quantity of trees need to be harvested; typically at least five thousand board feet (MBF) of merchantable timber per acre should be harvested to make a sale viable. "Merchantable timber" is described as trees, primarily true firs, Douglas-firs, pines and incense cedar that are at least 7 inches diameter at breast height (DBH) and at least eight feet long to a five inch top. However, for a timber sale to be economically viable, the timber harvested would normally have to average considerably larger than this minimum merchantable standard. Economically viable BLM sales in this area typically have average tree diameters in the 12 to 14 inch DBH range. Silvicultural prescriptions, although designed to meet wildlife, forest health and other resource objectives, should take economics into account. Variable timber prices can have a major effect upon economic viability of timber sales. Depressed timber prices could make even a well-designed and usually viable sale not profitable.

Fuel Hazard Reduction

There is a need within the planning area to reduce fuels hazards using a combination of treatments including; prescribed burning, modifying ladder and ground fuels arrangement 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. In the Spencer Landscape Area, 74 percent of the analysis area classifies as high and very high fire hazard rating. The Wildland Urban Interface (WUI) surrounding Lakewoods Village accounts for 10% of the analysis area. This WUI boundary was identified as a priority in the Keno Community Wildfire Protection Plan (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. The proximity of these structures to wildland fuels

makes them susceptible to wildfire. The need for fuel reduction is to protect resources and communities by reducing fine, ladder, and aerial fuels.

Riparian Reserves

There is a need within the planning area to maintain and improve riparian reserve habitat. The 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 and was identified due to its potential for restoration as part of a watershed restoration program and its contribution 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. There is an overall need to restore health and vigor to riparian stands by maintaining and improving riparian reserve habitat. Some natural-surface roads have poor drainage that can lead to erosion and increased sediment in nearby streams. Road maintenance is needed to improve drainage and to reduce chronic sediment input to the stream systems.

Unmapped Late Successional Reserves / District Designated Reserves

There is a need to provide connectivity across the landscape in support of a variety of organisms. The Tunnel Creek District Designated Reserve (DDR), Upper Spencer Creek Unmapped Late Successional Reserve (UMLSR), Lower Spencer Creek DDR, East Miners Creek UMLSR, Miners Creek DDR are located within the BLM administered land in the Watershed. There is a need to improve the vigor and resiliency of many of the larger trees, particularly under-represented species (pines and Douglas-fir) through culturing (thinning). Stem density is typically high in these stands, reducing large tree vigor and in some instances inhibiting progression toward late-successional forest conditions and species composition. Past management (fire suppression, timber harvest, grazing) and the resulting high fuel loading have further altered the LSR from its historical condition. Treatments within the Tunnel Creek DDR were previously analyzed under (CX-06-04) and Upper Spencer Creek EA (EA #OR-014-03-03). Those treatments were implemented from 2007 thru 2009.

Location

The Spencer Creek Planning Area is located five miles northwest of the city of Keno (Figure 1 – General Location Map). The project area is coincident with the Spencer Creek 5th field watershed. The BLM manages approximately 8,745 acres, and the US Forest Service manages approximately 22,273 acres of the 54,194-acre planning area. All of the BLM-administered lands within the watershed are Oregon and California Railroad Revested Lands. The planning area includes 7,278 acres of matrix land allocation designated as Southern General Forest Management Areas (SGFMA), 1,004 acres of riparian reserves, and 518 acres of District Designated Reserves (DDR).

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

Township	Range	Sections
38S	5E	15, 16, 23, 24, 25, 26, & 36
38S	6E	19, 20, 21, 24, 25, 28, 29, 30, 33, 34, & 35
39S	5E	1
39S	6E	4, 5, & 6

Management Direction and Conformance with Existing Plans

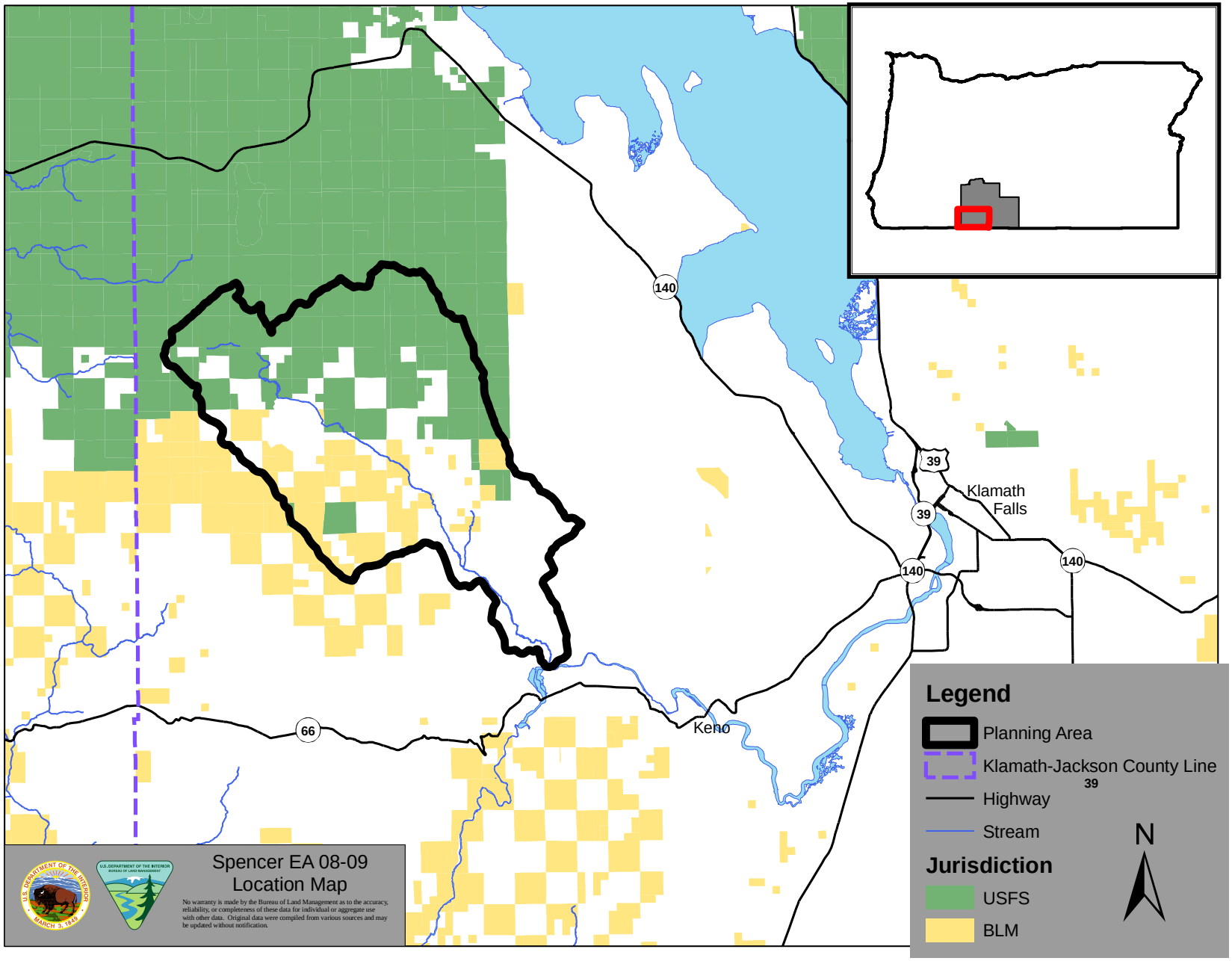
On July 16, 2009 the U.S. Department of the Interior, withdrew the Records of Decision (2008 ROD) for the Western Oregon Plan Revision and directed the BLM to implement actions in conformance with the resource management plans for western Oregon that were in place prior to December 30, 2008.

This project has been designed to comply with the land use allocations, management direction, and objectives of the 1995 Klamath Falls Resource Area Resource Management Plan (RMP). The project design and recommendations for implementation are contained in the ROD/RMP and a number of other related or supporting documents including:

- Oregon Wilderness FEIS and ROD (1989 and 1991)
- Wilderness Interim Management Policy (1995)
- Final Environmental Impact Statement, Vegetation Treatment on BLM Lands in Thirteen Western States (1991)
- Northwest Area Noxious Weed Control Program FEIS and ROD (1985) and Supplement (1987)
- Klamath Falls Resource Area Integrated Weed Control Plan EA (July 21, 1993)
- Lakeview District Fire Management Plan – Phase 1 (1998)
- National Fire Plan (A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment 10-Year Comprehensive Strategy) (2001)
- Wildland and Prescribed Fire Management Policy (1998)
- Emergency Fire Rehabilitation Plan (see Interagency Burned Area Emergency Stabilization and Rehabilitation Handbook - 2001)
- Northwest Forest Plan (1994)
- Memorandum of Understanding (2010) - To Promote the Conservation of Migratory Birds Aquatic Conservation Strategy Supplemental Environmental Impact Statement/Record of Decision 2004 (ACS SEIS EIS/ROD – 2004)
- 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 Project Exemptions - Northwest Ecosystem Alliance, et al. v. Mark E. Rey, et al., No. C04-844P (W.D.Wash)

This Environmental Assessment is tiered to the Final - Klamath Falls Resource Area Resource Management Plan and Environmental Impact Statement, September 1994 (FEIS). Relevant analyses from the FEIS are referenced in appropriate resource sections below.

Figure 1: General Location Map of the Spencer Creek Watershed



CHAPTER 2 – PROPOSED ACTION AND ALTERNATIVES

When this project was originally proposed and scoping letters were mailed to the public, a full list of actions needed to implement the RMP was identified. Scoping issues are summarized in Appendix C. However, as mentioned in the Introduction, only actions that are in compliance with the 2001 S&M ROD or meet the survey and manage project exemptions (Appendix D) will be proposed. The remainder of the actions originally proposed will be considered in the description of Cumulative Effects as "reasonably foreseeable future actions". The interdisciplinary team will complete a subsequent analysis of actions not currently in compliance with the 2001 S&M ROD at a later date after appropriate S&M surveys or mitigation are completed.

The EA Interdisciplinary Team developed two 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 team developed a range of alternatives based on the purpose and need of the project, existing environmental conditions, and input during the scoping process. During scoping, the public provided comments that were considered by the interdisciplinary team and incorporated into alternative development. Those alternatives considered but eliminated from further analysis are found in Appendix E.

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 project 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, forest inventory and surveys, 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. Inclusion of this alternative is done regardless of consistency with the RMP and without regard to meeting the purpose and need.

It should be pointed out the no action alternative is not a "static" alternative. It is implied that the present environmental conditions and trends will continue. This would include trends, such as vegetation succession and consequent terrestrial and aquatic habitat changes, increases in fire hazard, continuing demand for a sustainable supply of timber, and deteriorating road conditions.

For the No Action Alternative, the discussion includes an analysis of cumulative effects anticipated regardless of implementing any other actions. Cumulative actions specifically considered in the descriptions of cumulative impacts include the past riparian habitat restoration treatments, road improvements and obliterations, fuel treatments, timber sales, and forest development treatments.

Proposed Action and Alternative 1

Alternatives are presented and organized by "types of action" (*e.g.*, vegetation treatments, road actions, riparian restoration treatments, etc.). The action alternatives under each resource differ with regard to their specific objective or emphasis. The actions are based on what is foreseeable during the next ten years. Alternative 1 was designed to reduce the impacts on Northern Spotted Owls by reducing habitat loss within owl cores. Table 2 summarizes actions for the action alternatives. Figures 2 and 3 display treatments and unit boundaries. Numbers below are approximate and represent the maximum amount predicted. Road maintenance would continue only periodically on all open roads. Some roads may need to be upgraded for

winter hauling. Roads within the project area that are closed to vehicle traffic will be opened during the timber sale, and then closed afterwards.

Table 2: Summary of Action Alternatives

Action	Proposed Action	Alternative 1
Density Management and Group Selection	1000 ac	800 ac
Mechanical Thinning	600 ac	600 ac
Riparian Reserve Mechanical Thinning	30 ac	30 ac
Manual Thinning	280 ac	280 ac
DDR Manual Thinning	300 ac	300ac
Riparian Reserve Manual Thinning	40 acres	40 acres
Plant Trees	80 ac	80 ac
Underburning & Jackpot Prescribed Fire	920 ac	920 ac
Piling and Burning of Treatment Units	Up to 2250 ac	Up to 2250 ac
Improve Natural Fords	4	4
Culvert Replacement/Extension	3	3
Sediment Trap Removal	15 traps	15 traps
Noxious Weed Treatments	Up to 8700 ac.	Up to 8700 ac.

Actions Common to Both Action Alternatives

Proposed activities described in this section are incorporated into both action alternatives. Although the BLM considered developing a range of actions for these following treatments, it made little sense because of the relatively narrow scope of each action. Therefore the action alternatives were designed with the following actions being common to both.

Underburning and Jackpot Prescribed Fire

Underburning and jackpot fire would be applied to approximately 920 acres.

Initial burning

Underburning is prescribed burning where fire spreads across most of the targeted unit leaving most of the overstory intact. Jackpot burning occurs under moisture conditions when fire is limited to concentrations of sheltered fuels. Jackpot burning would occur when the objectives could not be met with underburning due to stand and fuel conditions. The objective is to reduce dead and down woody material, live and standing dead vegetation such as shrubs and small trees in the understory and live and dead branches close to ground level. Understory burning is conducted throughout the year when fuel and weather conditions permit. Typically, burning occurs between fall and spring. Summer or early fall burning is less common, but can be feasible to meet resource objectives and when risk of fire escape can be mitigated.

Underburning is conducted using hand ignition methods as the primary ignition device. Fire would likely be applied to the unit in a strip head or dot ignition pattern. Fire intensity would be controlled by adjusting the ignition pattern, distance between strips, the time between strips, and the number of strips ignited at one time. Desired fire intensity would generally include flame lengths of six inches to two feet. Each site specific prescription will be determined in the burn plan and will be based on the management goals, desired habitat conditions of the site, vegetation type and size, and fuel loadings. Underburns require control lines, or fire line, around the burn area. Existing control lines, such as roads, would be utilized as much as possible to minimize potential impacts associated with building new fireline. Control line would be constructed as necessary to contain the underburn. Control lines may be constructed using hand tools or a plow line that would be approximately two feet wide.

Maintenance Underburning

Frequent, low intensity underburns would then be used to maintain the site in low fuel hazard condition. Frequency of underburns would be based on management goals, desired habitat conditions, vegetation

responses, vegetation types, and other natural disturbances, such as wind throw and ice/snow damage or wildfire. It is estimated that maintenance burning throughout the project area would be on a 5-25 year rotation.

Post Harvest Fuel Treatment

Post harvest fuel treatments are intended to reduce potential increases in fuel hazard due to the buildup of harvest generated slash and residual small high density trees. All harvested areas, including small diameter thinning, would be treated to reduce fuel loads. Slash not utilized would be piled and covered with 4mil polyethylene sheeting. The piles would remain on site until dry enough for complete combustion (cured). It is expected that piles would be burned in the first winter or late fall following the construction of the piles. Exceptions to this would be if piles did not have enough time to cure, unseasonably dry burning conditions, or atmospheric conditions not conducive for favorable smoke dispersal. It can be expected that 2-10% of each individual pile would not be consumed leaving pile "rings" and that 2-5% of the piles on the site would not burn resulting in scattered pockets of slash remaining on site.

Planting

Up to 80 acres that has previously been treated would be planted with conifer species. Also up to 200 acres within or adjacent to the commercial harvest units would be planted with conifer species following harvest, associated site preparation, and fuels treatments. Planting would be accomplished in areas where the proposed treatments reduce conifers below minimum stocking levels. Manual brushing would be necessary on planted units to ensure seedling survival.

Small Diameter Thinning: Mechanical & Manual

These treatments are designed to accelerate the development of more structurally complex multi-layered forests and to reduce fuel loads. Small diameter mechanical thinning would occur on approximately 600 acres in plantations and younger stands (< 80 years old) to facilitate movement towards or maintain late successional conditions. Understory trees (<20" DBH) would be thinned to the desired density and stocking levels to reduce competition for water and nutrients. Harvest would primarily consist of thinning of over-stocked stands and cultivating around large legacy trees.

Trees selected for removal would include suppressed smaller trees within two drip lines of larger trees, trees judged unlikely to recover and thrive following harvest, and damaged residual trees. Trees may also be thinned (primarily in plantations) to reduce competition and to allow for the development of a more vigorous residual stand. Leave trees would include the healthiest and most vigorous trees, with a target stand composition objective as summarized in Appendix E of the RMP (p. E-10), and would be spaced 15-40 feet apart consisting. The wider spacing would be used for larger leave trees and areas with lower site productivity.

Mechanical thinning would include yarding of severed trees to a landing. This material would be utilized for firewood, biomass energy production, fiber, or other product. Brush removal using manual and mechanical techniques may also be included in small diameter thinning areas. Material not utilized will be piled and burned (see Post Harvest Fuel Treatment, below). Mechanical treatments would be performed by standard tracked or rubber tired equipment. Generally manual thinning is identified for units where the slope and other factors preclude mechanical methods.

Mechanical and manual thinning that takes place in riparian reserves and DDRBs will target the development and maintenance of late successional forest structure by retaining large trees and snags (RMP, p.18). Maintenance and enhancement of stream shading would be emphasized to lead towards attainment of potential natural community shade targets (Draft TMDL, ODEQ 2010)

Forest Product Contribution

Forest products resulting from commercial timber harvests, fuel reduction treatments, or forest development treatments would be available for utilization. These products include sawlogs, posts and poles, biomass, firewood, as well as other minor forest products. Treatments would be implemented and forest products would be removed and sold using a variety of contracting methods including; standard timber sale contracts, small

sales contracts, and stewardship contracts. Under all action alternatives, units or portions of units identified for harvest that are not economically feasible to treat under as part of a large commercial timber sale may be treated using stewardship contracts or sold as small sales There are no treatments identified specifically for stewardship contracts, rather, stewardship contracts offer opportunities to treat forested stands, address fuel hazards, and to meet ecological objectives. Harvesting and collection would occur before, after, or during the primary stand treatment. Material removed would generally be small diameter and would be removed in its entirety, usually whole tree yarding. Treatments and removal of different forest products would be designed to meet ecological and silvicultural objectives, provide a diversity of economic opportunities to local communities and contractors, and provide innovative methods to utilize woody material.

Instream and Riparian Restoration

Stream crossing improvements (see Table 3) would improve aquatic habitat/connectivity and reduce sedimentation. Thinning in Riparian Reserves would improve riparian vegetation conditions and functions by: 1) Increasing crown ratios, 2) Decreasing stand densities, 3) Increasing structural and species diversity, 4) Promoting conifer seedlings, 5) Maintaining long term connectivity corridors for terrestrial wildlife, 6) Increasing long term large wood recruitment potential, and 7) Reducing high fire hazard in these valuable areas.

Riparian Thinning and Fuels Reduction

Vegetation treatments within the riparian reserves would include thinning, hand piling and pile burning, and underburning as described in the Small Diameter Thinning section and Underburning & Jackpot Burning sections (above). Specific PDFs as described in Appendix B would be implemented when underburning in riparian reserves. Thinning would be prescribed in riparian reserves that exhibit high density, poor crown ratios, and poor conifer seedling regeneration. Thinning would be accomplished by cutting understory trees and retaining a minimum 50-60% canopy closure. Suppressed trees with low vigor and poor crown ratio would be removed while leaving the largest, healthiest trees of the preferred species. There are small areas (approximately 28 acres) where trees would be removed to be utilized from the riparian reserves. This would be accomplished with cable or by reaching into the riparian reserves. Trees that provide shade to perennial and intermittent fish bearing stream channels would be maintained. Thinning slash would be hand piled and burned. Underburning within the riparian reserve would occur in conjunction with burning outside of the reserve.

Sediment Trap Removal

The KFRA, in cooperation with the Rocky Mountain Research Station, conducted an assessment of the effects of roads on hydrological processes and sediment production. This information is used in transportation management planning, and to assess priorities for watershed restoration planning. Fourteen (14) monitoring stations consisting of sediment traps (see Figure 2) were installed in 2002 adjacent to roads in the Spencer Creek watershed. The traps consist of corrugated steel tanks (capacity of approximately 400 gallons) placed in excavated holes. Drainage in the immediate vicinity of the traps is controlled by a combination of ditches and berms that are not hydrologically connected to adjacent waterbodies. These traps are now scheduled for removal. These will be removed with a backhoe and any excavations will be backfilled. Disturbed areas will be seeded with native seed mix appropriate for the location. The total area of ground disturbance associated trap removal should be less than 400 square feet. The roads adjacent to the traps will be re-crowned and contoured to their original condition.

Roads and Transportation Management

Road maintenance would continue periodically on all open roads in the project area. Some roads may need to be upgraded for winter hauling. Roads within the project area that are currently closed to vehicle traffic will be opened during the timber sale contract, and then closed afterwards.

