Rabbit Mountain Fire LSR Recovery Environmental Assessment

Bureau of Land Management
Roseburg District Office
South River Field Office
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U.S. Department of the Interior, Bureau of Land Management
Roseburg District Office
777 NW Garden Valley Blvd.
Roseburg, Oregon 97471

This environmental assessment analyzes proposed hazard tree safety treatments, roadside fuels reduction, habitat restoration, and road decommissioning designed in conformance with management direction provided in the 1995 Roseburg Record of Decision and Resource Management Plan (ROD/RMP), as amended prior to December 30, 2008.

The BLM is providing a 30-day period for public review and comment on the documents, and will accept comments until the close of business (4:30 PM, PDT) on November 13, 2014. Before including your address, phone number, e-mail address, or other personal identifying information in your comment be advised 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 from public review your personal identifying information, we cannot guarantee that we will be able to do so. If you choose to submit any written comments, they should be directed to Steven Lydick, South River Field Manager, at the above address.

In keeping with Bureau of Land Management policy, the Roseburg District posts Environmental Assessments, Environmental Impact Statements, Findings of No Significant Impact, and Decision Records/Documentations on the district web page under Plans & Projects at www.blm.gov/or/districts/roseburg on the same day on which an electronic notice of availability is transmitted to those individuals and organizations on the District's NEPA mailing list who have expressed an interest in project planning and analysis. Individuals desiring a paper copy of such documents will be provided one upon request. Individuals with the ability to access these documents on-line are encouraged to do so. Internet use reduces paper consumption and administrative costs associated with copying and mailing.

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Chapter 1. Purpose and Need for Action

This chapter provides a description of the purpose and need for the proposed action, the decisions to be made, the scope of the analysis, issues expressed, and conformance with management direction and applicable laws and regulations.

1.1. Background

In the early morning hours of July 26, 2013, a series of dry thunderstorms ignited numerous fires in southwest Douglas County and northern Josephine County, Oregon. Three of these fires formed what was known as the Douglas Complex—the Rabbit Mountain, Dad's Creek and Farmer Gulch fires, which burned 23,984; 24,439; and 248 acres, respectively. A total of 48,671 acres burned on federal and private forest lands, of which 6,266 acres were lands administered by the South River Field Office, Roseburg District BLM.

The Cow Creek Backcountry Byway passes through the burned area, as do several major collector roads that provide access for forest management on the affected lands. A railroad right-of-way and three large quarries are also present within the burned area. The quarries at Rabbit Mountain, Hare Creek, and Quartzite Creek are the primary sources in the watershed for aggregate for road construction and resurfacing of existing roads.

Burn severity within the Rabbit Mountain Fire perimeter ranged from low to high with varying degrees of mortality in stands, young and old, in proximity to the roads, railroad right-of-way and quarries described above. In many instances, this has led to circumstances where the safe use of the facilities by the BLM, private landowners, and the general public could be compromised.

1.2. Project Area

The proposed project area is located within Douglas County, Oregon (Appendix A, Figure A- 1). The Rabbit Mountain Fire Late-Successional Reserve (LSR) Recovery project area lies within the following legal descriptions, Willamette Meridian:

- T31S, R7W, Sections: 19, 29, 31
- T31S, R8W, Sections: 15, 21, 22, 23 25, 27, 35
- T32S, R7W, Section: 5
- T32S, R8W, Sections: 1, 2, 3

The project area is within the Lower Cow Creek, West Fork Cow Creek and Middle Cow Creek watersheds (Appendix A, Figure A- 2). All proposed treatment areas are located on BLM-administered land with the LSR land use allocation. BLM lands are intermixed with private lands, creating a mosaic of ownership patterns (Appendix A, Figure A- 1).

1.3. Purpose (Objectives)

Management of BLM-administered lands and resources in the project area is subject to the requirements of the Federal Land Policy and Management Act, Endangered Species Act, and

Clean Water Act as discussed in the Roseburg District Record of Decision and Resource Management Plan (USDI BLM 1995a (ROD/RMP, p.15)). This Environmental Assessment (EA) is being prepared in compliance with the National Environmental Policy Act and related Council on Environmental Quality regulations.

1.3.1. Roadside, Railroad Right-of-Way, and Quarry Safety

Create a safe environment by felling and removing hazard trees, above and below roads, above the railroad right-of-way, and adjacent to the quarries described above, and those trees judged likely to die in the next three to five years as a consequence of injuries sustained in the fire, as determined by an objective set of standards related to percent of crown scorch, percent of bole circumference with cambium damage, and height of charred, spongy bark (Appendix B 2001). Specific ROD/RMP management direction provides for:

- Removing snags and logs to reduce hazards to humans along roads and trails and in or adjacent to recreation sites (ROD/RMP, p. 30).
- Removing hazard trees along utility right-of-way and in other developed areas (ROD/RMP, p. 70).
- Removing trees along rights-of way if they are a hazard to public safety. (ROD/RMP, pp. 30 and 73).
- Managing Back Country Byways according to policy and objectives contained in BLM Manual 8357 (ROD/RMP, p. 58).
- Identify and evaluate safety problems that occur along byways (BLM Manual 8357, IV-1).

1.3.2. Roadside Fuels Reduction

Provide access to manage future wildfires by maintaining the ingress/egress onto BLM lands through roadside hazard tree removal and fuels reduction. Specific ROD/RMP management direction provides for:

- Reducing hazards through methods such as prescribed burning, mechanical or manual manipulation of forest vegetation and debris, removal of forest vegetation and debris and combinations of these methods (ROD/RMP, p. 78).
- Modifying fuel profiles in order to lower the potential of fire ignition and rate of spread (ROD/RMP, p. 78).

1.3.3. Habitat Restoration

Initiate stand development on a trajectory to attain late-successional habitat characteristics through (1) accelerating stand initiation phase; (2) restoring historical tree species composition through planting of minor tree species to complement the natural seeding of Douglas-fir; (3) maintaining the natural component of fire-created snags and downed wood; (4) creating landscape diversity through treatment of portions of the landscape. Specific ROD/RMP management direction provides for:

- Planning and implementing silvicultural treatments, inside LSRs, that are beneficial to the creation of late-successional habitat (ROD/RMP, p. 29).

- Designing projects to improve conditions for wildlife if they provide late-successional habitat benefits or if their effect on late-successional associated species is negligible (ROD/RMP, p. 38).