Cross drains, culverts and fill slopes in stream channels and potentially unstable fill areas would be removed to restore natural hydrologic flow. Exposed soils would be covered with mulch to reduce sedimentation. Stream crossing improvements as described in Table 3 include culvert replacement, culvert extension, repairing scour

adjacent to natural fords and adding base material to natural fords. An excavator would be used to accomplish the work. All of the improvements are on intermittent or ephemeral streams and would be implemented late in the year when streams are dry. Heavy equipment would be restricted to staying outside of the dry channels to the greatest extent possible. During construction, road closures are anticipated. When the road is not closed, traffic delays would be approximately one hour. Roads could be closed for up to two days. During closure periods, signs would be installed informing users of the closure period and detour routes. Roads would be closed with a barricade or gate.

Table 3: Intermittent/Ephemeral Stream Crossing Improvements

Location	Road Number	Type	Issue	Improvement
39-6-4 NW1/4 NW1/16	39-7E-31	culvert	road sluffing	extend culvert
38-5-16 NE1/4 NE1/16	38-5E-10	natural ford	scoured road and large puddle in road	repair scour, add base material
38-6-30 NW1/4 SW1/16	38-6E-30.1	culvert	partially crushed	replace culvert
38-6-31 NE1/4 NE1/16	38-6E-30.7	natural ford	runs down road	repair scour, add base material
38-6-28 SW1/4 SE1/16	38-6E-33	culvert	totally blocked	replace culvert
38-6-24 SW1/4 SW1/16	38-6E-24.11	natural ford	scoured road	repair scour, add base material
38-6-24 SW1/4 NW1/16	38-6E-24.11	natural ford	scoured road	repair scour, add base material

Actions That Differ Amongst Action Alternatives

Proposed Action

Objective

The Proposed Action Alternative harvests timber volume 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 through retention of an uneven-aged stand structure with variable canopy closures. In addition, an assortment of RMP prescribed reserves within the project area will be retained (e.g., Riparian Reserves, DDRs, and species buffers).

Proposed Treatments

Density Management in the Matrix:

Density Management would include understory thinning, precommercial thinning and biomass utilization on up to 1000 acres of westside Matrix lands. Generally, a variable density prescription ranging from 40 to 180 square feet of basal area per acre would be used in the Density Management Units, with an average stand basal area retention objective of 80 to 120 square feet per acre. Up to 200 acres of the above density management would occur in the DDRB, and higher densities would be retained in these areas. The density management harvest prescription is designed to maintain an uneven-aged, multi-strata stand structure, reduce 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 dominant and co-dominant overstory trees > 24” DBH, and retain and culture around the large diameter, under-represented species like the ponderosa pine, sugar pine, incense cedar, and Douglas-fir.

The Density management harvest prescription would also allow 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. 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 remove decadent overstory trees impacted by disease and insects and establish a new cohort of early successional species (pines, incense cedar, and Douglas-fir).

Treatment within Riparian Reserves:
Commercial harvest would occur on approximately 30 acres and manual thinning on approximately 40 acres within the Riparian Reserves to enhance the stand health and aid in the long term implementation of the Aquatic Conservation Strategy.

Table 4: Riparian Treatment Units

Location	Acres	Treatment Type	Comments
T38SR5E-Sec 36 SE1/4	1.2	Riparian Mechanical Thin	Outer 80' of 160' buffer
T38SR5E-Sec 15 SW1/4	1.5	Riparian Mechanical Thin	Intermittent reach of Tunnel Creek, outer 80' of 160' buffer
T38SR5E-Sec 25 NE1/4	0.5	Riparian Mechanical Thin	Outer 80' of 160' buffer
T38-R6E-Sec19 SW1/4 and Sec30 NW1/4	11.9	Riparian Mechanical Thin	Outer 80' of 160' buffer, part DDRB
T38S-R6E-Sec 30 NW1/4	3.5	Riparian Mechanical Thin	Outer 80' of 160' buffer
T38S-R6E-Sec 35 SE1/4	8.6	Riparian Mechanical Thin	Clover Creek, outer 160' of 320' buffer
T39S-R6E-Sec 5 NE1/4	0.7	Riparian Mechanical Thin	Outer 80' of 160' buffer
T38S-R5E-Sec 15 S 1/2	1.5	Riparian Manual Thin/Pile & Burn	Intermittent reach of Tunnel Creek, Inner 80’ of 160’ buffer
T38S-R5E-Sec 25 NE 1/4	0.5	Riparian Manual Thin/Pile & Burn	Inner 80’ of 160’ buffer
T38S-R5E-Sec 36 E 1/2	0.4	Riparian Manual Thin/Pile & Burn	Inner 80’ of 160’ buffer
T38S-R6E-Sec 19 SW ¼ and Sec 30 NW ¼	11.5	Riparian Manual Thin/Pile & Burn	Inner 80’ of 160’ buffer, part DDRB
T38S-R6E-Sec 33NE 1/4	11.0	Riparian Manual Thin/Pile & Burn	Miners Creek, Inner 160’ buffer
T38S-R6E-Sec 35 SE 1/4	9.0	Riparian Manual Thin/Pile & Burn	Clover Creek, Inner 160’ of 320’ buffer
T39S-R6E-Sec 5 NE 1/4	0.9	Riparian Manual Thin/Pile & Burn	Inner 80’of 160’ buffer
T38S-R6E-Sec 30 NW ¼	3.6	Riparian Manual Thin/Pile & Burn	Inner 80’ of 160’ buffer

Alternative 1 – Owl Core Habitat Retention

Objective

This alternative is designed to maintain spotted owl habitat within the core area of known owl activity centers. This alternative will maintain suitable habitat (Nesting, Roosting and Foraging) within ½ mile of the activity center or nest site.

Proposed Treatment

The proposed treatments are the same as the proposed action with the exception that no harvest will occur in NSO suitable habitat within the core area of a known spotted owl activity center. This alternative to the proposed action equates to approximately a 200 acre decrease in commercial harvest. All other proposed treatments in the proposed action will remain the same.

Figure 2: Map of Proposed Treatments in the Spencer Creek Area

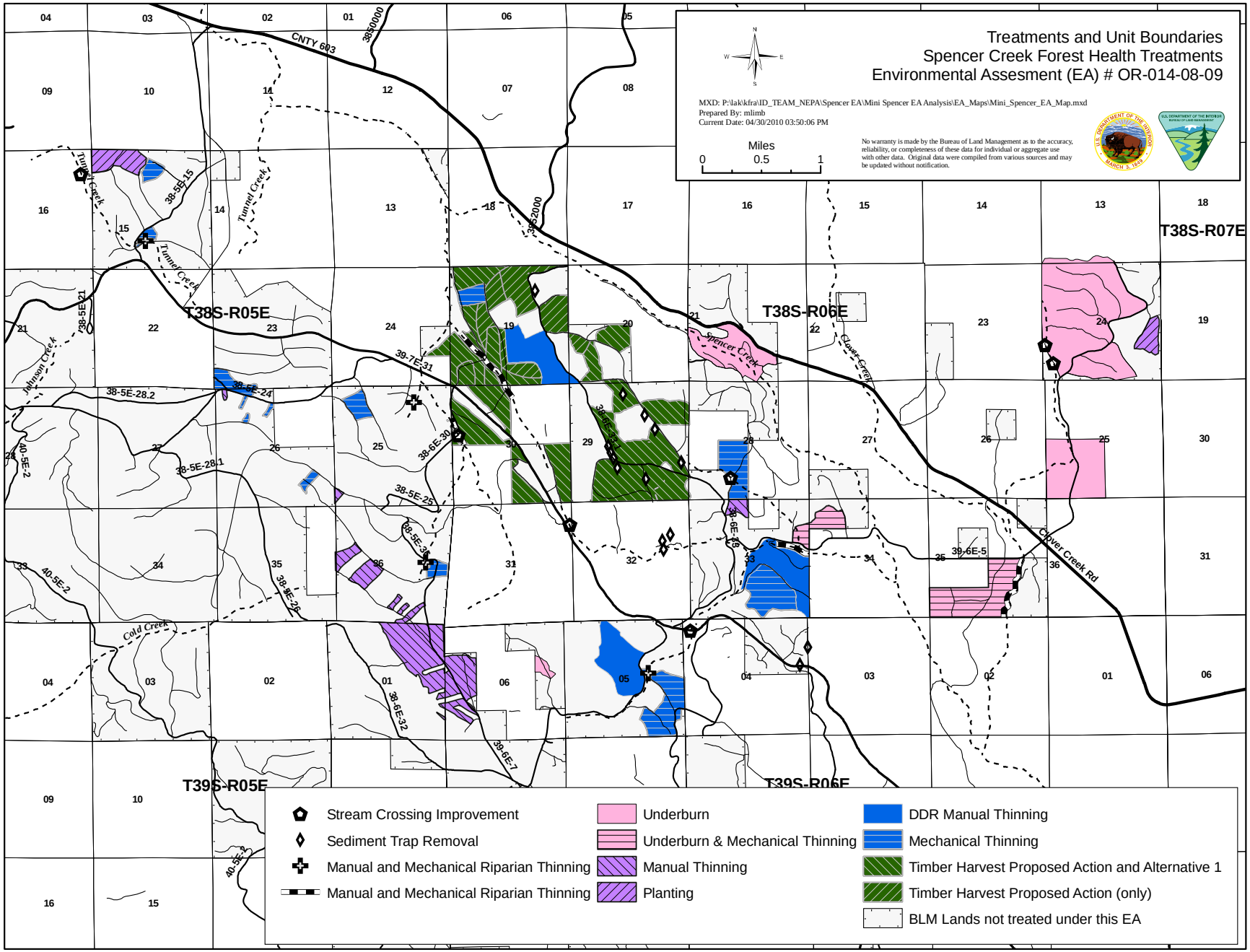
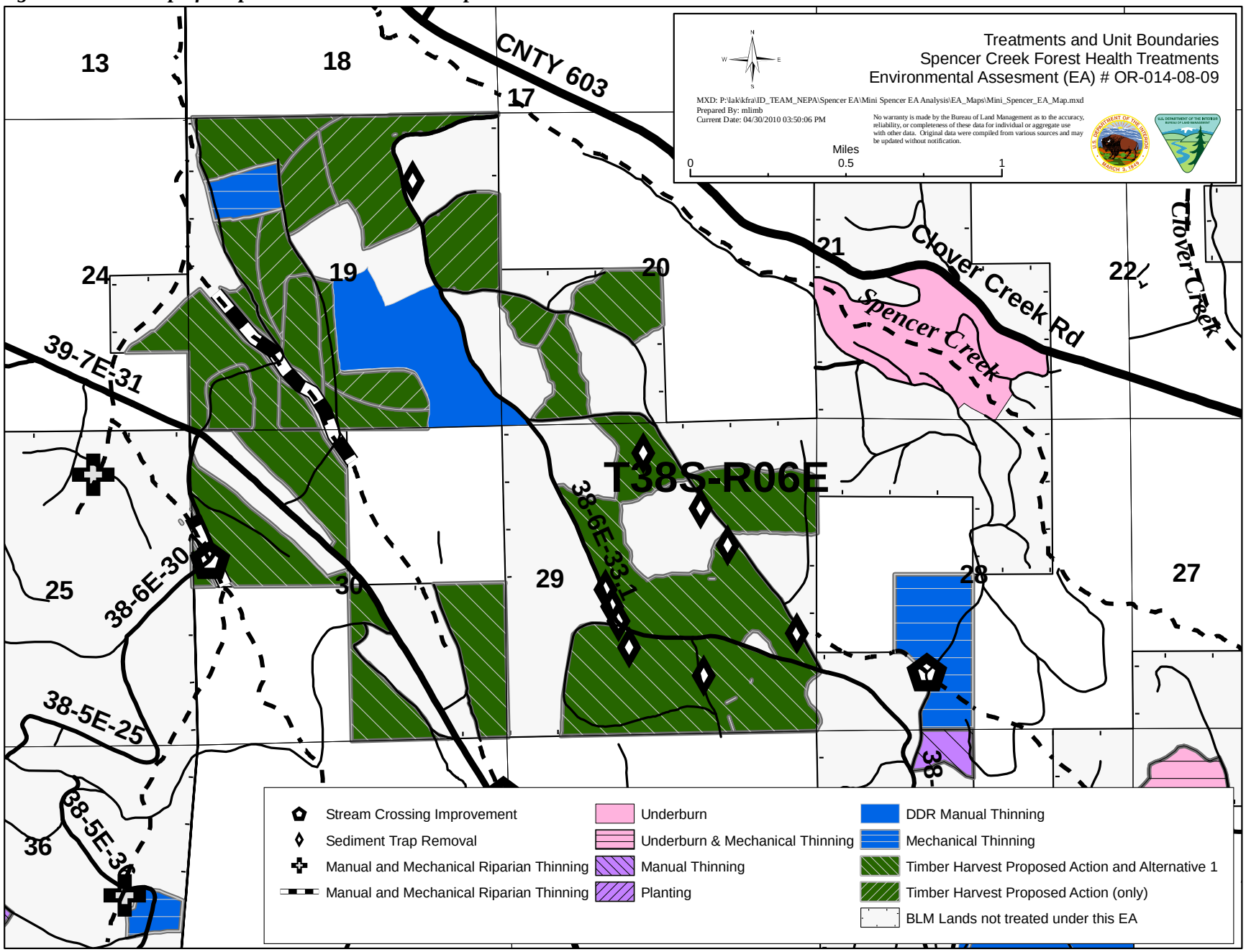


Figure 3: Inset Map of Proposed Treatments in the Spencer Creek Area



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. The following were found not to be affected by the proposed action or alternatives: 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 proposed action or 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 Spencer Project Area. This summary of the watershed and the future foreseeable actions provides a 'big picture' look at the watershed, puts the project into perspective, and allows for comparison of the action alternative 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 – Reasonably Foreseeable Future Actions

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 watershed within the next five years. Specific treatments are listed in Table 5. Private industrial lands are expected to remain in early to mid seral condition.

Table 5: Additional Treatments Currently Proposed on BLM lands in the Project Area

Treatment	Approximate Acres	Anticipated Year
Buck 13 Timber Sale (Already sold)	35	2012
Buck 23 Timber Sale (Already sold)	379	2012
Density Management & Group Selection	1,678	2011-2015
Mechanical Thinning	454	2011-2015
Aspen Restoration	104	2011-2015
Fishing Trail Construction	3 (miles)	2011-2015
OHV Play Area	22	2011-2015
Fuels Treatments – Piling, pile burning	2,132	2012-2015
Fuels Treatments - Underburning	304	2012-2015

Other Assumptions for the Analyses

Due to the restrictions imposed by the return of S&M species guidelines included in the 2001 S&M ROD, the original scope of this project has been reduced to include only areas that have already been surveyed or are exempted from survey due to lack of habitat. All areas covered under the initial scoping for the Spencer Landscape Treatments analysis are included as part of the cumulative action analysis. This includes an additional 1,678 acres of density management and group selection, 454 acres of mechanical thinning, 104 acres of aspen treatment, 22 acres of OHV play area and three miles of fishing trail construction.

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 and/or evidence of past aspen occupation (aspen logs and snags). Many of the stands have been selectively cut in the past leaving an array of trees sizes and ages. From the 1950's through the present, most of these stands were entered once or more for selective thinning and overstory removals. There are some stands within the project area where most of the larger and older overstory trees have been harvested and the residual stands consist primarily of dense stands of trees ranging from 8"- 20" in diameter. A large portion of the project area is occupied by large dead and dying white fir trees and groups of large declining pines. Many of the clumps of large mature pines are dead or in declining health due to overcrowded growing conditions and encroachment

by true firs. Tree sizes range from saplings to large trees over 60” DBH. Tree ages range from one to over 500 years old with the majority of the stand’s ages averaging greater than 80 years old.

Table 6: Land ownership and Age Class Structure in the Spencer Creek Watershed.

Owner	Age Class	Acres	% of BLM Land	% of Watershed
BLM Unforested Land		326	4%	1%
BLM Forested Land	0-10	8	0%	0%
BLM Forested Land	10-80	2,095	24%	4%
BLM Forested Land	80-160	3,490	40%	6%
BLM Forested Land	160+	2,826	32%	5%
Total BLM Land		8,745		16%
USFS Lands		22,273		41%
Private Land		23,174		43%
Total Watershed		54,194		

Present in the forested stands of the proposed project areas are an array of bark beetles 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 confer 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. 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). Small (less than one acre) patches of ponderosa and sugar pine have been killed and are currently being attacked by bark beetles as well. Many of these pines are very 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. There is also some evidence of white pine blister rust on the western white pine and sugar pine in the project area.

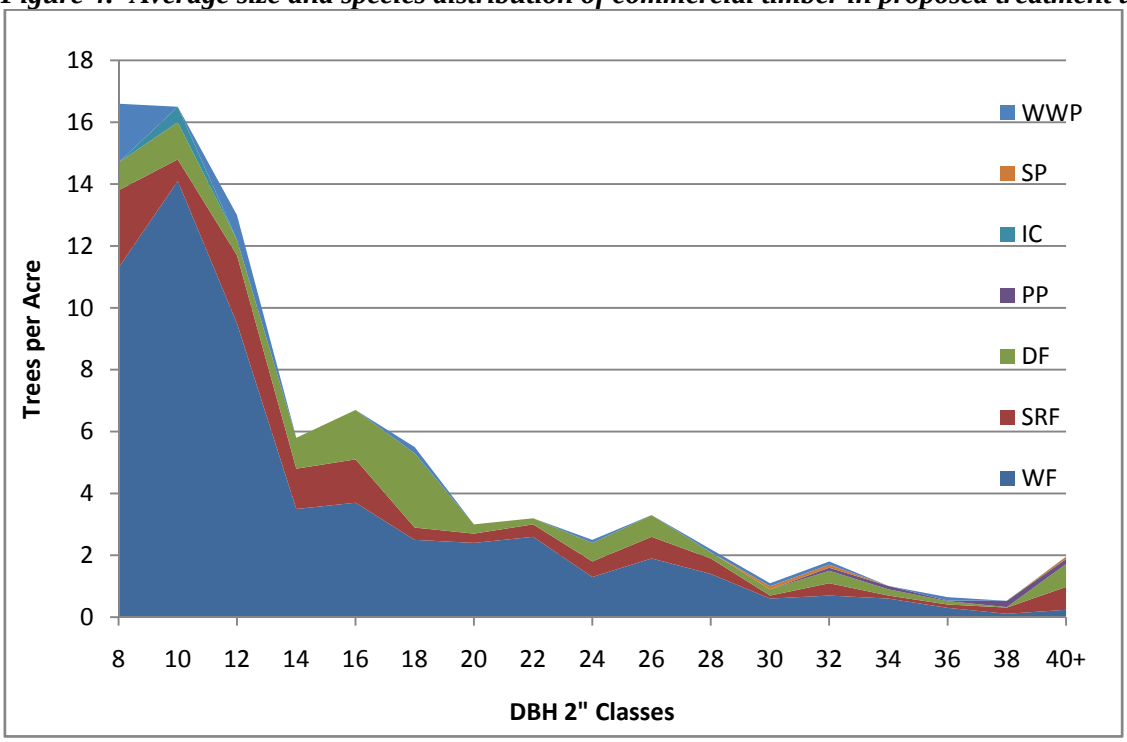
Forested plant communities in the proposed project area are generally categorized as being part of the moist plant association group of the White Fir-Grand Fir series by Simpson (2007) for the Oregon East Cascade region. Plant communities in the EA analysis area are within those plant associations described 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 commercial timber stands within the project area (approximately one every ten acres), the average stand basal area is 167 sq. ft./acre (CV%=36.5, SE%= 4.6) with an average trees per acre of 92 (CV%=80, SE%=10), however the statistics related to these figures indicate the high variability of the stand. The dominant species within these stands is white fir, followed by Douglas-fir and Shasta red fir (see Table 7 and Figure 4). The data shows an average of 3.6 snags (standing dead trees) per acre less than 20” diameter at breast height (DBH), and 3.2 snags per acre greater than 20” DBH. The area has an average of 1,230 linear feet of downed woody debris per acre (approximately 700 linear feet less than 20’ long and 530 linear feet greater than 20 feet long). The average canopy cover for the commercial timber stands within the project area 83%.