Specific guidance from the Revised Recovery Plan for the Northern Spotted Owl (2011) suggests:

- Retaining and restoring key structural components, including large and old trees, large snags, and downed logs (USDI FWS 2011, p. III-34).

- Recovery Action 12: In lands where management is focused on development of spotted owl habitat, post-fire silvicultural activities should concentrate on conserving and restoring habitat elements that take a long time to develop (e.g., large trees, medium and large snags, downed wood) (USDI FWS 2011, p. III-49).

1.3.4. Road Decommissioning

Restore site productivity to roads no longer needed (ROD/RMP, p. 138) through reclamation of these roads.

1.4. Need

1.4.1. Roadside, Railroad Right-of-Way, and Quarry Safety

Approximately 492 acres have been identified for potential roadside safety treatments based on fire severity, steepness of slope, road use (current and projected), and road classification. Railroad right-of-way safety treatment areas were selected based on fire severity and steepness of slope, and total approximately 11 acres. Potential quarry safety treatment areas surrounding three active quarries within the fire perimeter account for approximately 21 acres. Falling hazard trees within the potential roadside, railroad right-of-way, and quarry safety treatment areas would allow the South River Field Office to address the following needs:

- There is a need to provide safe travel conditions for members of the public who engage in dispersed recreational activities, gather special forest products or travel through the burned area.

- There is a need to create a safe environment within the burned area which allows for maintaining the integrity of the existing railroad right-of-way and the safety of personnel and equipment that transport cargo over it.

- There is a need to provide safe travel conditions for BLM employees, agents and contractors, and the employees and contractors of private timber companies engaged in the rehabilitation and reforestation of the burned area, and for holders of reciprocal rights-of-way who may transport timber or mineral materials through the burned area.

- There is a need for BLM to comply with state requirements for identifying and removing hazard trees. The 2008 Field Guide for Danger Trees Identification and Response by

Oregon Occupational Safety and Health Administration (Oregon OSHA), US Forest Service, BLM and Associated Oregon Loggers gives guidance on hazard tree identification and treatment area identification (Toupin *et al.* 2008). The Guidelines for selecting fire-injured trees that are likely to be infested by insects in southwest Oregon forests (SWOFIDSC 2001) uses objective and quantifiable criteria for identifying individual trees likely to die within five years post-fire (Appendix B).

- There is a need for safe access to and working conditions around quarry operations.

- There is also a need for the proposed action to reduce long-term maintenance and repair costs to BLM roads from dead trees falling onto and damaging roadways and the related infrastructure.

1.4.2. Roadside Fuels Reduction

Roadside fuels reduction would occur within roadside safety treatment areas, accounting for up to 138 acres. Reducing hazardous fuels along priority roads would allow the South River Resource Area to address the following needs:

- There is a need for BLM to eliminate safety hazards, reduce fuel loading, and provide access to manage future wildfires.

- There is a need to clear hazardous fuels along escape routes within the Douglas County Community Wildfire Protection Plan (CWPP) area (CWPP 2011). In the event of a fire, South Douglas County communities would utilize the evacuation routes that have been identified in the CWPP. Cow Creek Road is identified as an escape route.

- There is a need to improve the ability to limit the size of all wildfires (ROD/RMP, p. 27) through maintaining access along roadways.

1.4.3. Habitat Restoration

Of the 2,671 acres of moderate and high severity acres burned in the Rabbit Mountain Fire within the South River Resource Area, 1,642 have been identified for potential silvicultural habitat restoration treatments (246 of the identified acres were planted in 2014). Restoring LSR habitat within the potential silvicultural treatment areas would allow the South River Field Office to address the following needs:

- There is a need to restore and maintain sufficient northern spotted owl habitat to address the threats from a loss of habitat due to stand replacing fire (Forsman *et al.* 2011, USDI FWS 2011, p. vii).

- There is a need to conserve and restore habitat elements that take a long time to develop (e.g. large trees, medium and large snags, downed wood) during post-fire silvicultural activities (USDI FWS 2011, p. III-49).

1.4.4. Road Decommissioning

Within the Rabbit Mountain Fire LSR Recovery project area, approximately three (3.0) miles of roads have been identified for potential decommissioning. Decommissioning roads within the project area would allow the South River Field Office to address the following needs:

- There is a need to keep roads to the minimum needed for management (ROD/RMP, p. 74).
- There is a need to reclaim a road when it is no longer required for mineral or land management activities (ROD/RMP, p. 66).
- Unless a road is needed for continued resource management, there is a need to use a temporary road and put it to bed after use, using methods such as blocking, ripping, seeding, mulching, fertilizing, and waterbarring (ROD/RMP, p. 133).

1.5. Decision Factors

Factors to be considered in alternative development and selection will include:

- The manner in which the described objectives would be achieved, including seasonal restrictions on activities that could affect the northern spotted owl and marbled murrelet, the manner in which felled hazard trees would be removed from the site where they would become hazardous roadside fuels, the manner in which roadside fuels are reduced, and habitat restoration treatments are achieved.
- The nature and intensity of environmental impacts that would result from implementation, and the nature and effectiveness of measures to minimize impacts to resources present.
- Compliance with ROD/RMP management direction, terms of consultation on species listed and Critical Habitat designated under the Endangered Species Act, BLM programs such as Special Status Species, and laws that include the Clean Water Act, Clean Air Act, Safe Drinking Water Act, National Historic Preservation Act, and O&C Lands Act.

1.6. Scoping

The Rabbit Mountain Fire LSR Recovery Project is one of several post-fire projects located in Southwest Oregon following the 2013 wildfire season. The Southwest Oregon Fire Recovery team, consisting of Medford and Roseburg BLM management, has actively engaged interested public and stakeholders following the fires. The public involvement efforts specific to Rabbit Mountain Fire LSR Recovery Project are addressed below.

1.6.1. Internal Scoping

An interdisciplinary team was assembled at initiation of the project analysis. Issues identified for analysis were determined based on ROD/RMP management direction for utilization and protection of natural resources; circumstances and concerns identified through field reconnaissance; comments from external groups, and requirements set forth in laws, regulations, policy and court rulings.

1.6.2. External Scoping

The BLM initiated external scoping for this project on November 22, 2013. A scoping letter and a map describing potential project activities was sent to 259 recipients, including federal, state, county and municipal government agencies, tribal governments, adjacent landowners, and interested parties on the Roseburg District and Grants Pass Field Office mailing lists. The scoping letter was also posted on the Roseburg District BLM's website at http://www.blm.gov/or/districts/roseburg/plans/.

A total of 17 comment letters were received and considered during the scoping period. A detailed summary of the comments are included in the project record. Many comments were of a generic or philosophical nature that would not guide the development of alternatives. Other comments suggested analyses that cannot be addressed within the scope of this EA.

A smaller subset of comments was identified that might refine alternatives and project design. These are summarized in italics and addressed below, or addressed in Chapter 2.4.

Aquatic Habitat and Water Resources

"We encourage the BLM to be proactive in treating riparian reserves affected by the fires. Your RMP directs salvage in riparian reserves if required to attain ACS objectives. One of these objectives is to "maintain and restore the species composition and structural diversity of plant communities in riparian areas to provide adequate summer and winter thermal regulation." The "thermal regulation" that is mentioned here typically requires shade provided by mature tree canopies. Without post-fire tree planting, and the salvage that would need to occur in order to plant, this thermal regulation will be delayed and the ACS objective could remain unattained. It could take many years for the riparian areas to move through the early successional period and start providing thermal cover for these streams without some level of reforestation. ACS also direction [sic] to "restore habitat to support well distributed populations of native plant, invertebrate, vertebrate riparian dependent species.""

The Aquatic Conservation Strategy objectives were considered in detail throughout the analytical process for fish species, aquatic habitat, and water resources within the project area (Appendix E). As a result, the environmental consequences sections for hydrology and fish (Chapter 3.7.3) can be used to determine the level of consistency with the ACS objectives. The resulting summary from these effects discussions is that Alternative Two would meet the Aquatic Conservation Strategy objectives in all instances at the site and watershed scales. In the short term, felling of dead or dying trees could reduce streamside shade (ACS objective # 4, water quality), however, the number of hazard trees still providing shade that are imminently likely to die is low, and would not be expected to result in measureable changes to water quality or stream temperature. Based on the restorative nature of many actions taken by the BLM, such as directionally felling hazard trees to streams, upslope habitat restoration in the form of tree planting, and proposed culvert replacements that would improve/allow access for salmonids, this project would not prevent attainment of ACS objectives but would support attainment of these objectives (Chapter 3.7.3.3).

Cumulative Effects

"Clearly address the cumulative impacts on future fire behavior, snag retention, soil health, hydrology and wildlife."

Cumulative effects for all analyzed resources are addressed in Chapter 3.

Fire Risk and Fuels Management

"Maintain the existing road network to allow for quick initial attack of fires in addition to maintain [sic] existing road network as viable fire breaks. A maintained road network allowing ingress and egress for firefighters is essential for their safety and escape routes." One of the objectives of the project is to provide access to manage future wildfires by maintaining the ingress/egress onto BLM lands through roadside hazard tree removal and fuels reduction. The proposed roadside safety and fuels reduction treatments are described in Chapter 2.3.1.

"If any roads are closed, leave the road bed intact and free from large woody debris allowing for future use during fire suppression."

Individual evaluations would be conducted to determine the manner of decommissioning essential to meet resource needs. Roads selected for potential decommissioning would not be critical during fire suppression activities due to criteria used during the selection process (Chapter 2.3.4).

"Not taking aggressive action to remove snags imposes a serious risk of loss to adjacent landowners and tax payers of Oregon. Similarly, not replanting and allowing brush fields to proliferate, which are volatile fuels, also transfers a serious risk of loss to adjacent landowners and tax payers of Oregon. Therefore, it is imperative that aggressive post-fire removal of snags and fuel reduction work be done for the forests, the community and the state of Oregon."

As discussed in the description of Alternative Two (Chapter 2.3), imminent and likely imminent hazard trees would be identified and felled along priority roads, surrounding quarries, and along the railroad right-of-way. Silvicultural habitat restoration treatments on 52 percent of the LSR land that burned under moderate and high severity in the Rabbit Mountain Fire would also be implemented where there is a lack of available seed sources within 650 feet of the stands (Chapter 2.3.3). Planting a varying proportion of fire-resilient conifer species such as ponderosa pine, incense-cedar and Douglas-fir, would accelerate the stand initiation phase and restore historical tree species composition, reducing the likelihood of the stands converting to volatile shrub and hardwood stands. The other 48 percent of the LSR land burned under moderate to high severity have seed sources sufficiently close to facilitate natural tree regeneration that would compete against shrub and hardwood species.

"Lumping fuel sizes together prevents the decision-maker from accurately understanding the actual magnitude of the risk from logging or not logging."

This project groups fuels possessing common characteristics based on size and influence on fire behavior. Dead woody fuels are grouped by "small fuels" less than three inches diameter, which represent the greatest risk for ignition and contribute to rate of spread, and "coarse woody debris" (CWD) greater than three inches diameter, which is not highly susceptible to ignition but whose combustion represents the greatest contribution to fire severity, fire duration, and resistance to control.

"If fuels must be removed, the agency should remove the smaller fuels that are most hazardous and leave the largest logs that are least flammable and most valuable for habitat and other ecological services."

"Hazard trees do not need to be removed from the site. Large trees are not hazardous fuel."

Roadside fuels reduction treatments would focus on piling and burning activity fuels at landings, and chipping or hand-piling and burning fuels (less than 9 inches diameter) within the first 50 feet of the road edge along the roadside hazard tree safety treatment areas (Chapter 2.3.2). Larger fuels, greater than nine inches diameter, contribute to fire severity, fire duration, and resistance to control. Where there is an excess of felled hazard trees, removal may occur in order to: provide access for future fire suppression, decrease firefighter suppression hazards, decrease future fire severity potential, and reduce hazardous fuel loading (USDA and USDI 1994c, p. C-13-14) (Chapter 2.3.1).

"The agency often alleges that leaving large snags and logs will increase "resistance-to-control" during future firefighting. Any discussion of "resistance to control" needs to be limited to areas where direct attack fire-fighting is likely to occur."

This project uses the National Wildfire Coordinating Group's definition for resistance to control, as the relative difficulty of constructing and holding a control line as affected by resistance to line construction and by fire behavior. Douglas Fire Protective Association (DFPA) is contractually obligated to initial attack and fully suppress all fires at the smallest size possible; fuel loading, safe access, and resistance to control is a concern in the entire project area, not just roadways and access points.