Table 7: Stand level statistics by species for live and dead trees (snags) in proposed treatment units

Species	Live BA (sq ft/ac)	Dead BA (sq ft/ac)	Live QMD (in)	Dead QMD (in)	Live Trees/Acre	Dead Trees/Acre
White Fir	56	10	7	22	273	3.9
Shasta Red Fir	27	7	20	22	13	2.6
Douglas-fir	32	2	12	30	41	0.3
Ponderosa Pine	5	-	10	-	9	-
Sugar Pine	3	-	41	-	0.3	-
W. White Pine	5	-	5	-	36	-
Incense Cedar	0.3	-	10	-	0.5	-

Figure 4: Average size and species distribution of commercial timber in proposed treatment units



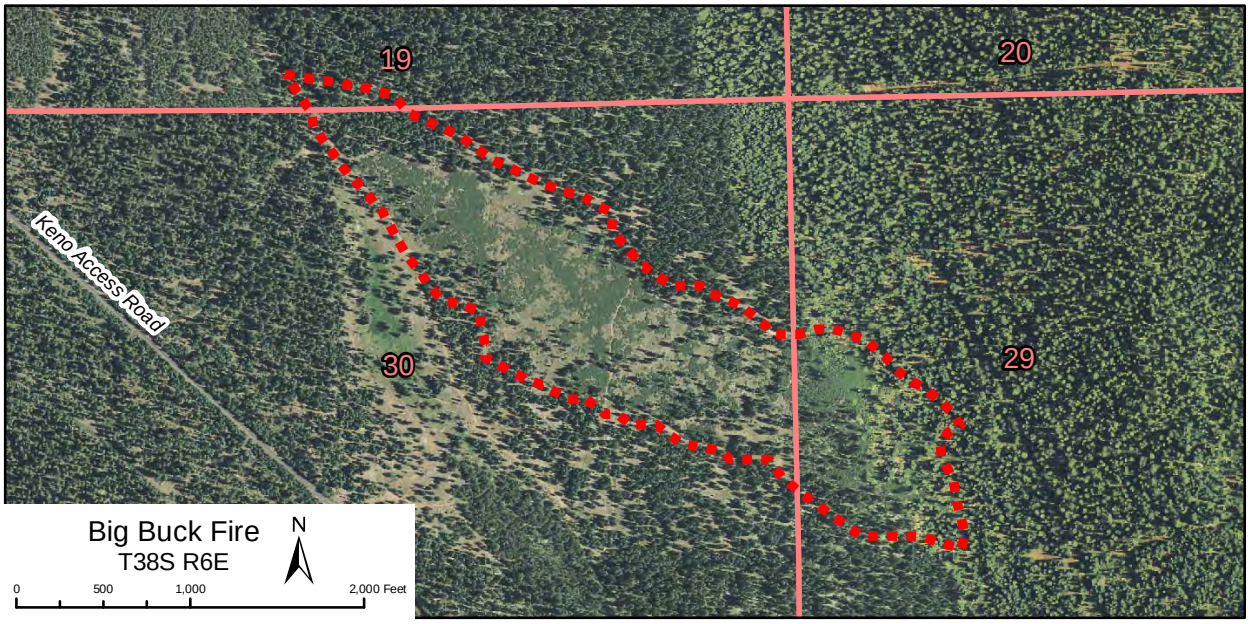
Note: (WF= White Fir, SRF= Shasta Red Fir, DF= Douglas-fir, PP= Ponderosa Pine, IC= Incense Cedar, SP=Sugar Pine and WWP= Western White Pine)

The coniferous forest overstory in the lower elevations of the analysis area, generally below 5,300 feet of elevation, consist 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. The coniferous forest overstory in the upper elevations of the analysis area, generally above 5,300 feet of elevation, consist mainly of Shasta red fir, white fir, and western white pine and historically had a mean fire return interval of approximately 26 years. 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 analysis area averages approximately six wildfires per year. 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 stand replacement, as shown on the photo in Figure 5.

Figure 5: Example of wildfire severity in mixed conifer; Big Buck Fire in 2009 aerial photo



<u>Assessment of 15% Standard and Guide</u>
The Northwest Forest Plan and the 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).

Special Status and S&M Vascular Plants

This EA will consider those species under the 2001 FSEIS that are listed as potentially occurring on the BLM Lakeview District, Klamath Falls Resource Area. (Refer to the Survey and Manage compliance table in Appendix G.) 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 will be surveyed for special status vascular plant species in anticipation of future projects.

Mountain lady's slipper orchid (*Cypripedium montanum*) is a vascular S&M species found on the Klamath Falls Resource Area. This orchid is found in a broad range of habitats, and may require the presence of specific symbiotic fungi to exist. *C. montanum* is suspected throughout the range of the Northern Spotted Owl. The plant is mainly found on northerly aspects, with slopes of 25 to 50 percent. This orchid can grow on a wide variety of substrates in wooded communities with 60-80percent canopy closure. *C. montanum* is generally found growing in mixed conifers and mixed evergreen/oak woodland plant communities. The communities it is known to occur in consist of *Pseudostuga menziesii* in combination with one or more of the following: *Arbutus menzeiesii*, *Pinus labertiana*, or *Pinus ponderosa*. Threats to *C. montanum* include physical disturbance of microhabitat, adverse edge-affect altering interior habitat conditions and microclimate due to fragmentation of habitat, decrease in pollinator abundance, and collection of plants. Three known locations of *C. montanum*, a category C species (pre-disturbance surveys, manage high priority sites), occur within the watershed.

Special Status and S&M Nonvascular Plants

All except one of the project areas with stands over 80 years which are proposed for habitat disturbing projects have been surveyed for Survey and Manage Species. Proposed activities within this section are Mechanical Thin, Manual Riparian Thin, and Mechanical Riparian Thin. Surveys were conducted in and around most of

the project area under Survey and Manage guidelines. However, surveys are not required for nonvascular cryptograms on the Klamath Falls Resource Area under the 2001 FSEIS ROD. Multiple populations of six Category B and three Category F Survey and Manage fungi species are known to occur within proposed project units. No suitable habitat is present in the project area for Survey and Manage nonvascular bryophytes or lichens.

Noxious Weeds

Several species of known noxious weed populations are located on BLM lands within the analysis area. Weed populations are often located in roadside habitats or past harvest units, and are primarily associated with physical disturbance. Noxious weed species located within the analysis area include Canada thistle (*Cirsium arvense*), Dalmatian toadflax (*Linaria dalmatica*), bull thistle (*Cirsium vulgare*), Yellow starthistle (*Centaurea solstitialis*), St. Johnswort (*Hypericum perforatum*), and diffuse knapweed (*Centaurea diffusa*). Specific locations are documented in the KFRA database. During the 2010 field season, approximately 4,500 additional acres within the project area will be surveyed for noxious weeds.

Vegetation – Environmental Consequences

Upland Forest

No Action Alternative

This alternative would result in no immediate timber harvesting or thinning in the proposed project area, although other timber harvests are proposed in the 5th field watershed in 2008-2010. Given the current successional trajectory, continued tree mortality from insects, disease, and competition for water and nutrients would occur in the proposed Spencer Creek 5th field watershed. The resulting accumulation of dead material would add to the already existing high fuel loads and thus the potential for high intensity wildfires would likely continue to increase. In addition, there would be little change in the species composition levels resulting in continuing encroachment by understory white fir and reduced tree resiliency to on-going natural disturbances. Large pine and Douglas-fir trees would continue to experience decline of vigor and mortality related to overstocked stand conditions and encroachment of under story white fir. Initial attack success rate would likely remain high, due in large part to the favorable accessibility of most of the analysis area. Wildfires that do escape initial attack would continue to be of primarily stand-replacing severity.

Cumulative Effects of No Action Alternative

At the 5th field watershed scale, the greatest change in vegetation would likely occur on private lands. Industrial forest management objectives normally result in shorter rotations and a higher percentage of early seral habitat. Oregon Forest Practices law requires prompt reforestation resulting in primarily ponderosa pine plantations fully stocked within five years. On BLM lands, vegetation changes would be relatively indiscernible at the watershed scale. Canopy closure from the dominant and co-dominant trees would be retained. Snag recruitment would continue. Most change would occur to vegetation and residual slash near or on the ground from thinning and underburning proposed in other projects.

Proposed Action

Variable density management (thinning) in combination with follow-up fuel treatments as proposed, would continue to maintain connectivity and late successional habitat over time by retaining a high percentage of the healthier older/larger trees. Some trees from each size class would be harvested to reduce the current stocking and basal area. The majority of the trees harvested would be from the small to mid diameter classes. The proposed thinning would increase resiliency of the remaining trees by reducing the competition for limited water, nutrients and light, restore desired species composition to more closely resemble historic conditions as described in the KFRA/RMP (page E-10), and also reduce the risk of stand replacing wildfires. Canopy closure in the more densely stocked stands would be reduced, but it is estimated (based on past similar BLM treatment prescriptions, 1999 to 2005) that 50 to 60 percent canopy closure would be retained after treatment. Some larger (20+ inches DBH) trees would be harvested; however, late seral structure and function would be maintained. Leave areas, where no trees are thinned, would contribute to habitat diversity.

The silvicultural prescription directs thinning around large, high value trees, particularly older pine and Douglas-fir trees. In some instances, these large trees can be 60" in diameter or larger. The Resource Area has for a number of years thinned around these high value trees to improve vigor. Typically, the trees marked for cutting around these large, old trees are the more shade-tolerant white fir, some of which exceed 20 inches DBH. The prescription is to thin to the dripline plus 10 feet, or at least 25 feet from the bole of the tree. Forest health would be improved in the treated areas resulting in a decreased risk of mortality due to disease, insects, wildfire, and competition. Timber harvest treatments would be designed to primarily reduce stand densities. The variable density management thinning is proposed to maintain structural and functional late-successional and uneven-aged stand characteristics. As a result, the proposed treatments are expected to result in little to no reduction of late-successional habitat within the proposed project area.

The initial attack success rate to suppress wildfires would remain high; any increases in success rate would be imperceptible due to the already high success rate and the relatively small portion of the analysis area being treated. However, the severity of wildfires occurring within treated areas would decrease, as well as the overall size of wildfires. This would be a result of the reduced surface fuels, reduced ladder fuels, and increased tree spacing.

Cumulative Effects of Proposed Action

In the last decade, since the signing of the RMP in June of 1995, the KFRA has thinned, using a density management prescription, approximately 2,342 acres in the Spencer Creek watershed. The general prescription of past thinning operations has been to harvest approximately 25-35% of the basal area in a given timber stand. The trees harvested consisted primarily of the understory, poorer growing, suppressed, and intermediate trees. A much lower percentage of co-dominant and dominant trees have been harvested. The effects of these harvest treatments have been monitored and documented in the Annual Program Summary and Monitoring Reports (BLM 1999 through BLM 2009). In summary, density management is effective in creating the desired future conditions stated above at both the project level and the landscape level. Monitoring has further indicated that fire severity has been reduced on treated areas. The proposed treatments would continue to meet the desired future conditions.

Potential future harvesting and fuels treatments on BLM lands within the watershed will have similar impacts on the timbered stand density and canopy closure as described for the alternative above. These types of the 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 4-35-4-40). The analysis of effects on biological diversity is filled with uncertainty, because biological diversity has not been intensively researched. 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. Commercial thinning proposed under the RMP will contribute to the improvement of forest and ecosystem health. The potential future actions 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 the proposed action 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 continue 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 1

The environmental consequences of implementing Alternative 1 would be similar to the proposed action. The difference would be that 200 acres of NSO suitable habitat would not be treated under this alternative. The 200 acres of NSO habitat would experience effects similar to those described in the No Action Alternative. Given the current successional trajectory, continued tree mortality from insects, disease, and competition for water and nutrients would occur on those untreated acres. In addition, there would be little change in the species

composition levels resulting in continuing encroachment by understory white fir and reduced tree resiliency to on-going natural disturbances. The resulting accumulation of dead material would add to the already existing high fuel loads. The potential for high intensity wildfires would likely continue to increase. The chances of accumulation of hazardous fuels are increased by restriction on prescribed fire within this area.

Cumulative Effects of Alternative 1

Overall, the cumulative effects of the treated acres in Alternative 1 would be similar to the proposed action. 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 will have similar impacts on the timbered stand density and canopy closure as described for Alternative 1. 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

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. The proposed treatments in either action alternative would meet this requirement.

Special Status Plant Species

No Action Alternative

No direct or indirect impacts to Special Status and S&M plants 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. No adverse affects to Special Status nonvascular plants within the proposed project area are anticipated under the No Action Alternative. Long-term the increased density of the forest stand and lack of fire within the stands may lessen the quality of habitat due to the potential for increased fire and insect outbreaks.

Cumulative Effects of No Action

Past harvest on BLM lands within the watershed has occurred on 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 private and public lands, but will vary in scale and intensity. Future federal actions in this Spencer Creek 5th field watershed could include 2,546 acres of timber sales and thinning, and 104 acres of aspen restoration. 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. 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.

Proposed Action and Alternative 1

The area containing the populations of *Cypripedium montanum* would be buffered to protect against potential impacts during thinning operations, such as equipment passing through the area. If additional sites are discovered during surveys in 2010, they would also be buffered to prevent direct or indirect impacts to plants. Buffer sizes will 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 Special Status plants from potential impacts. Because the BLM would protect Special Status plant sites from potential impacts of the proposed activities, the status of these species across their ranges would not change as a result of implementing the action alternative. However, under the proposed action there could be both direct and indirect impacts to known populations of special status plants. Potential effects from the proposed thinning and underburning

activities include direct damage to plant parts or bulbs during timber harvest operations. Damage to above and below-ground plant parts or plant mortality from heat or flames during post-harvest slash pile burning or underburning could also be a direct impact. Mortality, reduced population vigor or reproductive success could occur in two ways associated with overstory tree removal: environmental changes in light, temperature, or relative humidity, and disturbance of mycorrhizal connections and food cycling between conifers and plants. Two populations are in units proposed for underburning, and one is outside of any proposed action units. These populations should be avoided by burning outside of the thermal clumps currently identified.

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 Noxious Weed section below). Thinning dense forest stands and pine plantations would benefit Special Status fungi if present in the units because it would promote stand health and growth and make them more resilient to wildfire and disease. Reducing tree densities and ladder fuels reduces the potential of high intensity wildfire, which causes greater damage to soils and consequently to fungi than less intense wildfire. While the risk of damage to fungi from high severity wildfire would be reduced, there would be potential impacts to fungi if present in units where slash piles were burned or in units that were underburned.

Cumulative Effects of Proposed Action and Alternative 1

The cumulative effects on special status species was analyzed in the FEIS pages 4-67 to 4-70. The proposed action would not add to cumulative effects on Special Status fungi, if present, because the BLM assumes that protecting known sites per S&M guidelines and the existence of suitable habitat in reserves, in addition to conducting large-scale inventories throughout the Pacific Northwest, will ensure this project and future projects would not contribute to the need to list them. Potential future harvesting and fuels treatments on BLM lands within the watershed and potential future recreation and road actions should have little to no effect on Special Status and S&M Nonvascular Plants because known sites will be managed (avoided).

Noxious Weeds

No Action Alternative

Under the No Action Alternative, a modest increase in noxious weed infestation would be expected, other than is typical for those species. Any previously unknown infestations could spread unchecked if not detected.

Cumulative Effects of No Action Alternative

Past and future tree removal projects on BLM lands and non-BLM lands have the cumulative effect of likely increasing the presence of noxious weeds in the watershed. 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, natural processes and timber harvest, development, and road building on private lands would continue to create suitable conditions and avenues for the introduction and spread of noxious weeds. The BLM would continue to implement the noxious weed program, including documenting, treating, and monitoring noxious weeds through an integrated weed management plan.

Proposed Action

The actions proposed in this alternative could potentially result in an increase in noxious weeds. This would be caused by ground disturbance and the use of machinery which could transport weed propagules throughout project areas. Underburning may result in an initial flush of non-native plants, however, as native vegetation recovers it will likely become more dominant as non-native plants decline. Mitigation measures to reduce or prevent the spread or introduction of noxious weeds in the project area include washing equipment prior to moving into the project area, seeding disturbed areas with native plant seeds after project completion, and ongoing detection surveys, documentation, treatment, and monitoring of noxious weed populations in the project area and throughout Klamath Falls Resource Area.

Cumulative Effects of the Proposed Action
Tree removal projects on BLM lands and non-BLM lands have the cumulative effect of likely increasing the presence of noxious weeds in the watershed. The effects on vegetation including noxious weeds, is discussed in the FEIS (pages 4-35 to 4-40). Potential future harvesting, fuels treatments, recreation and road actions on BLM lands in combination with the proposed action, would have the greatest cumulative effect on the potential increase of noxious weeds, but should have little overall effect of increase or spread because of Project Design Features.

Alternative 1
Alternative 1 prescribes 20% or 200 acres less density management than the proposed action. This would result in less ground disturbance and potential for the spread of noxious weeds. The amount of underburning would be the same under this alternative.

Cumulative Effects of Alternative 1
Past and future tree removal projects on BLM lands and non-BLM lands have the cumulative effect of likely increasing the presence of noxious weeds in the watershed. Considering Alternative 1 proposed actions, a smaller overall cumulative effect on the potential increase of noxious weeds would occur than with the Proposed Action Alternative, but the difference may not be easily detectable.

Terrestrial Wildlife Species – Affected Environment

This section focuses on those species considered special status species that may be affected from management activities. These will include those species listed under the Endangered Species Act (ESA - listed, proposed and candidate species), those species listed under the BLM special status species policy as Bureau Sensitive, those 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 8 is a list of terrestrial wildlife species that may be affected and were considered during the analysis for this EA. For a list of other species and a description of their habitat that may occur in the proposed project area, refer to the 1994 Klamath Falls Resource Area FEIS (pgs. 3-37 to 3-41). 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 8: Special status species occurring in the project area and 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 Designated Critical Habitat.
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. No great gray owls detected.
Bird	Northern Goshawk	*Accipiter gentilis*	No Special Status	Foraging -Mature Mixed Conifer Nesting – Mature Mixed Conifer	Two known nest territories w/in project units. Surveys conducted no new goshawk territories located.
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
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 not been surveyed for S&M terrestrial mollusks. High priority habitat that would have been surveyed w/in units will be buffered and removed from harvest units.
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 not been surveyed for S&M terrestrial mollusks. High priority habitat that would have been surveyed w/in units will be buffered and removed from harvest units.
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 not been surveyed for S&M terrestrial mollusks. High priority habitat that would have been surveyed w/in units will be buffered and removed from harvest units.
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).)	The timber harvest area has not been surveyed for S&M terrestrial mollusks therefore priority habitat that would have been surveyed within the units will be buffered and removed from the harvest units.

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

There are four northern spotted owl territories that may be affected from the proposed projects; all four of these have been occupied in the past three years (Table 9). Three of the four have documented nests within the territories, the other (MSNO 2390) was identified by an activity center of owl use.

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

Table 9: Status of Spotted Owl Territories over the past five years

Master Site No.(MSNO)	2005	2006	2007	2008	2009
3252	S	P	S	NO	NO
2065	S	BO	S; BO	S; BO	BO
2390	S	S	BO	S; BO	BO
0103	NS	NS	P	P	1

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

Spotted Owl Populations within the Southern Oregon Cascades Demographic Study Area

The latest published population trend information for the spotted owl indicates that the Southern Cascades Demographic area population is considered stationary or stable although fecundity was declining (Lint 2005). A new meta-analysis was completed in 2009 for the Southern Oregon Cascades Demographic area but at the time of this assessment the results have not been published. Preliminary reports from the meta-analysis suggest that the population is still considered stationary but fecundity and annual adult survival is decreasing (Anthony et al 2010 preliminary report).

The South Demographics annual report (Anthony et al 2009, unpublished report) shows a downward trend in occupancy and spotted owl pairs within the Demographic Study Area. In 2008, only 48% of the 169 territories monitored were occupied; the lowest percentage of occupation since the study began in 1990. Thirty-two owl pairs were monitored for nesting success in 2008. One pair attempted to nest and this was the fewest nesting attempts documented during the study (Anthony et al 2009, unpublished report).

The trends within the KFRA are similar to South Cascades Demographic 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 2008 and 2009, only five territories were occupied. There also appears to be a decline over time of overall reproduction for spotted owls within the Resource Area.

Barred owls are continuing to influence occupation of spotted owls within the known territories. Surveys within known spotted owl territories have continued to show an increase in barred owl detections and a decrease of spotted owl detections.

Barred Owls

Surveys for spotted owls have been conducted annually within the KFRA since 1990. Until 2002, the barred owl was rarely detected within the Resource Area. Since that time the barred owl has regularly been detected in the Resource Area and there are three spotted owl territories that are now known to be occupied by barred owls. Several other barred owl detections within known spotted owl territories have also occurred. The Southern Oregon Cascades Demographic annual report for 2008 showed that the annual percentage of historic territories with both spotted owls and barred owls or barred owls alone has increased from 8.6 to 21.9% since 1997. Kelly et al (2003) reported that occupancy of spotted owls was significantly lower in the presence of barred owls. 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 owl has not occurred. Based on the current trends it is likely that spotted owls will continue to be displaced or negatively affected by barred owls within the Resource Area.

The Final Recovery Plan for the Northern Spotted Owl (USDI FWS 2008b) identified the competition from barred owl as the most pressing threat to the spotted owl. Barred owls have been documented in two of the four territories considered in this analysis. Both NSO sites have been displaced and are currently occupied by barred owls.

Spotted Owl Suitable Habitat within Known NSO Territories

There are four nest territories that may be affected from the proposed actions. Table 10 represents that current habitat available within the Core Area and the Home Range.