"The forthcoming NEPA document must disclose how many tons of slash would remain per acre and how its presence might influence the multitude of lightning strikes that occur in the watershed regularly."

Fire history and future risk of fire hazard, as well as current and future fuel conditions for the project area are discussed in detail in Chapter 3.4.

"[T]he BLM needs to ensure safety on all roads and, while it is not practically possible to completely eliminate all fire risks, it is imperative the BLM substantially reduce future fire risks throughout the fire area in order for this project to have meaningful effect."

"The scoping notice admits the presence of high levels of fuels and fire dangers and the BLM must address those risks seriously on a landscape level."

"Our organizations are extremely concerned that the proposed establishment of artificial plantations may increase future fire hazard in the planning area."

Priority hazard tree roadside safety treatment areas were identified based on functional road classifications. Alternative Two would identify hazard trees and individual tree potential failure zones using guidelines in the OSHA Field Guide for Danger Tree Identification and Response (Toupin *et al.* 2008), as described in the project design features (Chapter 2.3.5). Where there is an excess of felled hazard trees (Chapter 2.3.1), removal may occur to: provide access for future fire suppression, decrease firefighter suppression hazards, decrease future fire severity potential, and reduce hazardous fuel loading (USDA and USDI 1994c, p.

C-13-14). Activity fuels along roadside safety treatment areas would be machine piled at landings and burned (Chapter 2.3.1).

Alternative Two describes the silvicultural habitat restoration treatments. A mixture of approximately 50 percent minor species (ponderosa pine, sugar pine, Jeffrey pine, and incense-cedar) along with Douglas-fir, may be planted using a variable spacing technique (up to 500 trees per acre) to promote native species recovery (Chapter 2.3.3) and reduce the likelihood of stands converting to volatile shrub and hardwood stands. To create a discontinuous fuel loading, other management actions are frequently implemented, such as:

- Manual maintenance, consisting of periodically cutting competing brush.
- Precommercial thinning, which reduces competition among residual trees and breaks up the horizontal continuity of the fuel bed.
- Pruning, which removes the ladder fuels that can transport ground fire into tree canopies.

Habitat Restoration

"We encourage the BLM to develop an alternative that focuses on active management in order to restore the entire landscape and accelerate its' trajectory toward a quality late-seral forest. This active management alternative could include the approach that severely burnt areas will attain LSR objectives quicker by salvaging and replanting to a degree. We recognize that certain elements must be retained on the landscape to meet LSR and spotted owl critical habitat direction, however we would like to see a focus on restoration activities once these elements have been identified and protected."

Habitat restoration is a primary focus of the proposed project (Chapter 1.3 and 1.4). Alternative Two discusses the habitat restoration treatments, including young-forest planting, older-forest planting, and roadside safety treatment planting (Chapter 2.3.3).

"We would like to see an alternative that conducts habitat restoration on not only the spotted owl home ranges but also the spotted owl core areas, nest patches, and areas outside of owl circles completely."

Alternative Two describes habitat restoration treatments (Chapter 2.3.3). These treatments would occur within northern spotted owl nest patches, core areas, and home ranges, as well as outside of northern spotted owl circles.

"The BLM should take the "post-disturbance opportunities to restore more natural, early successional forest conditions.""

Roughly 50 percent of the area burned under moderate and high severity (2,671 acres of LSR) in the Rabbit Mountain Fire would remain untreated. These areas have seed sources sufficiently close, and would be left to regenerate naturally. In areas proposed for silvicultural restoration treatments, planting would occur with a mix of approximately 50 percent minor species (ponderosa pine, sugar pine, Jeffrey pine, and incense-cedar) along with Douglas-fir using a variable spacing technique to promote native species recovery (Chapter 2.3.3).

Hazard Tree Felling and Removal

"The Northwest Forest Plan states that the BLM can remove trees along right-of ways [sic] in LSRs and Riparian Reserves in limited cases. However, the EA must develop an alternative that leaves "material on site if available course [sic] woody debris is inadequate. Consider topping of trees as an alternative to felling." (RMP p 73)."

Under Alternative Two, CWD objectives would be met (Chapter 3.6.3.2). As discussed in the description of Alternative Two (Chapter 2.3), topping hazard trees would be considered an alternative to felling where physically and operationally practicable.

"Adequately fell and remove the majority of large snags to provide for the safety of firefighters, the public and forest workers (OR-OSHA Division 7 Administrative rules Sub C 437-007-0225)."

"Fell and remove (where possible) all snags (dead and dying) within two tree lengths of existing roads. At a minimum fell and remove snags within two and a half tree lengths above and one and a half tree lengths below of existing roads."

"Ensure that the entire road system affected by the fire is safe for commercial and noncommercial use, as well as the railroad right-of-way and adjacent forest improvements."

"Hazard trees should be broadly defined in accordance with OR-OSHA Division 7 Administrative rules Sub c 437-007-0255 (2008)."

"Remove snags in the areas identified as important to or containing critical infrastructure such as escape routes, railways, homes, gas lines, and traffic corridors identified in the Glendale/Cow Creek CWPP."

Priority hazard tree safety treatment areas were identified based on functional road classifications and critical infrastructure (areas around quarries and along the railroad right-of-way). Alternative Two would identify hazard trees and individual tree potential failure zones using guidelines in the OSHA Field Guide for Danger Tree Identification and Response (Toupin *et al*. 2008), as described in the project design features (Chapter 2.3.5).

Northern Spotted Owl

"[D]o not assume that fire has rendered spotted owl habitat unsuitable. The agency may not justify logging on the assumption that the fire has destroyed the spotted owls' habitat."

Post-fire foraging habitat conditions for the northern spotted owl are discussed in Chapter 3.5.2.

"The 2008 FRP (p 116) also says "Large and old trees, either living or dead, are important wherever they occur." The FWS response to comments on the draft recovery plan says "post-fire harvest recommendations stress the need to conserve large trees, both living and dead, as they are important components to the restoration of owl habitat after wildfire events." And recommends that after fire or other disturbance the agencies should "conserve the remaining large trees and snags"."

"Northern spotted owl Conservation [sic] BLM must follow the northern spotted owl Recovery Plan which calls for retention of large trees and large snags in LSRs and CHUs."

Alternative Two would limit the loss of habitat elements that take a long time to develop (e. g, large diameter snags and downed wood) to less than eight (8) percent of the LSR impacted by the Rabbit Mountain Fire, as discussed in the Wildlife section (Chapter 3.5.3). The draft recovery plan is obsolete as a final recovery plan has been issued, and while the recovery plan recommends conservation of large trees and snags, it does not suggest that all must be retained particularly where there are risks to life and property. The recovery plan is an advisory document and does not represent regulation or statute with which the BLM must comply.

Noxious Weeds

"The forthcoming NEPA document must adequately disclose and analyze the potential for proposed BLM activities to increase and hasten the spread of noxious weeds in the planning area."

Preventative measures that focus on minimizing the risk of introducing new weed infestations or spreading existing ones are discussed in Chapter 2.3.5, #4.

Road Engineering

"Proper road design and layout should pose little to no negative impacts on water quality or slope stability."

Alternative Two in this Environmental Assessment does not propose the construction of any new roads.

"Decommission roads and restore their hydrologic function, particularly in or near Riparian Reserves, on steep slopes, and where roads are not needed to support fire management or private access."

Alternative Two identifies approximately three miles of roads for potential decommissioning. Chapter 2.3.4 discusses potential road decommissioning in detail.

"Retaining down wood above roads is also desired form [sic] a road maintenance perspective because large logs along the contour will help store sediment and keep it from clogging road drainage features."

Felled hazard trees upslope of roads may pose a risk to traffic below, and some may require removal. Best management practices (BMPs) would be employed to effectively eliminate delivery of road derived sediment, as well as any produced from yarding operations, to road drainage features and nearby stream channels (USDI BLM 2014).

Snags and Coarse Woody Debris

"Snags should be retained when they are likely to persist until late successional conditions have developed."

"Leaving them [snags] in riparian areas would be best as long as long [sic] as it doesn't impact road safety."

Only imminent and likely imminent hazard trees would be felled in proposed safety treatment areas. There are limitations to hazard tree removal in riparian areas within listed fish habitat buffers (Chapter 2.3.5).

"If any trees are cut, the BLM must "Keep felled trees on-site when needed to meet coarse woody debris objectives.""

"Abundant down wood is an objective within in LSRs. Not just minimum levels of down wood but biologically optimal levels."

Under Alternative Two, CWD objectives would be met (Chapter 3.5.3.2). Hazard tree safety treatment areas may have less than optimal levels of downed wood post-treatment, although proposed treatments only account for eight (8) percent of the project area. The remaining 92 percent of the project area will have optimal levels of downed wood. Based on snag fall modeling, Open Canopy stands originating from wildfire would meet, or exceed, the 80 percent tolerance levels for downed wood (greater than 5 inches diameter) within 7 to 10 years (Appendix C).

Soils

"Please map soil types and composites using field reconnaissance data and include the maps in the NEPA document."

All soil types within proposed treatment areas were mapped based on field reconnaissance and GIS analysis. This data was used to describe the affected environment and environmental consequences in the soils analysis (Chapter 3.6). All soils maps are located in the project record.

"Design actions and mitigation after you have collected field reconnaissance data on soils at every site proposed for action."

After reviewing soils data for each hazard tree safety treatment site, project design features were developed for hazard tree removal methods to protect fragile soils (Chapter 2.3.5).

"Please do not lump "moderate" and "severe" fire impacts to soils in your forthcoming analysis."

Areas that burned under moderate and high severity were analyzed separately in the soils analysis (Chapter 3.6).

"Proposed activities, especially commercial log removal, will violate requirements to maintain long-term soil productivity. Soil compaction and erosion, loss of coarse woody debris, and erosion all adversely affect long-term productivity. Removal of a major fraction of the available organic matter through salvage of large trees will adversely affect soil productivity for decades or centuries."

A detailed analysis on the effects of hazard tree safety treatment areas to soils was completed. To help minimize the amount of soil displacement and compaction from the removal of hazard trees, project design features would be implemented (Chapter 2.3.5). The soil disturbance in the treatment areas from hazard tree felling, yarding and skidding would result in localized surface soil erosion. The surface soil disturbance would extend the initial vegetative recovery periods one to three additional years, depending on the site productivity, the amount of rock fragments in and on top of the soil, soil depth, and slope gradient. The reduction of a large percentage of the large woody component and the organic matter reserve would be a long-term effect. However, compared to pre-fire suppression era conditions, where fires may have burned more frequently, although likely in a mosaic burn severity pattern, the total on-site biomass may have been less historically, than just prior to the Rabbit Mountain Fire. The greatest effects to soil productivity would be from landings and skid trails. The estimated amount of area affected would be four to ten percent in ground-based areas, consisting mainly of designated skid trails (Chapter 3.6.3). The project design features would help initiate the recovery of these affected areas (Chapter 2.3.5).

"Please address the following conclusions from page 44 of the Doubleday Fire Salvage Environmental Assessment. March 2009. BLM-OR-MO50-0015-EA. Butte Falls Resource Area. Medford District BLM".

Conclusions about soil displacement and soil compaction from the Doubleday Fire Salvage Environmental Assessment are addressed in Chapter 3.6.2.6 and Chapter 3.6.3.2.

A notice of project initiation was published in the Roseburg District Quarterly Planning Update (Spring 2014), informing the general public of the nature of the proposed action. Letters were sent to landowners with property adjacent to BLM-administered lands where roadside safety treatment is proposed, those whose property lies beside or astride identified haul routes, and those with registered surface water rights for domestic use located within one mile downstream of the project area. They were encouraged to share any concerns or special knowledge of the project area that they may have.

On March 27, 2014, a pamphlet was posted on the BLM's post-fire recovery website. This document included a status update on all the post-fire projects in Southwest Oregon.

1.6.3. Public Meetings and Workshops

On January 10, 2014 a press release was issued to inform the public of a series of January 2014 public meetings specific to Southwest Oregon post-fire related projects. On January 15, 2014, the Grants Pass Field Office sent post cards to approximately 259 recipients, including federal, state, county and municipal government agencies, federally recognized Tribes, adjacent landowners, and interested parties on the Roseburg District and Grants Pass Field Office mailing lists informing them of the January 2014 meetings. Notice of the January public meetings was also published on the Roseburg and Medford District BLM's websites.