Table 10: 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	1195	362	*Deficit within HR
2390	929	321	*Deficit within HR
3252	696	184	*Deficit within HR and Core
0103**	946	183	*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. Territories below these thresholds are considered deficit in habitat for spotted owls.
** Includes Forest Service Acres

Suitable Habitat within the Spencer Creek Watershed

There are approximately 13,654 acres of suitable habitat and 4,354 of dispersal habitat available within the Spencer Creek watershed. Suitable habitat on BLM lands was classified in 1994 during the development of the Klamath Falls RMP. Habitat loss has been tracked since that classification.

Table 11: Spotted Owl Suitable and Dispersal Habitat Currently Available Within the 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

*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 habitat that adds to the suitable habitat component on private lands.

Spotted Owl Designated Critical Habitat

The project area was part of a northern spotted owl Designated Critical Habitat Unit OR-37 (USDI FWS 1992). The Final Rule revising Designated Critical Habitat issued by the U.S. Fish and Wildlife Service in August, 2008 changed the designation within the project area. As of September 12, 2008 the project area is no longer classified as Designated Critical Habitat for the Northern Spotted Owl (USDI FWS 2008b). Therefore there will be no impacts to Northern Spotted Owl Designated Critical Habitat from the proposed project. There is ongoing litigation with respect to change in NSO Critical Habitat and therefore the effects to NSO Designated Critical Habitat from the proposed action will be assessed with the U.S. Fish and Wildlife Service during the Endangered Species Act Section 7 consultation process.

Table 12: 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 not exceed 70% (USDI BLM 1994).
Dispersal Habitat: Owls use Category 1 and 2 for dispersal but this category includes those other forested stands that allow 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 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

*Category 1 and 2 equate to suitable habitat for the spotted owl

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

Survey and Manage

Great Gray Owl

The project area was surveyed (USDA/USDI 2004) 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 and again in 2006-2007. No great gray owl sites were located during those surveys.

Terrestrial Mollusks

Potential terrestrial mollusk habitat proposed for treatment under this EA was not surveyed for S&M terrestrial mollusks. 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 (Table 8) that require pre-disturbance surveys that may occur in the project area. Since specific surveys were not completed the BLM plans to avoid impact to habitat for these species. Priority habitats will be identified, buffered and removed from the proposed vegetation treatments that would be considered habitat disturbing (i.e. timber harvest). All other proposed actions that are not considered habitat disturbing (USDA/USDI 2003) would be compliant with the Standards and Guidelines in the 2001 S&M ROD and surveys would not be required. Management direction is to protect the microsite of the habitat feature following surveys (USDA/USDI 2004b, 2005). This methodology to identify habitat and avoid disturbance would meet the 2001 S&M ROD by assuming occupancy within the priority habitat and protecting its microsite characteristics. Two of the four terrestrial mollusks have not been documented in the Resource Area. The Oregon shoulderband and the Crater Lake tightcoil snails have not been found during any survey efforts and both were originally listed as suspected within the Resource Area.

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 Chace 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 **Chace 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 does contain suitable habitat for other special status species including the white-headed woodpecker and flammulated owl. 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 fragmented habitat 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 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. Surveys of potential habitat for the white-headed wood-pecker are planned in 2010 for the Spencer Creek watershed.

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.

Surveys (USDA 2003) were conducted for the northern goshawk in 2007, 2008 and 2009 within the timber harvest area. No new northern goshawk nests were located during these surveys. There are two known nest territories within the project unit boundaries both are within the DDR's proposed for hand-thinning of sub

merchantable material. All nest trees will be protected (PDF's) from project activities and a LOP will be in place for active nest sites to minimize disturbance during the critical nesting period. The northern goshawk is not considered a special status species for the KFRA and therefore will not be analyzed further in this document.

Terrestrial Wildlife Species – Environmental Consequences

Threatened and Endangered Species

No Action Alternative

Northern Spotted Owl

No direct impacts to spotted owls are anticipated from implementation of the No Action Alternative within the proposed project area. This alternative would not disturb spotted owls or modify the current habitat conditions for the spotted owl. The spotted owl territories would continue to provide habitat at their current levels. No direct adverse affects to spotted owls within the proposed project area are anticipated under the No Action Alternative.

By not implementing any stand improvement actions, there may be an indirect effect on habitat. Long-term, the increase density of the forest stand and lack of fire within the stands may lessen the quality of habitat due to the potential for increased fire and insect outbreaks (Cochran et al 1994). Habitat loss from insect and disease outbreaks could reduce suitable habitat within the proposed project area. NSO suitable habitat is already limited in the area and the majority of the adjacent private lands are currently early seral condition.

The No Action Alternative would continue to provide a mix of spotted owl dispersal and suitable habitat within the Spencer Creek watershed and Klamath Falls Resource Area that would allow spotted owls to move to and from the large blocks of late successional reserves as designated under the Northwest Forest Plan (USDA/USDI 1994). There are no Late Successional Reserves within the proposed project area or within the Klamath Falls Resource Area.

The Final Recovery Plan for the Northern Spotted Owl (USDI FWS 2008b) identified the competition from barred owl as the most pressing threat to the spotted owl. Barred owls have been documented in two of the four territories considered in this analysis and of these two NSO sites both have been displaced and are currently occupied by barred owls. The barred owl has continued to expand its range over the past decade and will potentially saturate the available spotted owl suitable habitat within the project area in the foreseeable future. Barred owl removal has not been proposed for this area and therefore the barred owl issue will continue to expand.

Proposed Action

Northern Spotted Owls

Under the proposed action there would be both direct and indirect impacts to spotted owls. Disturbance from proposed activities may affect spotted owls especially during the nesting season. Timber harvesting, timber hauling, mechanical thinning, stream improvement projects and fuels treatments may all require heavy equipment, chainsaws and large vehicles that produce high levels of noise into the environment. 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 may increase the chances for nest failure.

Disturbance 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 discountable or insignificant, or might cause the incidental "take" of a listed animal. Thus, within the disruption distance, actions would be expected to adversely affect listed species. The disruption threshold is the distance within which activities occurring during the critical breeding period could drastically disrupt the normal behavior pattern of individual animals or breeding pairs and could create a likelihood of injury (USDI FWS 2006). Table 13 describes these thresholds for several activity types.

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 and

incidental "take" would not be expected. 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. To correctly apply the standards of this assessment to individual animals or breeding pairs, the unit wildlife biologist may increase or decrease these disturbance distances according to the best available scientific information and site-specific conditions. Beyond the disturbance distance threshold, no effects to listed species are expected (USDI FWS 2006).

During the critical breeding period, activities occurring within the disruption distances (Table 14) could cause injury by disrupting the normal behavior pattern of individual animals or breeding pairs.

Table 13: Disturbance and Disruption threshold distances for northern spotted owl (USDI FWS 2006)

Activity	Spotted Owl	
	Disruption Threshold Distance	Disturbance Threshold Distance
Blast of more than two pounds of explosives	1 mile	
Blast of two pounds or less of explosives	120 yards	
Impact pile driver, jackhammer, or rock drill	60 yards	440 yards
Type I or II helicopter	440 yards	880 yards
Type III or IV helicopter or single engine airplane	120 yards	440 yards
Use of chainsaws	65 yards	440 yards
Use of heavy equipment	35 yards	440 yards
Rock crusher	180 yards	440 yards
Prescribed burning	440 yards	

During the nesting season, seasonal restrictions, also known as a limited operating period (LOP) will be implemented within a ¼-mile of the nest site from March 1st – September 30th (RMP). The RMP states that "fall no tree within ¼ mile of all active spotted owl nests" (RMP, p. 38). Therefore no disturbance to spotted owls would occur from tree falling. For other activities associated with the proposed action (chainsaw use, heavy equipment), operations will adhere to the distances in Table 13 within the same LOP. There are four known spotted owl territories within the project area. The LOP will apply to all four territories. Therefore the human activities that occur from the proposed actions would be considered discountable or insignificant during the critical nesting period for spotted owls. Outside of the nesting season, disturbance would still occur on individual adult owls but it is reasonable to assume they can move away from the area and avoid injury.

NSO Habitat

For this habitat effects analysis several assumptions were made to determine the effects of the proposed action on NSO suitable and dispersal habitat.

- Timber harvest prescriptions on similar forest stands from previous sales would result in similar habitat qualities after harvest within the proposed project. Post harvest stand exams (USDI BLM, 1999-2009) have supported this assumption with respect to canopy closure, tree density, snag density and stand structure.
- Timber harvests that maintained greater than 160 Basal Area (BA) with the majority of the BA in the overstory, multi age stands, snags, coarse woody debris and canopy closure greater than 60% would maintain suitable spotted owl habitat. If multiple treatments (i.e., commercial timber harvest, submerchantable thinning, and prescribed fire) occurred on the same acres the loss of the structural components by the additional treatment may reduce the quality of habitat and downgrade the habitat to dispersal habitat (i.e, thin the stand to a BA of 160, conduct understory thinning and also add prescribed fire to the same acres).

- Precommercial or hand thinning would maintain suitable habitat based on the structural components and canopy closure left after thinning. The habitat classified as dispersal pre project would remain dispersal post harvest. Post harvest stand exams from previous timber harvest on similar habitat have supported this assumption. On average if a stand is thinned to 120 Basal Area the resulting canopy closure has been approximately 50% (USDI BLM,1999-2009) therefore meeting the definition of dispersal habitat.
- The remaining treatments (stream crossing projects, plantation thinning, riparian and hand thinning) in the Spencer Creek Projects EA would not result in loss of NSO suitable habitat.

The prescription for the commercial timber harvest on matrix lands will be thinned within the range of 40 to 180 (average 100) square feet of basal area. The commercial harvest within the DDRB is designed to maintain and promote late successional habitat. Therefore for this analysis if the timber harvest prescription reduces stands of NSO suitable habitat on average to 100 square feet of basal area the determination would be to reclassify the habitat as dispersal. If the timber harvest prescription retained on average a basal area of 160 or greater, then the stand will be retained as suitable habitat. In areas where both timber harvest and prescribed fire occurred on the same acres those stands may be reduced to dispersal habitat.

Table 14: Approximate acres of suitable habitat within spotted owl territories – All Alternatives

NSO Territory	Home Range (1.2 mile radius)	Core Area (.5 mile radius)	Habitat Suitability	Home Range Proposed Action	Core Area Proposed Action	Habitat Suitability Proposed Action	Home Range Alt. 1	Core Area Alt. 1	Habitat Suitability Alt. 1
2065	1195	362	Deficit within HR	1105	362	No Change	1105	362	No Change
2390	929	321	Deficit within HR	535	239	Deficit within HR and Core	535	321	Deficit within HR
3252	**674	174	Deficit within HR and Core	674	174	No Change	674	174	No Change
0103***	946	183	Deficit within HR	843	183	Deficit within HR	843	183	Deficit within HR

* Deficit - The U.S. Fish and Wildlife Service define deficit levels to determine if sufficient habitat occurs within spotted owl territories. The thresholds for the home range and core areas are 1200 and 250 acres respectively. Territories below these thresholds are considered deficit in habitat for spotted owls.
** Includes the reduction of habitat from the Kakapo TS
*** Includes Forest Service Acres

Spotted Owl Suitable and Dispersal Habitat within Project Area

Removal or downgrading of suitable habitat within home ranges, and especially close to the nest site, can reasonably be expected to have negative effects on northern spotted owls. Dugger et al (2005) work has shown that loss of 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. 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. These studies suggest that habitat removal within core areas could have disproportionately important effects on owls.

The proposed timber harvest would downgrade approximately 82 acres of suitable habitat to dispersal habitat within the core area and 394 acres within the home range (Table 14) of one spotted owl territory (MSNO 2390). The proposed timber harvest will also downgrade approximately 103 acres of suitable habitat to dispersal habitat within another home range (MSNO 0103) (Table 14) This reduction of habitat may adversely affect the spotted

owls associated with these sites, especially in the presence of barred owls. These territories are already deficit at the home range. MSNO 2390 has been occupied by single spotted owls intermittently over the past decade. No nest has been documented within the territory and barred owls in the past three years have moved into the core area of the territory. MSNO 0103 has been occupied and produced young in 2009.The proposed action would not reduce habitat within the other two territories. The proposed mechanical thinning projects within the other two spotted owl territories are within young stands currently not considered suitable habitat rather dispersal.. Those mechanical thinning projects would maintain dispersal habitat and the LOP would limit disturbance during the critical nesting period.

The proposed hand thinning, hand piling, and pile burning within the DDR would maintain habitat quality. Small diameter white-fir (<6 in diameter) would be thinned with chainsaws, cut and piled to be burned at a later date but the work would be done outside of the critical nesting period to avoid disturbance. This type of thinning would not negatively affect the prey or appreciably diminish vertical structure within the stands.

On average the stands within the timber harvest units were sufficient in both snags and CWD that provide important structure and prey habitat for the NSO. Currently on average there are approximately 6.8 snags per acre and 1230 linear feet of CWD per acre. No snags or CWDS is planned for removal unless required to meet OSHA regulations. Even those stands that are downgraded to dispersal habitat from the proposed harvest will still likely provide foraging opportunities for the NSO based on the residual structure remaining within the stand. Long-term there are benefits to thinning and prescribed burning, particularly culturing and thinning beneath the larger and older pines and Douglas-fir to increase their resiliency and vigor. The proposed harvest will reduce competition and increase vigor within the stand and therefore reduce the risk of insect and disease. Based on FVS model projections these stands post harvest will return to their current condition within 25-40 years.

No habitat currently classified as dispersal would be downgraded from the proposed action. The reduction of suitable spotted owl habitat would primarily occur through timber harvest. The proposed fuels projects may downgrade some spotted owl suitable habitat although those projects are designed to maintain suitable and dispersal habitat (See PDF's). Those areas that both fuels treatments and timber harvest occur on the same acres will likely be reduced to dispersal habitat due to the loss of the structural complexity of the forest stand as well as the loss of overall canopy closure. The proposed action will continue to maintain canopy closures on average that exceed 40% and provide for dispersing owls. Post harvest stand exams (USDI BLM, 1999-2009) in similar stands with similar prescriptions to the proposed action have supported this assumption.

Proposed Action

There would be no difference between the Proposed Action and Alternative 1 from the direct impacts of disturbance. Both alternatives provide a LOP that would minimize impacts and make them discountable or insignificant to spotted owls during the critical nesting period. Both alternatives also retain snags and CWD at their current levels. There likely would be a slight reduction in snags for both alternatives due to OSHA requirements but the current snag levels (6.8 snags/acre) based on stand exams exceed current RMP standards (2.5 snags/acre).

Alternative 1 is similar to the proposed action except there is no commercial harvest of suitable habitat within the core area of one spotted owl territory. This equates to about 200 acres within a single spotted owl core area. The core area has both matrix and DDRB which would involve different silvicultural prescriptions. The DDRB objectives are to maintain or promote late successional habitat and the matrix is designated for timber production. Therefore under this alternative no suitable habitat would be reduced within the core area of any spotted owls. This would reduce potential impacts to those owls by retaining a critical portion of their territory. The home range for this territory is already deficit and Alternative 1 would downgrade suitable habitat to dispersal habitat within the home range by approximately 394 acres (Table 14). These acres would still provide foraging habitat within the territory but have been downgraded for the reduction in canopy and vertical structure which may negatively affect prey within the stand.

Dugger (2005) has shown there is a disproportional effect (for both survival and reproduction) to removing habitat close to the nest site (core area) especially if non-habitat exceeds 50% within the core area. This is the situation for most of the nest sites within the project area. Past management on both public and private lands has

limited the amount of habitat still available within the core areas. For MSNO 2390 the available habitat is currently at approximately 36% non-habitat within the core. Therefore actions that remove habitat within the core area may have a greater effect to the spotted owls. The situation is complicated by the presence of barred owls over the past three years. This core area is currently occupied by barred owls and has only been intermittently occupied by spotted owls over the past decade and no nest site has been documented. The site was identified for the presence of single owls over multiple years in the early 1990's. In the past five years there has been detection of individual spotted owls in three of those years (2005, 2006, and 2008). A pair of barred owls has been within the core area since 2007 (Table 9). Since the barred owls are within the core and the detections of the spotted owls in the past three years have been minimal and outside of the core area there may not be as much value to retaining spotted owl habitat within the core when occupied by barred owls.

Cumulative Effects on Northern Spotted Owl

No Action

Since 1994, past timber harvest on BLM lands within the watershed has reduced the current amount of suitable habitat by approximately 1,570 acres. Additionally the private lands are predominately in early seral stages and provide little suitable habitat for spotted owls. In the short-term, the No Action Alternative would maintain the current suitable habitat levels, provide for nesting, roosting, foraging and dispersal habitat. There are currently approximately 3,870 acres of suitable habitat and 3,410 acres of dispersal habitat on BLM lands within the watershed (Table 15).

The No Action Alternative will not address some of the forest health issues that in the long-term may indirectly affect spotted owl habitat. Overcrowded forest stands are at risk from insect and disease outbreaks and therefore may be susceptible to habitat loss due to mortality (Cochran et al 1994). This would reduce the quantity and quality of spotted owl habitat within the watershed.

The future timber harvest and fuels treatments (Table 5) would reduce spotted owl habitat within the Spencer Creek Watershed. Based on past harvest prescriptions and post stand exams (USDI BLM, 1999-2004) it is estimated that approximately half of the spotted owl habitat entered would be reduced to dispersal from thinning of the forest stands. The anticipated result from the foreseeable actions in the watershed is a reduction in the amount of suitable habitat by approximately 800 acres and an equal increase in dispersal habitat. The Forest Service has no plans in the foreseeable future to reduce owl habitat within the Spencer Creek watershed (Pers. comm. Jen Sanborn 2007). Private lands will likely continue to provide little suitable habitat for the foreseeable future.

Table 15: Estimated Available NSO Habitat on BLM Lands in the Spencer Creek Watershed

	Alternatives	Approximate Current NSO Suitable Habitat Acres	Approximate Current NSO Dispersal Habitat Acres	Estimated Post Treatment (Including Cumulative) Suitable Habitat	Estimated Post Treatment (Including Cumulative) Dispersal Habitat
BLM Lands	No Action	3,870	3,410	3,070	4,210
	Proposed Action			2,500	4,780
	Alternative 1			2,590	4,690
All Ownership	No Action	13,490	4,520	12,690	5,320
	Proposed Action			12,120	5,890
	Alternative 1			12,210	5,800

The Proposed Action and Alternative 1 will both further reduce suitable habitat within the watershed and may negatively affect two spotted owl territories. Future timber harvests or other actions that remove habitat within the core area or home range of known spotted owl territories will likely have an adverse effect on those owls due to the already limited amount of habitat available. The foreseeable timber harvests would potentially adversely affect an additional two spotted owl pairs within the watershed due to reduction of suitable habitat (Table 15.)

Cumulative actions were analyzed in the FEIS for the biological diversity (at 4-24 to 4-32) and for spotted owls and other species (at 4-70 to 4-89), and the potential future actions would be within the range of effects described in that analysis. The foreseeable actions within the Spencer Creek 5th field watershed added with the No Action Alternative, Proposed Action or Alternative 1 will continue to provide a mix of spotted owl dispersal and suitable habitat within the Spencer Creek watershed and Klamath Falls Resource Area that would allow spotted owls to move to and from the large blocks of late successional habitat reserves as designated under the Northwest Forest Plan (USDA/USDI 1994). There are no Late Successional Reserves within the proposed project area or within the Klamath Falls Resource Area.

The No Action, Proposed Action and Alternative 1 including the foreseeable projects within the Spencer Creek watershed are consistent with the Final Recovery Plan for the Northern Spotted Owl (USDI FWS 2008b). The recovery plan is set upon similar principles of the Interagency Scientific Committee report (Thomas et al 1990) and the 1992 Final Draft Recovery Plan for the Northern Spotted Owl (USDI FWS 1992). These principles focused on managing large blocks of suitable habitat in designated conservation areas that could support self sustaining populations of 15-20 pairs of spotted owls and spacing these blocks and managing the areas between the blocks to permit movement of owls between blocks (USDI FWS 2008b). The proposed project area is classified as matrix lands (areas between the large reserve blocks) and will provide a mix of spotted owl suitable and dispersal habitat providing connectivity for movement between reserve blocks. There are no Late Successional Reserves or Managed Owl Conservation Areas (MOCA) within the proposed project area or within the Klamath Falls Resource Area. The Klamath Falls Resource Area spotted owl banding program (1990-2008) continues to support this assumption. Dispersing spotted owls from the Klamath National Forest to the south, Rogue River National Forest and BLM Medford District to the West and the Fremont-Winema National Forests to the north continue to be documented on the KFRA as well as many unbanded spotted owls. Dispersing owls from the KFRA continue to be located on those same Forests and BLM Districts.

The Final Recovery Plan for the Northern Spotted Owl (USDI FWS 2008b) identified the competition from barred owl as the most pressing threat to the spotted owl. The barred owl has continued to expand its range over the past decade and will potentially saturate the available spotted owl suitable habitat in the watershed within the foreseeable future.

Potential future recreation and road actions should have little to no effect on upland forest vegetation and Special Status and S&M Nonvascular Plants. There is low potential for increases in spread of noxious weeds, and this should be minimized by implementing PDFs.