On the evening of January 21, 2014, a public meeting was held at the Glendale High School gymnasium. A total of 22 individuals identified themselves as interested in the Rabbit Mountain and Douglas Fire Recovery projects. On the evening of January 23, 2014, a public meeting was held at the Grants Pass Interagency Office. A total of 45 individuals identified themselves as interested in the Rabbit Mountain and Douglas Fire Recovery projects.

On January 30, 2014, a workshop was held at Douglas Forest Protective Association's Roseburg office for actively interested public, industry and environmental groups to have a facilitated group discussion on the proposed activities. A total of 17 individuals from a variety of interest groups attended the workshop. Several comments were received and considered from the January public meeting and workshop.

On June 27, 2014 a press release was issued to inform the public of the July 2014 public meeting specific to the Rabbit Mountain Fire LSR Recovery Project. Notice of the July public meeting was also published on the Roseburg District BLM's website.
On the evening of July 9, 2014, a public meeting was held at the Roseburg District Office. A total of seven individuals identified themselves as interested in the Rabbit Mountain Fire LSR Recovery Project.

1.7. Issues for Analysis

Through internal scoping, and consideration of informal external scoping comments, the interdisciplinary team identified the following issues for analysis.

1.7.1. Safety

- How would the alternatives meet the objective to provide for public and worker safety along BLM-managed roads, the railroad right-of-way, and adjacent to quarries with presence of fire killed or fire damaged trees?

1.7.2. Forest Vegetation

- How would the alternatives affect silvicultural practices (such as natural seeding and planting, vegetation management, and seedling protection) be to the development of late-successional forest conditions?

- How would the alternatives affect burned trees and their susceptibility to insect and pest infestation?

1.7.3. Fire and Fuels Management, and Air Quality

- How would the alternatives affect optimum levels of snags and downed wood, for wildlife habitat, regarding fire hazard?

- How would the alternatives affect accumulation of fuel loading on the forest floor?

- How would the alternatives affect air quality?

- How would the alternatives affect future fire suppression, such as road access and initial attack through a stand?

1.7.4. Wildlife

- How would the alternatives affect present and future snags and downed wood dynamics?

- How would the alternatives affect potential loss of snags used for foraging, nesting or roosting for northern spotted owl?

- How would the alternatives affect northern spotted owl Critical Habitat?
- How would the alternatives affect marbled murrelet Critical Habitat?
- How would the alternatives affect special status species and special attention species (survey and manage)?

1.7.5. Soils

- How would the alternatives affect ground cover recovery and nutrient cycling?
- How would the alternatives affect fragile soils?
- How would the alternatives affect erosion potential?
- How would the alternatives affect slope stability and risk of slope failures and landslides?

1.7.6. Fish, Aquatic Habitat and Water Resources

- How would the alternatives affect water quality, specifically temperature and shade, sediment, and turbidity in streams in the project area?
- How would the alternatives affect timing and quantity of stream flows in the project area?
- How would the alternatives affect Federally-threatened Oregon Coast coho salmon and other fish species that inhabit streams in proximity to proposed roadside, railroad right-of-way and quarry safety treatment areas?
- How would the alternatives affect aquatic habitat conditions, including Critical Habitat designated for the Oregon Coast coho salmon and Essential Fish Habitat designated for Oregon Coast coho and chinook salmon?

1.7.7. Visual Resource Management

- How would the alternatives affect visual resources within the project area?
- Noxious Weeds and Invasive Non-native Species
- How would the alternatives affect the introduction, establishment and spread of invasive species?

1.7.8. Carbon Storage and Release

- How would the alternatives affect the release of carbon as carbon dioxide (CO_2) at the project scale and in comparison to annual national and global CO_2 emissions, and future carbon sequestration by the forested stands proposed for hazard tree safety treatments?

1.7.9. Cumulative Effects

- What are the cumulative effects of ongoing BLM actions to the project area?

- What are the cumulative effects of additional post-fire projects on the Medford District to the project area?
- What are the cumulative effects of ongoing reciprocal rights-of-way road safety actions to the project area?
- What are the cumulative effects of private land management to the project area?

1.8. Issues Considered but not Analyzed in Detail

1.8.1. Environmental Justice

The proposed action is consistent with Executive Order 12898, which addresses Environmental Justice in minority and low-income populations. The BLM has not identified potential impacts to low-income or minority populations internally or through the public involvement process.

1.8.2. Native American Religious or Ceremonial Sites

No Native American religious concerns have been identified by the interdisciplinary team or through correspondence with tribal governments having historic interests in the area.

1.8.3. Areas of Critical Environmental Concern and Natural Areas

Areas of Critical Environmental Concern, Research Natural Areas, prime or unique farmlands, parklands, Wilderness, and Wild and Scenic Rivers are absent from the project area, and hence would be unaffected by any alternative.

1.9. Conformance

1.9.1. Applicable Planning Documents

Effects of natural resource management, including roadside safety treatments and habitat restoration, were analyzed in the Roseburg District PRMP/EIS (USDI BLM 1994). This EA will consider environmental consequences of no action and the proposed action to determine if there would be impacts exceeding those analyzed in the PRMP/EIS, precluding a Finding of No Significant Impact and requiring preparation of a Supplemental Environmental Impact Statement. Additional information and analysis provided by the following documents is incorporated by reference.

- *Final Supplemental Environmental Impact Statement (FSEIS) on Management of Habitat for Late-Successional and Old-Growth Related Species Within the Range of the Northern Spotted Owl* (USDA and USDI 1994a),
- *Roseburg District Proposed Resource Management Plan/Environmental Impact Statement* (USDI BLM 1994)
- *FSEIS for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines in Forest Service and Bureau of Land*

Management Planning Documents Within the Range of the Northern Spotted Owl (USDA and USDI 2000)

- *FSEIS for Management of Port-Orford-Cedar in Southwest* Oregon (USDA and USDI 2004a)
- *FSEIS to Remove or Modify the Survey and Manage Mitigation Measures Standards and Guidelines* (USDA and USDI 2004b)
- *Final Supplement to the 2004 Supplemental Environmental Impact Statement to Remove or Modify the Survey and Manage Mitigation Measures Standards and Guidelines* (USDA and USDI 2007)
- *Final Environmental Impact Statement for the Revision of the Resource Management Plans for the Western Oregon Bureau of Land Management* (USDI BLM 2008 (2008 FEIS))

Implementation would conform to management direction from the Roseburg District ROD/RMP as amended by the following:

- *Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* (USDA and USDI 1994b)
- *Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines in Forest Service and Bureau of Land Management Planning Documents Within the Range of the Northern Spotted Owl* (USDA and USDI 2001)
- *Record of Decision and Resource Management Plan Amendment for Management of Port-Orford-Cedar in Southwest Oregon, Coos Bay, Medford, and Roseburg Districts* (USDI BLM 2004)

1.9.2. Applicable Laws and Regulations

Design and implementation of the proposed action would conform to applicable laws, regulations and Executive Orders that include but are not limited to:

- **The Oregon and California Lands Act of 1937 (O&C Lands Act):** Section 1 of the Act stipulates that suitable commercial forest lands revested by the government from the Oregon and California Railroad are to be managed for the sustained production of timber.
- **The Federal Land Policy and Management Act (FLPMA):** Section 302 at 43 U.S.C. 1732(a), directs that "The 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 . . ."
- **National Historic Preservation Act, 2012 National Programmatic Agreement and 1998 Oregon State Historic Preservation Office Protocols:** Protection of resources of historic or cultural value.

- **Clean Water Act:** Section 313 and Executive Order 12088 requires federal agencies to comply with the provisions of the Clean Water Act to control water pollution from nonpoint sources.

- **Clean Air Act:** Directs federal agencies to maintain and enhance air quality.

- **The Endangered Species Act:** Section 7(a) (2) directs that each Federal agency shall, in accordance with and with the assistance of the Secretary, insure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined by the Secretary to be critical.

- **Migratory Bird Treaty Act and Executive Order 13186:** Protection of migratory birds.

- **Lacey Act, Federal Noxious Weed Act and Executive Order 13112:** Minimize the risk of establishment or spread of noxious weeds and invasive non-native plants.

1.9.3. Survey and Manage

In ruling on Conservation Northwest *et al.* v. Mark E. Rey *et al.* on December 12, 2009, Judge Coughenour in the U.S. District Court for Western Washington set aside the 2007 Record of Decision eliminating the Survey and Manage mitigation measures, but deferred issuing a remedy until further proceedings. Judge Coughenour did not issue a remedy or injunction at that time.

The plaintiffs and Federal Agencies entered into settlement negotiations in April 2010, and the Court filed approval of the resulting Settlement Agreement on July 6, 2011. The Defendant-Intervenor subsequently appealed the 2011 Settlement Agreement. On April 25, 2013, the Ninth Circuit Court of Appeals invalidated the 2011 Survey and Manage Settlement Agreement and remanded the case back to the District Court. On February 18, 2014, the District Court vacated the 2007 RODs which returned the BLM to the status quo in existence prior to the 2007 RODs.

The project is consistent with the 2001 ROD and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines, as incorporated into the District Resource Management Plan.

This project utilizes the December 2003 species list. This list incorporates species changes and removals made as a result of the 2001, 2002, and 2003 Annual Species Reviews (ASR) with the exception of the red tree vole. For the red tree vole, the Ninth Circuit Court of Appeals in KSWC *et al.* v. Boody *et al.*, 468 F3d 549 (9th Cir. 2006) vacated the category change and removal of the red tree vole in the mesic zone, and returned the red tree vole to its status as existed in the 2001 ROD Standards and Guidelines, which makes the species Category C throughout its range. Details of the project surveys are described in Chapter 3.5 and Appendix D).

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Chapter 2. Discussion of the Alternatives

This chapter describes the basic features of the alternatives being analyzed.

2.1. Terminology and Definitions

There are several terms whose definitions and meanings are integral to a clear understanding of the Rabbit Mountain Fire LSR Recovery Environmental Assessment. These definitions are presented below, prior to the description of the no action and proposed action alternative. In addition, throughout this Assessment, acres (or percentages of the proposed treatment areas by treatment type) are presented and discussed. These numbers are approximations based on post-fire aerial photo analysis, soil and vegetation burn severity models, and subsequent ground reconnaissance. These acres and percentages may change as additional information and further field review refine the approximations.

- **Burned Area Reflectance Classification (BARC):** A satellite-derived data layer describing post-fire vegetation conditions. BARC uses the Differenced Normalized Burn Ratio (dNBR), which is correlated with soil burn severity. The BARC has four classes: high, moderate, low, and very low/unburned. This product is used as an input to the soil burn severity map produced by the Burned Area Emergency Rehabilitation (BAER) teams.

- **Decayed Wood Advisor and Management Aid for Managing Snags, Partially Dead Trees, and Down Wood for Biodiversity in Forests of Washington and Oregon (DecAID):** An advisory tool used to evaluate snag and down wood sizes and levels needed to help meet wildlife management objectives. DecAID can also be used to evaluate effects from existing or proposed management activities on forest conditions and organisms that use snags and down wood (Mellen-McLean *et al.* 2012).

- **Functional Road Classification Type:**

    - **Collector:** These BLM-controlled roads normally provide primary access to large blocks of land and connect with, or are extensions of, a public road system. They accommodate mixed traffic and serve many uses. They generally receive the highest volume of traffic of all roads in the BLM road system. User cost, safety, comfort and travel time are primary road management considerations.

    - **Local:** These BLM-controlled roads normally serve a smaller area than collectors and connect to collectors or public road systems. Local roads receive lower traffic volumes, carry fewer traffic types and generally serve fewer users. User cost, comfort and travel time are secondary to construction and maintenance cost considerations. Low volume local roads in mountainous terrain, where operating speed is reduced by terrain, may be single lane roads with turnouts. Environmental impacts from construction of local roads would be reduced through road designs for the steeper grades, sharper curves, and lower design speeds.

    - **Resource:** These BLM-controlled roads are spur roads that provide point access and connect to local or collector roads. They carry very low volume and accommodate only one or two types of use. Use restrictions are applied to prevent conflicts between users needing the road and users attracted to the road. The location and design of these roads are governed by environmental compatibility and minimizing bureau costs with minimal consideration for user cost, comfort or travel time.