Special Status Species

No Action Alternative

For special status species, such as the white-headed woodpecker, flammulated owl, pallid bat, fringed bat, Oregon shoulderband, evening field slug, Crater Lake tightcoil, chace sideband and the northern goshawk the No Action Alternative would not directly impact these species. No disturbance and no immediate impact to their habitat would occur.

The white-headed woodpecker (WHWO) and flammulated owl (FLOW) may be negatively impacted in the long-term within the proposed project area due to their association with ponderosa pine and the projected loss of that habitat. Both species are associated with mature ponderosa pine or mixed conifer stands with a ponderosa pine as a dominant component. The conversion of ponderosa pine dominated stands to white-fir and other shade tolerant species has been identified as a detriment to the white-headed woodpecker and flammulated owl and their habitat (Altman 2000). The Spencer Creek watershed analysis (USDI BLM 1995) indicated that within the Spencer Creek watershed there was only 1,500 acres of habitat scattered suitable for WHWO and 900 acres for the FLOW. This is in large part of past management and the continued conversion of shade tolerant species within once ponderosa pine stands. Based upon the characteristics and distribution of ponderosa pine in the Spencer Creek watershed in its historic conditions it is assumed that the WHWO and FLOW would have been fairly common because of the historic distribution of the ponderosa pine (USDI BLM 1995). The No Action Alternative would not provide treatments that would benefit ponderosa pine and the conversion to a climax white-fir stand would continue therefore reducing habitat quality and quantity for these species.

The pallid and fringed bat habitat would not be affected by the No Action Alternative. Habitat conditions would remain the same and no loss of habitat would occur. Both species are strongly associated with rocks and caves for day roosting but have been shown to use snags as well (Verts and Carraway 1998). Pallid and fringed bat day roosts structure would be affected by the No Action Alternative. Foraging habitat would also not be affected.

The evening fieldslug and Crater Lake tightcoil snail are associated with perennially wet habitat in forested habitats; microsites include a variety of low vegetation, litter and debris; rocks may also be used as refugia. (Burke 2000, USDA/USDI 2004a). This is consistent with the detections of the evening fieldslug found within the Resource Area; they were located within the riparian reserves adjacent to streams. The Crater Lake tightcoil has not been detected in the Resource Area. The No Action Alternative would not affect habitat associated with these species. The existing riparian reserves would maintain current microsite conditions for these species. The No Action is consistent with the management recommendations for this species.

The Oregon shoulderband and the Chace sideband snail are both associated with rock or talus habitat adjacent to or within forested habitat. The No Action Alternative would not affect habitat associated with these species. The existing rocky outcrops and talus slopes would maintain current microsite conditions for these species. The No Action is consistent with the management recommendations for this species.

Proposed Action and Alternative 1

White-headed Woodpeckers and Flammulated Owl

There is potential for loss of woodpecker reproduction if proposed activities occur adjacent to nests during the nesting season. Some nest structure could be lost or disturbance near the nest site could result in nest failure. The white-headed woodpecker is typically associated with open ponderosa pine or mixed conifer stands dominated by ponderosa pine (Marshal et al 2003). These woodpeckers use larger (>16") snags, dead-top and heart rot live trees for their nesting structure (Marshal et al 2003). Considering the fragmented habitat, and the relatively large home range needed in fragmented habitat, 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). The proposed treatments under the Proposed Action and Alternative 1 would remove some trees, primarily dead-top trees, that add to the suitable habitat for these species. However the majority of the harvesting would remove white-fir trees with an emphasis on ponderosa pine retention. Ponderosa pine snag retention and green tree retention guidelines (Appendix B) would maintain foraging and nesting habitat for these species (Bull et al 1990 as cited in Marshal et al 2003, Altman 2000). Based on stand exams for the timber harvest area there is approximately 6.8 snags per acre. No existing snags are planned to be cut unless required for safety (OSHA requirements). This would provide and maintain snag habitat that is currently available. Thinning would continue to promote larger ponderosa pine trees in the stand which may benefit the white-headed woodpecker (Altman 2000).

The flammulated owl is typically associated with ponderosa pine stands exhibiting an open understory with patches of dense thickets for roosting. The owl typically uses larger >20" snags (Bull et al 1990 as stated in Marshal et al 2003) as nesting habitat and the open understory or adjacent grassy. Dense thickets of young ponderosa pine are used for day time roosts. No flammulated owls have been found in the analysis area during surveys for other owl species and planning activities. The Proposed Action and Alternative 1 would maintain current nesting structure by maintaining the available snags (PDFs –Appendix B) and providing green tree retention for future snags. The Proposed Action is designed to retain the large ponderosa pine and remove predominantly white-fir. This would benefit the flammulated owl by retaining the larger ponderosa pine and providing an open understory (Marshal et al 2003). If the species is present within the project area there is potential for loss of reproduction if harvesting occurs during the nesting season (April – August). Some nest structure could be lost or disturbance near the nest site could result in nest failure. Daytime activities associated with the proposed project may disturb some nesting and foraging sites, but only in the short-term for the duration of harvest and fuel treatment activities.

Fringed Myotis Bat and Pallid Bat

The fringed myotis and the pallid bat occur in the project area although they are generally associated with caves, mines or rock crevices. Both species are sometimes found using cavities in snags as roosts (Cross and Kerwin 1995). Weller and Zabel (2001) found that the fringed myotis using snags switched roost areas often and did not

show strong site fidelity as previously shown with other roost substrate. Snags typically used by fringed myotis are typically greater than 24 inches diameter at breast height and taller than 45 feet (Weller and Zabel 2001). No snags are proposed to be harvested in the Proposed Action and Alternative 1 unless required for safety. The snag retention guidelines would maintain current snags and the green tree retention would provide for future roosting structure (Appendix B). Snag monitoring on past timber harvest on BLM lands have consistently shown that snag retention guidelines have been met and snags are well distributed within the watershed (BLM APS 1999, 2002). Under the Proposed Action and Alternative 1 short-term disturbances could push individuals from snags or thickets. These disturbances however would have a short duration and overall would have minimal impacts to the species. The existing snag and green tree retention levels (PDFs, Appendix B) would be sufficient to meet the needs of both species.

Evening Fieldslug and Crater Lake Tightcoil Snail

The evening fieldslug and Crater Lake tightcoil snail are associated with perennially wet habitat in forested habitats; microsites include a variety of low vegetation, litter and debris; rocks may also be used as refugia. (Burke 2000, Duncan 2005). This is consistent with the detections of the Evening Fieldslug found within the Resource Area; they have been located primarily within the riparian reserves adjacent to streams. The Crater Lake Tightcoil has not been detected in the Resource Area. Under the Proposed Action and Alternative 1 all high priority habitat will be identified and buffered from the project activities. The buffering of the habitat will protect the microsite and continue to provide habitat for these species if they occur. Therefore the proposed timber harvest and fuels reduction projects would not alter the micro site habitat for the evening field slug within the riparian reserves. Overall the Proposed Action and Alternative 1 will not have an appreciable negative effect on the evening field slug or Crater Lake tightcoil population or their habitat and therefore meeting the requirements of the 2001 S&M ROD to protect known sites.

The Oregon Shoulderband and the Chace Sideband snail are both associated with rock or talus habitat adjacent to or within forested habitat. Under the Proposed Action and Alternative 1 all high priority habitat will be removed and buffered from the project area. The buffering of the habitat will protect the microsite and continue to provide habitat for these species if they occur. The buffering of existing rocky outcrops and talus slopes would maintain current microsite conditions for these species. Therefore the proposed timber harvest and fuels reduction projects would not alter the microsite habitat and would not affect habitat associated with these species. Overall the Proposed Action and Alternative 1 will not have an appreciable negative effect on the Oregon shoulderband or chace sideband population or their habitat and therefore meeting the intent of the requirements of the 2001 S&M ROD to protect known sites.

Cumulative Effects of No Action, Proposed Action and Alternative 1

White-headed Woodpeckers and Flammulated Owl

Cumulative actions were analyzed in the FEIS for special status species (at 4-70 to 4-89), and the potential future actions would be within the range of effects described in that analysis. Past management (fire exclusion and timber management) within the project area has changed the stand structure and there has been a dramatic increase in shade tolerant species like white fir and a decrease in shade intolerant species like ponderosa pine (RMP 1995). The Proposed Action and Alternative 1 when added with the foreseeable projects (Table 5) would benefit those special status species (WHWO, FLOW) associated with ponderosa pine. These projects would benefit ponderosa pine habitat within the watershed and therefore benefit those species associated with it. The No Action would continue to indirectly reduce habitat within the watershed for these species in the long-term. The continued conversion of these stands to shade tolerant white-fir would continue to degrade their habitat. This conversion of habitat is a conservation risk for these species (Altman 2000).

Fringed Myotis Bat and Pallid Bat

The cumulative effects of this project with those foreseeable projects would not adversely affect the fringed myotis or the pallid bat. Both those species are highly associated with cave and rock crevices but do use snags for roosting as well. These projects would not affect their primary roosting habitat. Snag retention guidelines would in turn continue to provide their additional roosting habitat as well. The proposed projects would not affect their foraging habitat.

Evening Fieldslug and Crater Lake Tightcoil Snail

The mitigation requirements to protect known sites and pre-disturbance surveys for terrestrial mollusks would continue to protect and maintain their populations within the project area. Therefore the cumulative effects would continue to maintain the populations and not appreciably diminish habitat for these species due to the requirements in the 2001 S&M ROD.

The cumulative effects of this project when considered with the others on both public and private lands within the Spencer Creek Watershed would not adversely affect the overall populations of special status species considered for this EA and would not contribute to the need to list these species under the Endangered Species Act. The PDFs and Standards and Guidelines ensure that habitat components necessary for these species are maintained during implementation of projects. Potential future harvesting, fuels treatments, recreation and road actions on BLM lands should have little to no effect on these species because of mitigation requirements.

Aquatic Species and Habitat – Affected Environment

There are four streams that contain habitat for fish and other aquatic species within the analysis area. They include Spencer Creek, Tunnel Creek, Clover Creek and Miners Creek. For a list of aquatic species documented within or adjacent to the analysis area, see Table 16.

Table 16: Aquatic Species in 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*	BLM Sensitive	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 Sensitive, S&M	Present in Miners Creek

Spencer Creek

Spencer Creek supports a variety of native aquatic species. It is an important 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 known to reside in Spencer Creek. Spencer Creek is one of the eastern most streams occupied by this species. 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 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 trout (*Onchorhynchus mykiss*) migrated to Spencer Creek to spawn and rear (Hamilton et al 2005). Resident forms 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 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 and downstream in sections 22 and 23 it is perennial. Sections 15 and 23 are managed by BLM and section 22 by a private timber company. The perennial section of Tunnel Creek is fish-bearing 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 fish-bearing below Dead Porcupine Spring located in T38S-R6E-sec.10 on JWTR land. It is perennial for approximately 3 miles as it flows through USFS and JWTR 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 intermittently 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 fish-bearing below Dead Porcupine Spring and contains redband trout (*Onchorhynchus mykiss*) and eastern brook trout (*Salvelinus fontinalis*) (ODFW 2003). Fish likely 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

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. The intermittent stream crossings identified for improvement would continue to scour and/or erode causing increased sediment loads to be delivered to adjacent streams.

Overstocked areas in Riparian Reserves would remain at an elevated risk for stand replacing wildfire. If a stand replacing wildfire were to occur, likely negative effects on aquatic species 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 long term stream shading and large wood recruitment. 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 succession 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.

Proposed Action and Alternative 1

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 one of these alternatives with the application of the identified mitigation and appropriate BMP's and PDF's are expected to minimize short term impacts to aquatic resources and riparian reserves (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.

Density Management

There are no perennial or fish-bearing streams/waterbodies within or adjacent to the proposed density management treatment units of the analysis area (sections 24, 19, 20, 30 and 29). However, there are intermittent drainages within or adjacent to these units and therefore specific project design features (PDF's) are in place to minimize impacts. Implementing the PDF's in Appendix B is expected to mitigate effects on downstream aquatic species to levels analyzed in the KFRA RMP and FEIS. Along intermittent streams, a160 foot Riparian Reserve buffer (one site potential tree height) will be established. The trees in this buffer account for nearly all stream shading and contribution of LWD entering the aquatic system. Management actions within the 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 (RMP, pgs 13-14).

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 LWD recruitment regimes, where trees would fall into the stream channel at a variable rate. This would provide the streams with a variety of size, species, and decay classes of LWD, which is critical in order to provide aquatic species habitat and channel stability and complexity.

In the analysis area, there are seven proposed mechanical riparian thinning units totaling 28 acres and eight proposed manual riparian thinning units totaling 38 acres (see Table 4). One perennial/fishbearing section of Miners Creek and one intermittent/ fishbearing section of Clover Creek have adjacent manual riparian units proposed. Implementing the PDF's in Appendix B is expected to mitigate effects on downstream aquatic species (fish and aquatic mollusks) to levels analyzed in the 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 project design features (PDF's) are in place to minimize impacts. Implementing the PDF's in Appendix B is expected to mitigate effects on downstream aquatic species to levels analyzed in the 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 LWD entering the aquatic system. Management actions within the 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 (RMP, pgs 13-14).

By following guidelines set by the KFRA RMP PDF's, 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 Action is consistent with the objectives for Riparian Reserves and the Aquatic Conservation Strategy (ACS) in the KFRA RMP and would not prevent or retard attainment of any of the ACS objectives in the long term (RMP, pgs 7-8).

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 extremely important as habitat for aquatic species. Therefore, in sections 21, 27 and 34, ignition of broadcast fires should not occur within a minimum of 160 feet from the stream channel within the Riparian Reserves.

Stream Crossing Improvements

Culvert and natural ford improvements on intermittent streams (see Table 3) would result in a short-term, through the first winter after construction, increase in sedimentation reaching stream channels by removing cover vegetation and exposing loose soil to ditchline and surface run-off. Minimal impacts from surface erosion, ditchline runoff, and sediment transport to stream channels from these actions are expected with appropriate applications of PDF's (See Appendix B). Since all of the improvements are proposed on intermittent drainages, no negative effects to the perennial aquatic environments discussed are anticipated. It is anticipated that the

proposed stream crossing improvements would improve the aquatic habitat in the long-term by reducing erosion and sediment delivery from roads.

Cumulative Effects of No Action Alternative, Proposed Action, and Alternative 1

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.

Soils – Affected Environment

Soils in the Spencer Creek area were derived primarily from andesite, basalt, and ashy deposits. Upland plateaus and lava flows dominate the landscape, with elevations ranging from about 4,100 to over 5,000 feet. Most of the landscape in the area consists of nearly level to steep slopes. A minor component has very steep slopes. In the project area, the NRCS identified six main mapping units containing five soil types. None of the soils were identified as fragile or unstable.

The proposed action alternatives include timber harvest, thinning, and fuel reduction activities. Also included in these alternatives are stream-crossing improvements and various instream restoration projects. Soils were analyzed for impacts of these management activities, as well as cumulative impacts of past and future soil disturbances. Issues of greatest concern in the project area with respect to soils are the potential for compaction, rutting, erosion and displacement, and susceptibility to damage from fire. Table 17 summarizes select characteristics and ratings of soils in the treatment area.

Table 17: Mapping Units and Interpretations for Management-NRCS Data

Map Unit	Soil & slope	Surface Texture	Compaction Resistance	Rutting Hazard	Erosion Hazard (roads)	Fire Damage Susceptibility
138C	Oatman-Otwin complex, 0-12%	Cobbly Loam to Stony Sandy Loam	Low	Severe	Slight	Moderate
147C	Pokegama-Woodcock complex, 1-12%	Loam to Stony Loam	Low	Severe	Moderate	Slightly
135E & 136E	Oatman cobbly loam, 12-35% north- & south-facing	Cobbly Loam	Low	Severe	Moderate	Highly
204E & 205E	Woodcock-Pokegama, 12-35% north- & south-facing	Stony Loam to Loam	Low	Severe	Severe	Highly

Former management treatments, human activities, and naturally occurring events have resulted in various degrees of soil disturbance within the Spencer Creek watershed. It is likely that detrimental soil conditions occurred resulting from prior activities. However, detrimental conditions exceeding the standards enumerated in the 1995 KFRA RMP/ROD have not been documented. 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.

The KFRA ROD/RMP identifies compaction, displacement, and creation of adverse cover conditions as components contributing to detrimental soil conditions. Detrimental compaction is defined as (1) an increase in soil bulk density of 15 percent or more over the undisturbed level; and/or (2) a macropore space reduction of 50

percent or more. All of the soils in the project area have a low resistance to compaction, and thus favor the formation of a compacted layer.

The major soil types within the project area also exhibit a severe rutting hazard. The criterion used by the USFS Region 6 to measure detrimental rutting is the visual observation of ruts to at least six inches in depth. Displacement and puddling (soil deformation and compaction) often occur simultaneously with rutting. Soil displacement is the quantifiable loss of the topsoil or surface horizons. Standards for measuring soil displacement thresholds vary by region and agency. USFS Region 6 defines soil displacement as loss of 50 percent of the A horizon, the standard referred to in this report for quantifying detrimental conditions. Typically, heavy-tracked vehicles, equipment, and large animals are the source of ruts, compaction, and soil displacement.

Erosion Hazard Ratings specific to the treatment area are primarily slight to moderate, with a smaller percentage of the soils rated severe. The overall results are indicative of the predominantly gentle slopes and stable soils in the watershed. Further discussion of potential erosion resulting from the proposed action can be found in the Hydrology section of this report.

The susceptibility to fire damage ratings represent the relative risk of creating a water repellant layer, volatilization of essential soil nutrients, destruction of soil biological activity, and vulnerability to water and wind erosion prior to reestablishing adequate cover on the burned site. Soils highly susceptible to fire damage are primarily on slopes over 12 percent and have a large volume of rock fragments in the surface horizon. Steeper slopes also increase site vulnerability to water erosion following wildfire or (hot) prescribed burn events.

Soils – Environmental Consequences

The 1995Klamath Falls Resource Area RMP/ROD outlines objectives and practices to protect the soil resource during management activities. The plan states that the cumulative effects of detrimental soil conditions are not to exceed 20 percent of the total acreage within an activity area. Detrimental conditions occur when thresholds for various criteria are exceeded, and thus require mitigating treatments.

No Action Alternative

Under this alternative no soil-disturbing treatments would be implemented. There would be no additional detrimental soil impacts resulting from associated timber harvest or thinning operations. Underburning and prescribed fire would not occur, allowing live and dead fuels to accumulate. The lack of adequate periodic fuel treatments would likely result in more intense and wide-spread wildfires. Direct impacts 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.

Proposed Action and Alternative 1

Environmental Consequences and Cumulative Effects to the soil resource under the Proposed Action and Alternative 1 would be similar; therefore the effects of both alternatives are discussed concurrently. The total acreage of each major soil type comprising the treatment areas in Alternative 1 would be slightly less than the proposed action. The minor variations in soil composition of the treatment units would be negligible from a management standpoint.

Timber Harvest Activities

Road building and timber harvest are the land management activities determined to have the most potential for adversely affecting soils and producing detrimental conditions. Roads, skid trails, and landings have the greatest impact on soils because of their long-lasting effects of compaction, rutting, displacement, erosion, and subsequent loss of soil productivity.

Under the Proposed Action and Alternative 1, soils in the project area may sustain increased compaction, rutting, and displacement of surface layers. Although detrimental conditions exceeding the standards specified in the KFRA RMP/ROD have not been documented, all of the soils in the project area have characteristics that favor

the formation of a compacted layer and exhibit a severe rutting hazard. Displacement, or loss of topsoil, can also result from harvesting disturbance and mechanical site preparation. It occurs most frequently and is most pronounced when harvest equipment makes small radius turns on bare ground. If BMPs (Appendix B) are effectively implemented, it is anticipated that detrimental conditions will not exceed the standards of the RMP.

A slight increase in erosion, above natural soil-building processes, may initially occur on skid trails. Here again, the potential for surface runoff and erosion within the project area can be minimized by following practices and mitigation measures specified in the RMP. Treatment units where additional design features may be necessary include the Woodcock-Pokegema soil types, 204E and 205E. These soils, present in small isolated areas of Sections 28, 29, 33, and 34, have a "severe" erosion hazard rating (see map in project record). Although they are considered highly erodible, the effective implementation of BMPs and PDFs associated with prior treatments has resulted in less than 5 percent erosion throughout the units (Cindy Foster, personal observation, 5/24/10). It is anticipated that erosion resulting from the currently proposed treatments would again be minimal, if adequate vegetative cover and woody material is retained following site disturbance.

Road Treatments

No additional miles of roads would be added to Spencer Creek watershed. Roads that were decommissioned from past contracts would be reevaluated to determine the best road closure once the harvest activity is completed. 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). Road maintenance and resurfacing should reduce active erosion from road surfaces and ditches. Depending on amounts of road use and precipitation, it is anticipated that roads within the project area would continue to yield some amounts of sediment.

Thinning

To reduce fuel loads and decrease competition for water and nutrients, understory vegetation will be thinned using manual and mechanical techniques. Thinning decreases amounts of fuels and should decrease the likeliness of a wildfire burning large portions of the treatment area. Most likely, decreasing amounts of fuels would decrease effects of fire damaging the soils because surface temperatures would be less intense, and less of the duff layer and soil organic matter would be consumed. Mechanical brush removal could result in compaction, rutting, and displacement if operations occur when the soil is moist or topsoil is removed. It is expected that hand thinning and brush removal will have minimal impacts on the site or soil resource.

Fuels Treatments

Depending on the size, intensity, and duration, burning slash piles would 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. 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. Detrimental effects from pile burns would be minimized with proposed mitigation.

Low-intensity underburns will have minimal direct effect 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. Overall, any negative impact to the soil resource would be offset by the benefits of reduced fuel loading.

Instream/Riparian Restoration

Restoration activities would have initial adverse effects on soils. Specifically, running large equipment on wet soils would cause compaction, rutting, and displacement. However, any detrimental soil conditions would be site-specific and the enhancement projects would compensate for initial adverse impacts. To minimize surface disturbance and long term effects, it is recommended that: (1) machine piling or ripping for aspen removal be avoided; (2) rehabilitation commenced promptly, by seeding or planting of native species or species that will quickly establish desired ground cover conditions; and (3) on completion of restoration project, unsurfaced roads be blocked to prohibit motorized vehicle use.

Cumulative Effects

The FEIS describes cumulative effects on soils (at 4-11 to 4-16). Timber management activities can have adverse cumulative effects on soil through repeated entries to harvest timber, to dispose of fuels, and to prepare sites for planting. Cumulative increases in compaction and corresponding decreases in soil productivity will occur with repeated entries associated with uneven aged management. These cumulative effects will be minimized and mitigated through application of best management practices. Although management prescriptions and mitigation measures have been designed to keep the extent and duration of adverse effects on soils within acceptable levels, adverse effects cannot be completely eliminated.

Cumulative Effects of the Proposed Action and Alternative 1

Past, present, and future activities in the project area include: timber sales, vegetation and fuels treatments; grazing; dispersed recreation; road construction and maintenance; watershed improvement projects; firewood cutting; and invasive plant management. Wildfires have occurred and continue to occur throughout the watershed.

Former management treatments, human activities, and naturally occurring events have resulted in various degrees of soil disturbance within the Spencer Creek watershed. 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.

Performing the treatments and activities outlined in the Proposed Action and Alternative 1 could result in further detrimental soil impacts. To ensure detrimental conditions are within acceptable limits, BMPs must be adhered to and effectively implemented. Specifically, using existing skid trails and landings, retaining effective ground cover and woody material, and restricting the season of operations should continue the soil recovery from past management practices.

Potential future harvesting, fuels treatments, recreation and road actions on BLM lands would have similar impacts on soils, but over a larger area than described above. The actions would occur within the watershed but on different lands then those proposed in this EA. The FEIS cumulative effects analysis assumes that certain practices such as timber sales would limit soil impacts by restricting skid trails, etc. Continued monitoring (discussed below) will help to assure that these future actions meet the assumptions in the RMP and FEIS. It is therefore assumed that implementation of these future actions would conform with standards and guidelines of the RMP.

Mitigation

Additional mitigation measures are recommended to limit the cumulative effects of detrimental soil conditions on highly erosive soils. For reference, a map of the highly erosive soils is included in the project record.

Limit ground-based activity (timber harvest and mechanical thinning) on highly erosive soils to one or more of the following:

- single pass timber removal
- logging over snow (greater than 20 inches)
- whole tree yarding with one-end or full-tree suspension
- retain 45 to 60 percent minimum effective ground cover, including all living or dead herbaceous or woody materials

To alleviate potential detrimental effects, from pile burning, burned areas should remain small and interspersed throughout the units. Burning should only occur when the soil surface is very moist or wet.

Monitoring

Soil monitoring is recommended on pre- and post-treatment units. Compaction monitoring studies were conducted throughout the years on other timber sales in the KFRA to assess soil disturbance after timber sale activity. Results of the studies concluded soil disturbance (post-treatment) was at or near levels considered

detrimental. However, quantifiable increases in soil bulk density could not be determined. Results of the studies suggest future soil monitoring utilizing methodology other than bulk density sampling.

USDA Forest Service methodology for assessing compaction, rutting, displacement, and fire damage is utilized on forests in the Pacific Northwest (USDA, Forest Soil Disturbance Monitoring Protocol, 2009). These replicable soil evaluation methods should be conducted on select units of the project. In the event the 20 percent threshold is exceeded, mitigation measures should be implemented to minimize the impacts to the standards prescribed by the RMP.

Roads – Affected Environment

Current road densities on BLM land in the density management project area are approximately 4.3 miles (2.6 miles of open roads) of BLM road per square mile. The RMP goal is to reduce road density to 1.5 miles per square miles. Access on roads within the analysis area is typically limited during the winter months due to snow depths. Some roads within project area had restoration work completed during the summers of 2003 and 2005. This restoration included relocating roads out of riparian reserves, decommissioning roads and blocking roads with gates. These activities reduced open and existing road densities in the proposed project area.

Roads – Environmental Consequences

No Action Alternative

Road maintenance would continue only periodically on all open roads in the project area. Although roads are currently in good condition, some storm proofing needed because of erosion caused by heavy precipitation. Road improvements which include road surfacing or culvert replacement will not occur under No Action.

Cumulative Effects of No Action

Lower level maintenance roads would not receive the proper maintenance needed for future transportation system management. Some of these roads may require additional waterbars or drainage improvements. Roads would not receive any surface repair to bring them back to proper road standards.

Proposed Action Alternative 1

All roads within project area will be assessed 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. The road density would remain the same.

Cumulative Effects of the Proposed Action and Alternative 1

Periodic maintenance or storm proofing of system roads would reduce erosion and provide a safe travel way. Although 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 ownership and subsequent access agreements with adjacent landowners reduces BLM's flexibility to reduce densities any further. Potential future harvesting, fuels treatments, and recreation on BLM lands would utilize existing roads, either currently open or closed. No new road construction is specifically known, however, typically when it occurs on KFRA it is intended to reduce duplicate roads and replace a poorly designed or poorly located road to reduce resource impacts. Therefore, no long term detrimental effects to the road system are expected.

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, and are found where surface and subsurface flow from a sufficiently large drainage area collects. Most ephemeral streams in the area do not have

a noticeable surface expression but rather take the form of swales. Stream channels in the analysis area range in condition from exhibiting no response to past/current management to being severely affected by management actions. Channel processes have been affected by roads and stream crossings (Table 3).

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. Past logging activities removed riparian conifers, and a skid trail and roads direct runoff to the stream channels in some locations in the analysis area. As a result of increased runoff and decreased channel-stabilizing structure (i.e., large wood), the some stream channels 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 pines within the active stream channel and location of landings and skid trails), road construction, and grazing. Ongoing effects include loss of large woody debris recruitment, compaction and loss of site potential, loss of stream shading, and trampling of riparian vegetation.

Although PFC (Proper Functioning Condition) surveys have been completed for fish-bearing 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 which may affect flow routing. 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 buffer area around springs and seeps less than one acre in size.

Riparian Reserves

Riparian reserves are buffers 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 buffer area around springs and seeps less than one acre in size and two site potential tree heights for fish-bearing and permanently flowing 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. The 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.

Hydrology

The hydrology of the Spencer Creek watersheds is driven by snow melt and springs. Snow accumulation and melt dynamics are affected by vegetation treatments. Vegetation also strongly influences evaporation, which can withdraw water from soils. The proposed treatments are located in the upper part of the Spencer Creek watershed, a Northwest Forest Plan Tier 1 Key Watershed. Perennial streams in or near the analysis area include Spencer Creek (as it flows through Buck Lake), Tunnel Creek, and 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) for this analysis, a 25 year recovery period was assumed. The Equivalent Clearcut Area (ECA) methodology is commonly used to assess the cumulative hydrologic impacts of past and proposed timber harvest (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 for 1995 in the Spencer Creek Watershed Analysis. Public land survey data indicate that approximately 17 percent of the watershed was in ECA in 1899, primarily as a result of natural fires (Spencer Creek Watershed Analysis, page 4-41). Although both of these values are approximations based on assumptions, the magnitude of difference between the historic and current conditions suggests that past and recent management actions have affected hydrologic processes in the watershed.

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.

The assessment of watershed-scale impacts suggests that the magnitude of management impacts has detrimentally affected hydrologic processes in both the Spencer Creek watershed. Reduced canopy closure and the increased extent of large openings are likely causing peak streamflows and baseflows in these watersheds to be higher that they were historically. The magnitude of these effects, if they are 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 have begun addressing these concerns.

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

Hydrology and Water Quality – Environmental Consequences

The FEIS analyzed the effects of all actions proposed in the RMP on pages 4-16 to 4-24. That description of effects concluded that effects from timber harvest would generally be short term and will tend to diminish as areas revegetate and soil conditions improve. 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). Considering soil compaction, most effects of compaction are confined on-site. However, off-site effects include increased runoff due to compaction. These off-site effects include increased erosion and subsequent sediment input to streams. The effects of compaction and displacement on water quantity, and the subsequent indirect effects on turbidity and sediment, will be long term and will last as long as he surface remains detrimentally compacted. The following analysis considers both localized as well as watershed scale cumulative effects of the actions proposed in this EA.

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 from harvest activity would not 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 and even-aged stands in Riparian Reserves would remain at an elevated risk for stand replacing wildfire and remain suppressed. If a stand replacing wildfire were 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 large wood recruitment. Understory species and structurally 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 succession 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.

The stream crossings identified for improvement would continue to scour and/or erode causing increased sediment loads to be delivered to adjacent streams. Hydrologic recovery of open stands would continue and the overall percentage of hierologically recovered area would not be set back by additional harvest on BLM lands in the watershed.

Proposed Action and Alternative 1

Effects of Thinning and Density Management

Proposed commercial and pre-commercial thins, and underburning, would likely retain sufficient canopy and ground cover such that no hydrologic impacts would be realized. Matrix density management treatments (including patch-cuts within density management prescriptions) account for approximately 2-3 percent of the watershed acres for each of the three subwatersheds (6th field hydrologic units) (Table 18) and approximately 2% of the Spencer Creek 5th field watershed. Since canopy retention is estimated to be approximately 50% within the density management units, the actual ECA impact should be approximately ½ the acre values or 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 suspected to be susceptible to rain-on snow event processes. In the short term, these treatments would reduce canopy closure from 83% to between 40 and 60%. In the short term (until forest canopy recovery occurs, typically within a decade after harvest for thinning harvest), decreased ET will make more soil water available for streamflow, and may cause slightly increased early winter water availability and summer base flow. Due to the porous soils and generally high elevations within the analysis area (above the transient snow zone), it is not likely that increased early winter water availability will cause increased peak flows.

Effects of Riparian Reserve and DDR Treatments

Treatments within reserves would be designed to maintain and restore forest composition, canopy closure, and old-growth characteristics. These treatments would cause immediate reductions in canopy closure but would favor the long-term maintenance or restoration of hydrologic processes, stand health, and structural diversity. This project proposes Riparian Reserve harvest along only intermittent and non-fish bearing streams. The outer 80 feet is proposed to utilize mechanical thinning and harvest methods, however the inner 80 feet of the Riparian Reserves would be restricted to manual thinning

Effects of Prescribed Fire and Non-Commercial Treatments

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

In the short-term, noncommercial 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 KFRA ROD/RMP pages F-26 to F-31, and 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 are not likely to directly compound the effects of timber harvest on hydrologic processes. Noncommercial treatments would not occur within timber sale units. The use of prescribed fire in harvested areas could cause additional mortality (and loss of ET), but this would not be expected to occur over large areas. Prescribed fire in patch cut and regeneration units is likely to be of low intensity and severity and should not detrimentally affect hydrologic resources.

Roads and Trails

No net increase in open road mileage in the Spencer Creek area would occur. Road reopening and closure would potentially cause short term increases in sediment, but long term the sediment would remain at current levels.

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

Road resurfacing, in some instances, would be done. 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 proposed improvements of problem drainage structures will reduce the potential for sediment delivery to streams. Overall this would reduce road-related runoff and peak flows, and would help attain ACS objectives and goals identified in the Spencer Creek Watershed Analysis (page 5-43). Reduction in total road miles and open road miles in the analysis area would reduce the potential to adversely affect groundwater recharge and aquifer function.

Cumulative Effects of Proposed Action and Alternative 1

Vegetation Treatments

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

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 (see KFRA ROD/RMP pages F-23 and F-24) and PDFs would mitigate these effects.

Table 18: Density Management Treatments including the Proposed Action and Alternative 1 and their ECA consequence for each 6th Field Watershed.

	Proposed Action			Alternative 1		
Subwatershed	Density Management (Acres)	Percent of sub Watershed Area)	ECA %	Density Management (Acres)	Percent of sub Watershed Area)	ECA %
Buck Lake	439	2.8	1.4	363	2.4	1.2
Lower Spencer	269	2.0	1.0	269	2.0	1.0
Upper Spencer	259	2.2	1.1	140	1.2	0.6

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 of activity proposed in the alternatives there would be little potential for the Proposed Action to cause further detectable increases in annual water yields or peak flows above current levels. The creation of additional ECA acres in the watershed may slow recovery of ET rates and snow processes from past timber harvest, 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.

Table 19: Potential effects on water quality and proposed mitigation measures

Management Action	Potential Effect	Mitigation
- Haul traffic on roads that cross or are in close proximity to streams - Yarding across streams or Riparian Reserves	- Soil disturbance - Sediment could directly enter streams	- Delineate riparian reserves - Avoid hauling during wet weather - Maintain or improve haul roads - Implement riparian reserve, timber harvest, and soil protection BMPs
- Road maintenance, renovation 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

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 (see KFRA ROD/RMP pages F-11 to F-13) and PDFs would reduce the likelihood of adverse impacts (see Table 19). No harvest that would impact stream shading is proposed under any of the alternatives.

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 19). 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 dirt roads (Road inventory report 2003). Most roads in the analysis area do not have direct hydrological connections with stream channels. Ensuring that haul roads are in good condition will 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. Treatments within riparian reserves may slightly reduce stream shading in the short-term, although such treatments will occur only along intermittent streams that do not flow during the period when water temperature is a concern.

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 increase late spring and early summer flow. Increased low flows would benefit water quality by reducing the warming rate of small streams.

Livestock Grazing – Affected Environment

Livestock

The proposed treatment areas are within small portions of the Buck Lake (#0104) and Buck Mountain (#0103), and Grubb Springs (#0147) livestock grazing allotments. Cattle grazing is permitted within the proposed treatment areas, though most of the treatment areas receive little if any grazing due to steep slopes, thick timber, and/or limited herbaceous growth. A complete description of the grazing activities in these allotments, including current use levels, historical use, allotment boundaries, etc. is found in the Topsy-Pokegama Landscape Analysis, July 1996 (Buck Mountain and Grubb springs allotments)and the Spencer Creek Pilot Watershed Analysis, August 1995 (Buck Lake, Buck Mountain, and Grubb springs allotments). In addition, Rangeland Health Standards Assessments were completed in 2000 for all three grazing allotments; these assessments may also be referenced for more information on livestock grazing. Additional information is found in the KFRA RMP/FEIS, KFRA ROD/RMP and Rangeland Program Summary.

Wild Horses

The proposed project area is outside of the Pokegama Wild Horse Herd Management Area (HMA). Wild horses would be rarely encountered in the treatment area but have been historically known to leave the unfenced herd area and thus could possibly be found in the south portions of the analysis area. Relatively recent wild horse removals in and adjacent to the HMA (1996 and 2000) have reduced this small herd enough so that horses have not been noted in the analysis area in recent years.

Livestock Grazing – Environmental Consequences

No Action

Implementation of the No Action Alternative would have no affect on livestock management, wild horses, or forage production.

Proposed Action and Alternative 1

Harvesting activities and fuels treatments as described in the Proposed Action and Alternative 1 would have a small, mid-term (2 to 10 years) positive effect on livestock/wild horse grazing due to an increase of palatable, herbaceous plant species that would be more abundant once some of the over story trees and understory fuels are removed. There could be a short-term (1 to 2 years) negative effect on forage amounts due to the ground disturbing impacts of the timber harvesting machinery and the burning treatments. Observations of the grazing use in the proposed activity area by BLM range personnel have indicated that cattle & 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 area is made on the lower elevation lands to the north and west. The lands to the west are predominantly privately owned and leased for cattle grazing by JWTR, LLC. The lands to the north are a mix of BLM and private lands.

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 all three grazing allotments, the July 1996 Topsy-Pokegama Landscape Analysis, and the Spencer Creek Pilot Watershed Analysis, August 1995. Additional information is also found in the Klamath Falls Resource Area Resource Management Plan/FEIS (at 4-35 to 4-137), and in the RMP Record of Decision and Rangeland Program Summary.

Cumulative Effects

Cumulative effects are discussed in the FEIS (at 4-35 to 4-137). The actions in this EA combined with potential future harvesting, fuels treatments, recreation and road actions on BLM lands would, in the short term (less than 2 years), include a slight decrease in available forage for livestock and wild horses. The long-term cumulative effects of vegetation treatments in the area will 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 area is within a larger territory ceded to the United States in 1864 by The Klamath Tribes. Along with the Klamath and Modoc, Shasta and Takelma peoples likely utilized this area as well (Ray 1963). The Spencer Creek watershed flows into the Klamath River Canyon which is extremely rich in archaeological and historical resources and presumably served as a corridor for entry into the analysis area by both prehistoric and historic inhabitants. To date, archaeological and ethnographic research has demonstrated a high amount and apparently year-round use of the Klamath River Canyon by prehistoric groups. The Spencer Creek area, or the upland use was apparently only associated with seasonal rounds conducted for subsistence needs (Mack 1991 and Spier 1930).

The first Euroamerican settlement on Spencer Creek occurred during the summer and fall of 1860 when Company L, 3rd Artillery, commanded by 1st Lieutenant Alexander Piper with sixty-six men established Camp Day about one mile upstream from the confluence with the Klamath River. It is thought that Camp Day was headquarters of an expeditionary force in search of a location for a permanent Fort (Vaughan 1968). Historically (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 roads. The project area is part of what was known as Weyerhaeuser Timber Company's "West Block Line" that was active from 1928 to 1956 (Bowden 2003).

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. 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 that exists within the study area; it also served as an important position for the military during

the Modoc Wars (Beckham 2005). Immediately south of the analysis area are what were once known as Camp 2 and Camp 3 of Weyerhaeuser's logging operations for the "West Block" (Bowden 2003) Homesteading in the analysis area also occurred. Merle Anderson, descendent of Hiram and Mary Spencer, recalls Weyerhaeuser building cabins for its employees to become homesteaders, later the employees would sign over the land to the company for logging. Additionally, the region was crossed and is adjacent to numerous early and important travel routes including the Applegate Trail, Southern Oregon Wagon Road, Topsy Road, and Ward Road (Beckham 2005). 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 referencing the history and prehistory of the region (Anderson 1994, Beckham 2005, Bowden 2003, Follansbee and Pollack 1978, Mack 1991, and Spier 1930).

All proposed activities have previous inventories from fourteen cultural resource inventories. There are two known historic sites within the project area that have been flagged for avoidance by proposed activities mentioned in this NEPA analysis.

Cultural Resources – Environmental Consequences

No Action Alternative – Cumulative Effects

No historic properties will be affected, however increased fuel loads can lead to potential damage to properties as a result of a catastrophic fire.

Proposed Action and Alternative 1 – Cumulative Effects

The two known cultural sites will be flagged prior to implementation and avoided. Potential future harvesting, fuels treatments, recreation and road actions on BLM lands should have little to no effect on cultural resources because of the requirements to survey prior to implementation and to avoid cultural sites.

Recreation Resources – Affected Environment

The analysis area provides opportunities for dispersed recreation such as hunting, fishing, off-highway vehicle driving, camping, sightseeing, mountain biking, snowmobiling, and cross-country skiing. Recreation facilities with some level of development include a small campground and a snowmobile trail network. Surveyor campground is a small rustic campground with limited facilities set in a grove of old growth conifers, near the headwaters of Johnson Creek, adjacent to the planning area. The Pederson snowmobile trail is a designated, groomed 11-mile trail that travels over the Keno Access road from the Burton Flat road intersection to the Spencer Creek Hook-up road intersection.

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 Clover Creek Education area parking area, a trail along Spencer Creek, and an off-highway vehicle use area in an abandoned rock quarry near Clover Creek.

For additional information about recreation resources in the analysis area, reference the Spencer Creek Watershed Analysis, pages 4-4 through 4-8. For general information about recreation in the Spencer Creek area, refer to the Klamath Falls RMP/ROD pages 47-53, and RMP maps 2-8 and 2-10.

Recreation Resources – Environmental Consequences

No Action Alternative

Under the no action alternative, no impacts to recreation resources would be expected. Existing snowmobile trails would continue to be maintained and groomed by the local snowmobile clubs.

Cumulative Effects of No Action Alternative

Opportunities to pursue recreation activities are expected to remain unchanged under this alternative.

Proposed Action and Alternative 1

Under both action alternatives, only temporary, minor disruption to recreational uses would occur during 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 and mushroom gathering, and viewing wildlife would be expected to increase under these alternatives. No decrease in motorized access would be expected. Some roads that are currently closed to public travel would be opened for the timber sale and then closed again. If primitive camping or other recreation opportunities are located on or adjacent to these currently roads, the use may be temporarily disrupted, but would be reestablished following the timber sale or other vegetative treatment actions. A positive effect from re-closing the roads is the enhancement of non-motorized recreation opportunities, such as hiking or wildlife encounters.

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

The impacts associated with the proposed density management, group selection or thinning, described in Alternatives 1and 2, would not approach or exceed those described in the Klamath Falls Resource Area Final RMP (pages 4-104 through 4-108). No new recreation facility enhancements are proposed under these alternatives.

Cumulative Effects of the Proposed Action and Alternative 1

Cumulative effects from the Proposed Action and Alternative 1 are expected to be negligible, except in the event of a large scale wildfire 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. Future potential recreation projects including a recreation trail and an OHV area would both focus existing use to designated areas and provide additional recreation opportunities.

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: BLM lands within 1/4 mile of Spencer Creek. VRM Class II management objectives are for low levels of change to the characteristic landscape. Management activities may be seen but should not attract attention.

VRM Class III 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 repeating 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.

Visual Resources –Environmental Consequences

No Action Alternative

Current scenery would remain unchanged except for gradual changes as the stands age and additional trees die from insects and disease. No short term effects on visual resources would be expected, however there is a greater likelihood of widespread insect mortality and catastrophic fire, which would greatly affect long term 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 drastically alter visual resources.

Proposed Action and Alternative 1

Under both 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. 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, especially on private timber lands, is altered from pre-timber harvest conditions. Generally, viewsheds that are noticeably altered can be further modified with less adverse visual impacts then viewsheds with little or no noticeable alterations.

Long-term visual resources within the analysis area will likely be positively impacted by proposed treatments, the riparian area thinnings and follow-up prescribed fire activities. These activities will greatly reduce the opportunity for catastrophic wildfire within the treated areas.

Cumulative Effects of Proposed Action and Alternative 1

Cumulative effects of the action alternatives combined with all other actions are expected to be negligible, except in the event of a large scale wildfire, 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.). Green house 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 (see Additional References).

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, B. R. et. al. Preparing for Climate Change in the Klamath Basin, 2010).

The Proposed Project Area is a very small part of a global carbon cycle. In general, as forests grow, trees and other vegetation accumulate carbon from the atmosphere (CO2). The carbon is stored in all vegetative parts including leaves, roots and stems or tree boles. The faster the vegetation grows, the more carbon it stores. The carbon remains stored or sequestered until the plant dies and decomposes or it is consumed by fire releasing carbon back into the atmosphere. 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, and past management. Temperate forests in the Pacific North West are not directly comparable to tropical forests on the equator in terms of GHG sequestration and emissions (Sierra Pacific Industries THP, CEQA Analysis, 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 from factors associated with crowded growing conditions has been observed in the area (BLM stand exams 2009).

Local Climate

The area of the proposed project is on the east slope of the Cascade mountain range at elevations ranging from 5,000 to 5,300 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 1990's 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

No Action Alternative

The No Action Alternative would be expected to have little effect on the current levels of carbon and/or greenhouse gasses released from the proposed project area. The timber stands in the area are overcrowded and some are beginning to experience substantial reductions in growth rates. Mortality associated with overcrowding and reduced vigor is also occurring. Currently, it is not possible to measure the changes of carbon sequestration or greenhouse gas emissions associated with the growth, mortality and decay of forest vegetation in the proposed project area.

A potential dramatic impact would be the occurrence of a large wildfire in the area. If the timber stands continue to grow denser and mortality contributes to ladder fuels and down fuels, the risk of an uncontrollable wildfire increases. Such a fire would result in direct mortality to all or most of the vegetation in the proposed project area. Large amounts of CO_2 would be released directly by the process of combustion and over a longer period of time by decomposition of fire killed timber and other vegetation. However, such releases would be expected to be temporary as the forested stands would be replanted and would return to growing and sequestering carbon.

Proposed Action

The Proposed Action would include density management and thinning of commercial stands, thinning of precommercial stands and use of fire 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, harvest (removal) of growing trees, decomposition of slash and forest products, and burning of slash and forest residue.

Harvest of Growing Trees

Trees that are harvested would cease to sequester carbon and wood products and slash created by the harvest would begin to decompose. Many of the products would retain carbon in fairly stable materials such as lumber, plywood and post and poles. 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 chips, biomass, paper and firewood would be expected to break down or be burned and release carbon

fairly quickly. Forest residue including limbs, leaves, needles, cull logs, etc., would also begin to decompose and release carbon.

The 20 to 40% of the trees on the landscape that are harvested would immediately cease to sequester carbon, however, the remaining 60 to 80% of the trees would soon experience increased growth rates associated with less crowded growing conditions. It is difficult to estimate greenhouse gas emission changes related to timber harvested or growth improvement, particularly in uneven-aged, variable density management areas like the area of the Proposed Action. Forest growth - and therefore carbon sequestration - varies with species, elevation, soils, treatment prescriptions, etc. However, some similar cases have shown that mixed conifer timber stands managed under density management prescriptions have returned to preharvest carbon sequestration levels in less than ten years. (USDI BLM, 2010).

Fuels Treatment/Prescribed Fire

Treating 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 amount of slash openly burned would be reduced if forest residue is used for energy production through utilization of biomass. In addition, such utilization of biomass would contribute to energy production. Depending upon the biomass energy generating facility, the amount of PM_{10}, CO, NMOC, CH_4, NOx, SOx emissions would be substantially less than any open pile burning

Fossil Fuel Use

The equipment such as skidders and mechanical harvesters, light trucks, log trucks, chip trucks and chainsaws used for timber harvesting, thinning and prescribed fire operations all use fossil fuels. The burning of fossil fuel results in direct emissions of CO_2 to the atmosphere. A similar BLM timber sale (Highland Fling TS, Salem District) calculated that approximately 2.65 gallons of diesel fuel was required to harvest and transport to a mill one thousand board feet (MBF) of timber. Diesel fuel use for harvesting and hauling timber under this Proposed Action is expected to be higher per MBF because trees are smaller and yarding and haul distances are greater. It is estimated that fuel use will be 2,000 to 2,500 gallons (8 MMBF X 2.65 gallons/MBF = at least 2,120 gallons of diesel). If 2,500 gallons of fuel is used, it can be converted to approximately 28 tons of CO_2 emissions (1 Gallon of Diesel = 22.2 lbs/gal of carbon dioxide omissions, ESA website).

Alternative 1

Carbon sequestration and greenhouse gas emissions resulting from implementation of Alternative 1 would be similar to those of the Proposed Action. Harvest prescriptions and fuels treatments would be similar but on a smaller acreage. Alternative 1 would result in approximately 20% less CO_2 emissions related to fossil fuel use because Alternative 1 would harvest up to 6.4 MMBF instead of up to 8 MMBF of timber.

Cumulative Effects

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. However, these emissions would likely be offset in as little as 10 years by increased growth rates of the unharvested timber. In addition, forest residue (slash) from the Proposed Action is likely to be utilized as biomass to produce energy requiring less use of fossil fuels for energy production and overall reduce emissions of PM10, CO, NMOC, CH4, NOx, SOx

It is currently beyond the scope of existing science to identify a specific source of greenhouse gas emissions or sequestration and designate it as the cause of specific climate impacts at a specific location. The incremental increase in carbon emissions as greenhouse gasses that could be attributable to the proposed action is of such small magnitude that it is unlikely to be detectable at global, continental or regional scales or to affect the results of any models now being used to predict climate change.

The effects of all proposed actions authorized under the KFRA RMP are analyzed in the FEIS (at 4-7 to 4-10 and in Appendix T). The analysis concludes that the effect on global climate would be slight. Even though an analysis of potential future harvesting, fuels treatments, recreation and road actions beyond those in this EA are

not analyzed in detail, it is reasonable to assume that any impacts will be within the range of those analyzed for the entire RMP.

Air Quality – Affected Environment

Air quality is a sensitive issue in the Upper Klamath Basin primarily because of the recent designation of part of the county as nonattainment for PM2.5. 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 1963 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 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 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, Group Selection and Mechanical Thinning 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.

Proposed Action

This alternative would produce approximately 278 tons of PM2.5, all of which would occur during time periods selected for ideal dispersal of smoke away from smoke sensitive receptor areas. The smoke produced from these treatments will occur over the duration of implementation and not all at one time. Consequently, no impact to Klamath Falls or other sensitive areas is expected. There will be some residual smoke, particularly in the evening following burning that will remain within and near the project area, potentially impacting nearby residents for several hours. Due to the smoke dispersal conditions that are selected for burning and the topography of the analysis area, it is unlikely that the NAAQS would be exceeded in these residential areas. The potential for subsequent wildfires that would produce large quantities of PM2.5 would be greatly reduced.

Alternative 1

This alternative would produce approximately 268 tons of PM2.5, all of which would occur during time periods selected for ideal dispersal of smoke away from smoke sensitive receptor areas. The smoke produced from these treatments will occur over the duration of implementation and not all at one time. Consequently, no impact to Klamath Falls or other sensitive areas is expected. There will be some residual smoke, particularly in the evening following burning that will remain within and near the project area, potentially impacting nearby residents for several hours. Due to the smoke dispersal conditions that are selected for burning and the topography of the

analysis area, it is unlikely that the NAAQS would be exceeded in these residential areas. The potential for subsequent wildfires that would produce large quantities of PM2.5 would be greatly reduced.

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.

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 Alternative

The No Action alternative would affect local businesses primarily dependent upon the production of forest products, as no timber harvesting or treatments of smaller material would be completed. Current timber-related industries would not benefit from the production of timber. Based upon the assumption above that for every one million board feet of timber harvested, ten timber related jobs are generated, up to 80 jobs would be affected.. Additionally, approximately 800 goods and service jobs (based on the Proposed Action), both local and within the communities that processes the timber, could be impacted.

However, the No Action alternative should not result in any detectable socioeconomic change in regard to recreation uses. Hunting and other recreational uses would be expected to continue at the present level regardless of which alternative is implemented.

Proposed Action

The Proposed Action would harvest up to 8 million board feet of timber (MMBF) and result in approximately 80 related jobs. Additionally, approximately 800 goods and service jobs, both local and within the communities that processes the timber, could be positively affected. The local area processes a considerable amount of timber and the proposed action is a small percentage of what is processed annually. The RMP states that the annual sale quantity for the KFRA from matrix lands is approximately 6 MMBF. Processing facilities are dependent upon a stable, sustainable, and reliable supply of timber. However, continual delays such as litigation of timber sales on federal lands have decreased the stability of a sustainable supply. The cumulative effects of this instability are partial to permanent closures of processing facilities and the corresponding loss of jobs. Although private timberlands supply much of the present demand for timber, some of the present forest industrial infrastructure is dependent upon a sustainable supply of timber from federal lands. Further, while each timber sale harvested may offer a short duration of the above mentioned employment, cumulatively timber sales offered are expected to result in longer, more reliable employment.

Alternative 1

The effects of Alternative 1 would be similar to the Proposed Action except that only up to 6.4 MMBF would be harvested, resulting in approximately 64 related jobs. Approximately 640 goods and service jobs, both local and within the communities that processes the timber, could be positively affected.

Cumulative Effects of All Alternatives

Potential future harvesting, fuels treatments, recreation and road actions on BLM lands are not analyzed in detail here, but they will provide products and opportunities for employment similar to the alternatives described above. An estimated additional 13.4 million board feet of timber could be harvested within the watershed over the next ten years. This could produce the equivalent of as many as 134 jobs (assuming all actions occurred simultaneously). Approximately 1,340 goods and service jobs, both local and within the communities that processes the timber, could be positively affected. The 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.

CHAPTER 4 – AGENCIES AND PERSONS CONTACTED

Public Involvement

Public scoping began with the release of the April 2008 scoping letter. BLM mailed out approximately 106 scoping letters to landowners and others who have asked to be kept informed about upcoming BLM projects. Two comment letters were received in response. Comment letters and personal discussions provided public input for BLM consideration.

Consultation

The following agencies were consulted during the planning process: Klamath Tribes, USDA Forest Service, and US Fish and Wildlife Service. Endangered Species Act consultation with the U.S. Fish and Wildlife Service has been initiated for the proposed action and will be completed prior to implementation. A determination of “May Affect, Likely to Adversely Affect” was made by the BLM for the northern spotted owl. A “No Effect” determination was made for all other listed species and Designated Critical Habitat.

The Klamath Tribes were consulted on this project in June 2008.

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APPENDIX A – BIBLIOGRAPHY

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APPENDIX B – SUMMARY OF BEST MANAGEMENT PRACTICES AND PROJECT DESIGN FEATURES

Project design features (PDFs) are included in the proposed action for the purpose of reducing anticipated adverse environmental impacts that might stem from project implementation.

Upland Forest Vegetation

Density Management Harvests

- For uneven-aged stands, maintain a multi-strata stand structure.
- Thin around large mature trees to improve vigor and reduce hazardous fuels risk.
- Generally retain the most dominant or co-dominant tree that is full crowned, vigorous, and disease free.
- Species selection priority: Sugar pine (highest), Douglas-fir, Ponderosa pine, Incense cedar, White fir (lowest). Retain (no thinning) isolated thermal clumps to provide variability in spacing and structure.

Patch Cuts

Patch Cuts would not exceed 5 acres in size and would comprise no more than 15% of the total harvest area.

Roads

- The BMPs listed in Appendix D of the RMP provide standard management practices that are to be implemented. Seasonally restricting renovation activities is recommended to eliminate sediment transportation to streams.
- Installing drainage dips in accordance with RMP BMPs to reduce surface and ditchline run-off is recommended.
- Apply mulch and seeding or other methods of soil stabilization to any exposed soil surfaces prior to the wet season to reduce surface erosion.
- Direction from the RMP ROD for Key Watersheds includes reducing road mileage and a no net increase in road mileage. Minimal or no grading of the existing roads will be done to maintain the existing ground cover and vegetation and to decrease sediment movement.

Wildlife

Prescribed fire requirements 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.

Other wildlife

When feasible minimize/avoid impacts to nesting migratory birds by implementing Best Management Practices as described in W.O. IM 2008-050 under Project Level NEPA Guidance.

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" (RMP/ROD, Page 26-27).

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 (RMP/ROD, Page 22).

Seasonal Restrictions
Seasonal restrictions will be applied for northern spotted owls and northern goshawks and can be found on pages 231-240 of the KFRA FEIS.

Survey and Manage Mollusks
Microsite protection – Habitat identified in the commercial timber harvest units that meet the following habitat descriptions will be buffered by one site potential tree (160ft) on all sides of the identified habitat to protect the microsite characteristics of the site. For example once the feature (rock or perennial water) is identified for reserve then the appropriate priority habitat distance (10 m or 30 m) will be delineated around the feature; then a no entry buffer of up to160 ft will be placed around the entire priority habitat to maintain the microsite characteristics.
Chace sideband snail – Priority habitat for the chace sideband snail includes 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.
Oregon shoulderband snail – Priority habitat for the Oregon shoulderband is rocky habitat, generally within 30 m. (98 ft.) of stable talus deposits or other rocky areas in shrub lands or rocky inclusions in forest habitat.
Evening field slug – Priority habitat for the evening field slug is moist forest in low vegetation, litter, debris, rocks. High priority habitat is considered forested habitat within 30 m (98 ft.) of perennial water.
Crater Lake tightcoil – Priority habitat for the Crater Lake tightcoil snail is 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.

Cultural Resources
- Prior to each field season the project lead(s) will provide the Cultural Resource Management Division maps and descriptions of the proposed projects for the next year so that Section 106 of the National Historic Preservation Act can be fulfilled. Follow procedures for cultural protection and management outlined in the KFRA ROD/RMP (page 43), and protect identified sites by buffering.
- Follow procedures outlined in KFRA Clearance Protocol for Cultural Resources. The project lead will fill out a project request form during project development and prior to implementation.
- 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.

Soil Resources
- 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 will require 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 (October 15 to May 1) unless waived by BLM personnel due to dry weather conditions or snow logging.
- Limit mechanical cutting and yarding operations to periods when the soil moisture is below 20 percent at a six inch depth. Even lower soil moisture levels are preferable on fragile soils.
- Permit logging activities during this time period if frozen ground or sufficient snow is present. This is normally when snow depths are in excess of twenty (20) inches in depth.

- 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.
- Seed and/or mulch exposed and disturbed soil surfaces with native seed when seed is available.
- Restricted use of mechanized equipment is required on slopes that are greater than 35 percent.
- Construct fireline by hand on slopes greater than 35 percent.

Hydrology & Riparian Reserve Treatments

From the Klamath Falls Resource Area Resource Management Plan, "Riparian Reserves are lands along streams and unstable and potentially unstable areas where special standards and guidelines direct land use." (See Table B-1). Riparian areas, for the purposes of these PDFs are defined as lands adjacent to perennial and intermittent streams, springs, lakeshores, wetlands, and reservoirs. Riparian areas have vegetation and soil with physical characteristics showing permanent surface or subsurface water influence. Streams covered under these PDFs include perennial streams, (streams that generally flow year round) and intermittent streams (streams that generally run for at least 30 days per year and have a definable channel and evidence of annual scour or deposition). Wetlands are areas that are inundated by surface or ground water and support vegetation adapted for saturated soil conditions.

Harvest within Riparian Reserves

- Delineate Riparian Reserve widths as described in the RMP (pg F-8, ROD pgs C-30 to 31). Refer to Table B-1 below.
- For understory vegetation treatments within older, multi-age stands within Riparian Reserves, delineate "no-cut" buffers along stream channels and wetland areas. No-cut widths would be 20 foot on each side of non-fish bearing stream channels and wetlands and 50 feet for fish-bearing stream channels.
- 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 in the Riparian Reserves.
- No new permanent roads will be constructed within Riparian Reserves (except where construction or re-alignment of short road segments allows obliteration of longer road segments within Riparian Reserves).
- Yarding/skidding corridors that pass through Riparian Reserves will be designated prior to project implementation, will have a minimum spacing of 300 feet and be oriented perpendicular to streams, will have minimal relative slope, and will be revegetated following project implementation (as needed). Stream crossings will be selected at stable, naturally armored locations or will be armored with slash before being used as a corridor.
- Use of existing roads and landings within Riparian Reserves will be reviewed and approved by the Klamath Falls Resource Area Hydrologist or Soil Scientist.
- Mechanical treatments would be allowed in aspen stands only during periods when detrimental soil effects would be least likely to occur.

For units adjacent to or containing riparian areas or fish habitats:

Objectives of fuels and harvest thinning 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 coarse woody debris (CWD) and overhead cover for stream function and aquatic habitats.

From the Klamath Falls Resource Area Resource Management Plan, "Riparian Reserves are lands along streams and unstable and potentially unstable areas where special standards and guidelines direct land use." (See Table B-1). Riparian areas, for the purposes of these PDFs are defined as lands adjacent to perennial and intermittent streams, springs, lakeshores, wetlands, and reservoirs. Riparian areas have vegetation and soil with physical characteristics showing permanent surface or subsurface water influence. Streams covered under these PDFs include perennial streams, (streams that generally flow year round) and intermittent streams (streams that generally run for at least 30 days per year and have a definable channel and evidence of annual scour or deposition). Wetlands are areas that are inundated by surface or ground water and support vegetation adapted for saturated soil conditions.

Riparian thinning will maintain trees that provide shade to perennial and fish bearing intermittent streams.

Hand treatments would be performed within the no-mechanical-entry zones to meet fuels management objectives and enhance late successional habitat characteristics such as species age and size diversity; release of suppressed overstory trees that could provide future large wood debris to aquatic habitats.

Ignitions (using liquid petroleum products) within Riparian Reserves:

- Ignition of broadcast fires should not occur within a minimum of 50 feet from the stream channel within the Riparian Reserves unless site specific analysis determines ignition is needed to attain Riparian Reserve objectives. The specific distance for lighting fires within the RR will depend on topography, habitat, ignition methods, and fuel moisture.
- Spencer Creek has recently had restoration activities implemented, including instream and floodplain log placement. It is also part of a Tier 1 Key Watershed and is important habitat for aquatic species. Therefore, in sections 21, 27 and 34, ignition of broadcast fires should not occur within a minimum of 160 feet from the stream channel within the Riparian Reserves.
- 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 direct 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 to protect shading values.
- 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:

- No new permanent roads will be constructed within Riparian Reserves except where construction or re-alignment of road segments allows obliteration of existing road segments that are causing greater resource damage within Riparian Reserves. If possible, use new technology construction methods for building temporary roads into treatment units (including but not limited to wood chip constructed roads).
- 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. Use of existing roads and landings within the RR will be reviewed and approved by the resource advisor.
- Minimal or no grading of the existing roads will be done to maintain the existing ground cover and vegetation and to decrease sediment movement.

Chemical fire retardants in riparian reserves:
No use of chemical retardants would occur within the full width of the riparian zone (per KFRA RMP.)
In cases of escaped or wildfire control, soap based retardants may be applied to within 50 feet of a stream that contains water.

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.

Table B-1: Riparian reserve types and widths from the KFRA RMP

Riparian Reserve Type	Riparian Reserve widths
Fish-bearing streams	At a minimum, the reserve width will include: Slope distance equal to the height of two site-potential tree heights on each side of a stream channel as measured from the ordinary high water line
Perennial non-fish-bearing streams	At a minimum, the reserve width will include: Slope distance equal to the height of one site-potential tree height on each side of a stream channel as measured from the ordinary high water line.
Intermittent non-fish-bearing streams	At a minimum, the reserve width will include: Slope distance equal to the height of one site-potential tree height on each side of a stream channel as measured from the ordinary high water line.
Ponds <¼ acre, wetlands, springs, seeps, ditches, and canals	At a minimum, the reserve width will include: The edge of a body of water or wetland to the outer edge of its riparian vegetation, or to the extent of seasonally saturated soil, whichever is greatest.
Lakes and ponds >¼ acre	Slope distance equal to the height of two site-potential tree height on each side of a stream channel as measured from the ordinary high water line.
*A site-potential tree is defined as the average maximum height of the tallest dominant trees (200 years old or more) for a given site class. In the Spencer Creek project area, the site potential tree height was determined to be 160 feet.	

<u>Scenic/Visual Resources</u>

- 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 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.
- Place burn piles in a manner to protect reserve trees from mortality during burn operations.

<u>Protection of range improvements</u>

- During manual tree felling operations, trees will be directionally cut to fall away from fences. This includes allotment and pasture fences and exclosure fences around springs, water developments, and study sites.

- If trees do damage fence components including wires, posts, stays, clips, rock cribs, gates, or brace structures these will be repaired immediately.
- During mechanical tree cutting operations, trees will be directionally cut to fall away from fences.
- Cut trees will not be piled on or next to fence lines.
- Machinery will not physically contact fence components.
- If fences must be crossed to access cutting units, this should be done by cutting the wires between two posts and rolling the wire back. If livestock are present in the cutting areas these wires shall be temporarily reattached at the end of each days operation. At the completion of cutting operations, the wires will be detached from the two posts, the wires will then be stretched and spliced together and then reattached to the posts.
- During prescribed burning operations, slash shall not be piled on or next to fence lines.
- If fences have wood posts, all necessary measures will be taken to avoid burning the posts including not piling slash near posts and pulling any concentrations of flammable material away from the posts prior to ignition.
- If any wood posts are burned, they will be immediately replaced with steel posts and the fence wires will be attached to the new post.
- If prescribed burning operations damages fence wires, these will be replaced.

Noxious Weeds

- Require cleaning of all equipment and vehicles prior to moving on-site to prevent spread of noxious weeds. Also, if the job site includes a noxious weed infestation, require cleaning of all logging and construction equipment and vehicles prior to leaving the job site. Removal of all dirt, grease, and plant parts that may carry noxious weed seeds or vegetative parts could be accomplished by using a pressure hose to clean the equipment.
- Mow noxious weeds in the immediate area of yarding operations to ground level prior to seed development.
- Conduct monitoring activities related to proposed treatments as described in the Klamath Falls ROD.
- 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.

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 or other parking/staging areas.
- Coordination between snowmobile operations and winter time harvesting operations will be done annually.
- During any winter harvesting operations, all subcontractors working in the Contract Area shall be advised of snowmobile traffic.

APPENDIX C – SCOPING ISSUES

Public Input Summary and Issue Development

A variety of issues and concerns were raised during project scoping by interested individuals, groups or by BLM's interdisciplinary team. 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. Pertinent issues identified through the scoping process are listed below. These issues were used to formulate alternatives, identify appropriate design features, or analyze 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. The pertinent planning issues are:

Issue: Need adequate surveys for archaeological sites and culturally significant plants in areas of treatment or proposed for designation as a recreational site. Ensure avoidance of cultural sites.
Response: Surveys will be completed and any known sites avoided.

Issue: Interpretive sign placement may promote or cause damage to cultural sites.
Response: Not proposed in any alternative.

Issue: Restore ecological processes in addition to the forest structure.
Response: Designed into both action alternatives.

Issue: Upgrade existing roads; avoid new road construction; and reduce road density.
Response: Minimal upgrading of existing roads would occur, primarily road maintenance; no new road construction is proposed; and road density has been reduced by recent past projects. No additional reduction is proposed in this EA.

Issue: Reduce impacts of the road system and livestock grazing.
Response: Impacts of roads designed into both action alternatives. The affected environment does not indicate that unacceptable impacts are occurring from livestock grazing. No changes in grazing are proposed.

Issue: Convert an abandoned rock quarry for use as a "rock crawling" OHV play area.
Response: Considered as reasonably foreseeable, however not analyzed directly in this EA.

Issue: Use variable density thinning in dense young stands; leave trees with old growth characteristics and larger trees, retain and protect under represented trees and shrubs; maintain connectivity, habitat diversity and important ecological functions; manage to retain special status plants; and avoid spread of noxious weeds.
Response: Designed into both action alternatives.

Issue: Consider diameter limits when developing thinning prescriptions.
Response: Diameter limits were considered but rejected. See Citizen's Alternative below.

Issue: Thinning may increase fire hazard by increasing surface fuels, changing the forest microclimate, and increasing growth of surface and ladder fuels.
Response: Included in the analysis.

Issue: Leave a portion of the trees in the forest to retain nutrients.
Response: Designed into both action alternatives primarily through leaving coarse woody debris.

Issue: Avoid impacts to raptor nests and enhance habitat for prey species.
Response: Designed into both action alternatives. All known raptor nests will be protected and seasonal restrictions will be in place during the critical nesting period to avoid nest failure or nest abandonment from proposed activities. Any raptor nest found during the proposed activities would warrant the same protection.

Issue: Buffer streams from the effects of heavy equipment and loss of bank trees and trees that shade streams. –
Response: Designed into both action alternatives.

Issue: Mitigate for the loss of large DWD input by retaining extra snags and wood in riparian areas.
Response: Designed into both action alternatives.

Issue: Retain abundant snags, course wood and green trees for future recruitment of snags and wood.
Response: Designed into both action alternatives.

Issue: Follow the Aquatic Conservation Strategy to maintain water quality.
Response: Designed into both action alternatives.

Issue: Minimize ground-based logging and avoid large burn piles to protect soils.
Response: Designed into both action alternatives.

Issue: Avoid the spread of weeds.

Response: Designed into both action alternatives as PDFs.

Issue: Consider carbon sequestration and climate consequences.
Response: Included in the analysis.

Issue: Avoid regeneration harvest.
Response: There are not large enough areas of land to require full regeneration of the stand. In addition, collaboration with the public has suggested that variable density thinning (patch cuts, clumps and gaps) would be a preferred management strategy. No regeneration harvest is proposed.

Issue: Commercially thin plantations to increase vigor and provide wood fiber.
Response: Designed into both action alternatives.

Issue: Reduce fuels.
Response: Designed into both action alternatives.

Issue: Thin small trees in overly dense stands.
Response: Designed into both action alternatives.

Issue: Retain late-successional forests.
Response: Designed into both action alternatives.

APPENDIX D – SURVEY AND MANAGE PROJECT "PECHMAN" EXEMPTIONS

Judge Pechman's Order from October 11, 2006 directs: "Defendants shall not authorize, allow, or permit to continue any logging or other ground-disturbing activities on projects to which the 2004 ROD applied unless such activities are in compliance with the 2001 ROD (as the 2001 ROD was amended or modified as of March 21, 2004), except that this order will not apply to:

A. Thinning projects in stands younger than 80 years old:
B. Replacing culverts on roads that are in use and part of the road system, and removing culverts if the road is temporary or to be decommissioned;
C. Riparian and stream improvement projects where the riparian work is riparian planting, obtaining material for placing in-stream, and road or trail decommissioning; and where the stream improvement work is the placement large wood, channel and floodplain reconstruction, or removal of channel diversions; and
D. The portions of project involving hazardous fuel treatments where prescribed fire is applied. Any portion of a hazardous fuel treatment project involving commercial logging will remain subject to the survey and management requirements except for thinning of stands younger than 80 years old.

APPENDIX E – ALTERNATIVES CONSIDERED BUT NOT ANALYZED IN DETAIL

Citizens Alternative

A group of organizations proposed a Citizen's Action Alternative for the Spencer Creek project in which:

- Plantations are commercially thinned so as to increase vigor and provide wood fiber to meet the intent of the LRMP;
- Fuels are reduced in the project area;
- Small trees in overly dense stands are thinned;
- Remaining late-successional forests and large diameter trees (over 20 inches DBH) are retained;
- Regeneration harvest is avoided;
  Existing roads are upgraded;
- And road density is reduced.

This alternative was considered by the ID team, but was dropped from analysis as a separate alternative because most of proposed management is already presented as part of the proposed action. The only suggestion that is not presented as a part of the proposed action is to retain all trees greater than 20 inches DBH.

This part of the Citizen's Alternative was not analyzed in detail because it does not meet the purpose and need by not addressing the silvicultural need to reduce tree densities in all size classes in order to maintain forest health and vigor. There are a large number of diseased, decadent and dying trees in the larger (>20") size classes (See Figure 4 of this EA). Many of these trees are white fir, an early seral species that begins to degrade as it ages. These trees take up valuable growing space and reduce the ability for less shade tolerant species such as pine and Douglas-fir to regenerate in the understory. By removing some of these trees, regeneration of more desirable species in the understory is encouraged. Likewise many of the large pine and Douglas-fir trees have large white firs growing around them that limit resources. By removing some of these larger white fir trees and smaller ones, more water, nutrients and sunlight would be available for desired species.

Regeneration Alternative

The ID team considered a regeneration alternative for much of the project area that contains decadent overstories made up primarily of dead and dying trees. It was determined that the areas needing complete overstory removal to replace the dead and dying trees were not large enough to require full regeneration of the stand. These small areas can be treated with group selection or patch cuts followed by replanting. These treatments are considered part of the silvicultural prescription for unevenaged management. In addition, collaboration with the public has suggested that variable density thinning (patch cuts, clumps and gaps) would be a preferred management strategy (see scoping comments and Citizen's Alternative above) which also meets BLM's purpose and need. Therefore, this EA does not propose or analyze a full regeneration harvest alternative.

Spotted Owl Habitat Retention Alternative

Proposed Treatment - This alternative was designed to maintain all spotted owl suitable habitat (Nesting, Roosting and Foraging), where it currently exists within this analysis area. The proposed treatments are the same as the proposed action with the exception that no commercial harvest or prescribed fire will occur within habitat classified as suitable habitat.

As stated in the Purpose section of this EA, the purpose of the project is to "Produce a sustainable supply of timber and other forest commodities on matrix lands to provide jobs, contribute to community stability (RMP, p. 22) and provide timber receipts to Klamath County by offering timber sales"; "Restore stand health and vigor and the composition of pine and Douglas-fir stands where those components have been lost (RMP, Appendix E, p. 9)" and "Design a timber sale project that is economically practical (RMP, Appendix E, p. 7).

The proposed project is on matrix lands that are relegated to provide for a sustainable timber supply to the public. Commercial density management including understory thinning would be reduced to areas that are outside of spotted owl suitable habitat. This would reduce the commercial density management area available to only 190 acres within the project area. This reduction in commercial forest lands would not provide the sustainable supply of timber and would not provide an economically feasible timber sale. Additionally this alternative would not address the silvicultural needs of the forest stands within spotted owl habitat.

Therefore this alternative was not analyzed in detail because it does not meet the purpose of the project to produce a sustainable supply of timber, provide for an economically practical timber sale or address the silvicultural need to treat within the owl habitat.

APPENDIX F – CUMULATIVE ACTIONS

Table F-1: Projects completed on BLM lands in the Spencer Creek watershed (1998 to present)

Treatment	Approximate Volume (MBF)	Approximate Regeneration Harvest Acres	Approximate Density Mgmt Acres	Approximate Total Acres	Year(s) Implemented
Timber Sales/Vegetation Treatments					
Kakapo Stew Timber Sale	2.17	0	397	397	1997-2000
STH Salvage Timber Sale	0.09	0	50	50	1998-2000
Clover Hookup Timber Sale	2.96	39	905	944	2000-2002
Sinking Salvage Timber Sale	0.04	0	30	30	2002-2005
Surveyor Mtn. Timber Sale	9.15	126	220	346	2004-2007
Tunnel Creek DDR Thinning	0.3	0	108	108	2007, 2008
Buck 15	2.92	17	450	467	2008-present
TOTALS	18	182	2,160	2,342	
Mechanical Fuels Treatments					
Spencer Creek Piles				45	2003
Tunnel Creek				85	2007
TOTALS				130	
Prescribed Fire					
Kakapoo Underburn				157	2001
Spencer Creek Piles				45	2004
Surveyor TS Piles				195	2007
Tunnel Creek Underburn				50	2008
Surveyor Piles				209	2008
Saddled Again Hand Piles and Landings				30	2008
Tunnel Creek Underburn				123	2008
TOTALS				792	
Misc.					
Spencer Creek Helicopter Large Wood Placement				3 miles	2009
Spencer Creek Ground-based Large Wood Placement				2 miles	2006
TOTALS				5 miles	

APPENDIX G – SURVEY & MANAGE COMPLIANCE REVIEW TABLE

Environmental Analysis File
Lakeview District BLM – Klamath Falls Field Office
Project Name: Spencer Creek EA **Prepared By:** Steve Hayner
Project Type: Timber Harvest, road crossing, culvert installation, prescribed burning, mechanical and manual thinning
Date: 06/01/2010
Location:

Township	Range	Sections
38S	5E	15, 16, 23, 24, 25, 26, & 36
38S	6E	19, 20, 21, 24, 25, 28, 29, 30, 33, 34, & 35
39S	5E	1
39S	6E	4, 5, & 6

S&M List Date: January, 2001

Species listed below were compiled from the 2001 Record of Decision and include those vertebrate and non vertebrate wildlife and non vascular and vascular botanical species whose known or suspected range includes the Klamath Falls Resource Area according to the protocols listed below. There are no known sites for Category B, D, E, and F species. (Refer to Table G-1 - Survey & Manage Wildlife and Botany Species.)

- Survey Protocols for Survey and Manage Strategy 2 Vascular Plants Version 2.0 (December 1998)
- Management Recommendations for Survey and Manage Lichens Version 2.0 (March 2000)
- Natural History and Management Considerations for the Northwest Forest Plan Survey and Manage Lichens Based on Information as of the Year 2000 (USDA Forest Service R6-NR-S&M-TP-03-03 2003). Survey Protocols for Survey and Manage Category A & C Lichens in the Northwest Forest Plan Area Version 2.1 (2003)
- 2003 Amendment to the Survey Protocol for Survey and Manage Category A and C Lichens Version 2.1 (2003)
- Survey Protocols for Survey and Manage Component 2 Bryophytes Version 2.0 (1997)
- Survey and Manage Protocols Protection Buffer Bryophytes 2.0 (1999)
- Handbook to Strategy 1 Fungal Species in the Northwest Forest Plan (PNW-GTR-476 October 1999), and Handbook to Additional Fungal Species of Special Concern in the Northwest Forest Plan (PNW-GTR-572 January 2003)
- Survey Protocol for the Great Gray Owl within the Range of the Northwest Forest Plan v3.0 (Jan. 2004)
- Survey Protocol Aquatic Mollusk Species From the Northwest Forest Plan Version 2.0 (Oct. 1997)
- Survey Protocol for S&M Terrestrial Mollusk Species v 3.0 (Feb. 2003).

Statement of Compliance

Pre-disturbance surveys and management of known sites required by protocol standards to comply with the *2001 Record of Decision and Standard and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measure Standards and Guidelines* (2001 ROD were completed for the great gray owl. Some project areas proposed for treatment under this EA have not been specifically surveyed for S&M terrestrial mollusks. The terrestrial mollusk protocol (USDA/USDI 2003) identified priority habitat for surveying for specific species. Using this protocol the Bureau of Land Management (BLM) identified priority habitat for the species, and will avoid the habitat to prevent impacts. Priority habitats will be identified, buffered and removed from the proposed vegetation treatments that would be considered habitat disturbing (i.e. timber harvest). This methodology to identify habitat and avoid disturbance meets the 2001 S&M ROD by assuming occupancy within priority habitat and protecting its microsite characteristics. The proposed project also complies with any site management for any Category B, D, and E species as identified in the 2001 ROD (as modified): no sites of any of these species (B, D, E) is present in the project area.

Based on the survey results, there are currently no known sites of Survey & Manage species that require management within the project area. Therefore, based on the information (Table G-1) regarding the status of surveys for Survey & Manage wildlife species and the results of those surveys, it is my determination that the

Spencer Creek environmental assessment complies with the provisions of the *2001 Record of Decision and Standard and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measure Standards and Guidelines* (a2001 ROD).

_____ _____

Field Manager Date
Klamath Falls Field Office

Table G-1 - Survey & Manage Wildlife and Botany Species

Species	S&M Category	Survey Triggers			Survey Results			Site Management
		Within Range of Species?	Contains Suitable habitat?	Project may negatively affect species/habitat?	Surveys Required?	Survey Date Month/ year	Sites Known or Found?	
Vertebrates								
Great Gray Owl (Strix nebulosa) [1]	A	Yes	Yes	Yes	Yes	1996-1997 2006-2007	0	N/A
Mollusks								
Chace Sideband (Monadenia chaceana) [2]	B	Yes	Yes	No	No	***	0	Buffered all priority habitat
Crater Lake Tightcoil (Pristiloma arcticum crateris) [3]	A	Yes	Yes	No	No	***	0	Buffered all priority habitat
Evening Fieldslug (Deroceras hesperium) [4]	B4	Yes	Yes	No	No	***	0	Buffered all priority habitat
Oregon shoulderband (Helminthoglypta hertieni) [2]	B4	Yes**	Yes	No	No	***	0	Buffered all priority habitat
Fluminicola no. 3	A	Yes	No	No	No	N/A	#	N/A
Fluminicola no. 1	A	Yes	No	No	No	N/A	#	N/A
Vascular Plants								
Cypripedium fasciculatum[5]	C	Yes	Yes	Yes	Yes	2004	0	No
Cypripediium montanum[5]	C	Yes	Yes	Yes	Yes	2004	0	No

** Species was removed from the KFRA list during the 2002 annual species review because of a clarification of the range
*** Survey and Manage terrestrial mollusk priority habitat was removed and buffered from the timber harvest area.

[1]Pre-disturbance surveys for great gray owls are required since there is suitable nesting habitat within the project area. The required habitat characteristics of suitable habitat include: (1) large diameter nest trees, (2) forest for roosting cover, and (3) proximity [within 200m] to openings that could be used as foraging areas (Survey Protocol for the Great Gray Owl within the range of the Northwest Forest Plan v3.0, January 12, 2004). Surveys for the great gray owl were conducted in 1996-1997 using the 1995 protocol and in 2006 and 2007 using the 2004 protocol, both designed to meet Survey and Manage standards including the 2001 Survey and Manage Standards and Guidelines. Survey protocols used were "Great Gray Owl Survey protocol (1995)", and "Survey protocol for the Great Gray Owl within the Range of the Northwest Forest Plan (2004)." No great gray owls were located.

[2] Equivalent-effort pre-disturbance surveys are required for the Chace Sideband (IM-OR-2004-034) and the Oregon Shoulderband. (Survey Protocol for S&M Terrestrial Mollusk Species v3.0, 2003). Priority habitat for Chace sideband and the Oregon shoulderband on KFRA are rocky outcrops, talus slopes and rocky areas within forest stands. This habitat removed and buffered from timber harvest area.

[3]Suitable habitat for the Crater Lake tightcoil is "perennially wet situations in mature conifer forests, among rushes, mosses and other surface vegetation or under rocks and woody debris within 10 meters of open water in wetlands, springs, seeps and riparian areas…" (pg. 43, Survey Protocol for S&M Terrestrial Mollusk Species v3.0, 2003). This habitat removed and buffered from the timber harvest area.

[4]The evening field slug's range was extended to include the KFRA in March 2003 (pg 2 and 3 2002 Annual Species Review and Appendix A pg32., Survey Protocol for S&M Terrestrial Mollusk Species v3.0, 2003). 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. This habitat was removed and buffered from the timber harvest area.

[2]The Oregon shoulderband 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 habitat was removed and buffered from the timber harvest area. 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.

[5]Surveys for Cyperpidium fasciculatum and Cypripediium montanum were conducted in 2004 within the project area. No sites were found.