- **Hazard Tree (Danger Tree):** A standing tree, alive or dead, that presents a hazard to personnel due to deterioration or physical damage to the root system, trunk (stem), or limbs, and the degree and direction of lean. Oregon-OSHA does not define Hazard Tree in the regulations. The term Hazard Tree is, however, used interchangeably with Danger Tree in the Field Guide for Danger Tree Identification and Response (Toupin *et al.* 2008).

- **Forest Vegetation Simulator (FVS):** A collection of forest growth simulation models. FVS can be used to model natural succession, disturbances, and proposed management actions (Crookston *et al*. 2014).

- **Hazard Tree Failure Potentials:**

    - **Low failure potential:** Defective or rotten trees, snags, or their parts, have a low failure potential if they require considerable effort to make them fail during project implementation. They have a low probability of failure within ten years of rating.

    - **Likely failure potential:** Defective or rotten trees, snags, or their parts, have a likely failure potential if they require some effort to make them fail during project implementation. They will have a high probability of failure within three to five years of rating.

    - **Imminent failure potential:** Defective or rotten trees, snags, or their parts, have an imminent failure potential if they require little effort to make them fail during project implementation. They will have a high probability of failure within one year of rating.

- **Qualified Person:** A person who has:

    - A recognized degree, certification, professional standing, knowledge, training or experience; or

    - Successfully demonstrated the ability to perform the work, solve or resolve problems relating to the work, subject matter, or project; or

    - Been specifically trained in the identification of hazard trees and designated by a manager (BLM standard of a qualified person).

- **Rapid Assessment of Vegetation Condition after Wildfire (RAVG):** a satellite-derived data layer describing post-fire vegetation conditions (basal area loss and canopy cover loss). RAVG is considered an initial assessment, which describes initial vegetation mortality (typically 30 days post-fire containment), but does not capture delayed vegetation mortality. RAVG uses the Relative Differenced Normalized Burn Ratio (RdNBR), which is derived directly from the dNBR, but is considered more sensitive to vegetation mortality than the dNBR.

- **Snag:** Any standing dead tree or portion thereof. A snag may also be a hazard/danger tree.

- **Wildlife Tree:** A live, partially dead, or snag tree in the forest riparian zone, or in a cutting unit that is left for wildlife habitat.

2.2. Alternative One - No Action

This alternative describes a baseline against which the effects of Alternative Two can be compared. It discusses the consequences of not taking any action and assumes that current resource trends would continue into the future.

No roadside, railroad right-of-way, or quarry safety treatments would occur. Individual hazard trees would be evaluated and treated in compliance with OSHA standards (Toupin *et al.* 2008). Roads would be maintained on an as needed basis. No activity fuels would be generated along roadside, railroad right-of-way, or quarry safety treatments. Fuels reduction treatments, aimed at improving ingress/egress and reducing the risk of human-caused roadside ignition would not occur.

No further habitat restoration would occur. Young and older-forest stands that burned under moderate and high severity would not be planted.

No roads would be decommissioned.

The decision maker does not need to make a specific decision to select the no-action alternative. If that is the choice, the proposed action would simply be dropped and the National Environmental Policy Act (NEPA) process ended. Future activities in the area would not be precluded and could be analyzed in subsequent NEPA documents.

2.3. Alternative Two – Proposed Action

Roadside, railroad right-of-way, and quarry safety treatments would occur on approximately 524 acres, roadside fuels reduction would occur on up to 138 acres, and habitat restoration would occur on roughly 1,392 acres within the Rabbit Mountain Fire LSR Recovery project area (Appendix A, Figure A- 3). Table 2-1 identifies approximate treatment area acreage for each of the proposed activities.

Table 2-1. Proposed fire recovery treatments in the Late-Successional Reserve land use allocation within the Rabbit Mountain Fire LSR Recovery project area, South River Field Office, Roseburg BLM

Proposed Activities within the Late Successional Reserve LUA		Gross Area[1]
Hazard tree safety treatments	Roadside safety	492 acres (12.6 miles)
	Railroad right-of-way safety	11 acres (0.5 miles)
	Quarry safety	21 acres
Roadside fuels reduction	Machine piles	60 acres
	Hand piles	138 acres
Habitat restoration	Young forest planting (< 50 years)	486 acres
	Older forest planting (> 50 years)	414 acres
	Roadside safety planting	492 acres
Road decommissioning		3.0 miles

[1]Gross areas are approximations based on post-fire aerial photo analysis, soil and vegetation burn severity models, and subsequent ground reconnaissance. Gross areas may change as additional information and further field review refines the approximations.

2.3.1. Roadside, Railroad Right-of-Way, and Quarry Safety

2.3.1.1. Roadside Safety

All roads on BLM-managed lands within the Rabbit Mountain Fire LSR Recovery project area (32.6 miles) were analyzed for potential roadside safety treatments. Priority roadside safety treatment areas along 12.6 miles of roads, totaling 492 acres (Appendix A, Figure A- 3), were selected based on: (1) functional road classification, (2) exposure duration, and (3) hazard tree failure potential identified by the OSHA Field Guide for Danger Tree Identification and Response (Toupin *et al.* 2008; Table 2-2). Although priority roads have been identified, hazard tree identification and felling of individual and small groups of trees may occur to ensure public and operator safety as needed throughout the project area. Hazard tree identification and felling would occur within 1.5 tree heights below roads, 1.5 tree heights above roads on slopes less than 35 percent, and 2.5 tree heights above roads on slopes greater than 35 percent (see Chapter 2.3.5. PDF #2). Canopy cover would not be reduced below 50 percent in 52 percent of the safety treatment areas burned under very low to low severity. Where physically and operationally practicable, topping of hazard trees would be considered as an alternative to felling (ROD/RMP p. 73). Where there is an excess of felled hazard trees (greater than 10 tons per acre (i.e., 10 logs per acre, 16 feet in length)), removal may occur in order to: provide access for future fire suppression, decrease firefighter suppression hazards, decrease future fire severity potential, and reduce hazardous fuel loading (USDA and USDI 1994c, p. C-13-14). There are limitations to hazard tree removal in riparian areas (Chapter 2.3.5, #5).

Table 2-2. Selection criteria for priority roadside safety treatment areas within the Rabbit Mountain Fire LSR Recovery project area, South River Field Office, Roseburg BLM (Toupin *et al.* 2008)

Priority	Functional Road Classification	Exposure Duration	Failure Potential
High	Collector Active haul routes Active projects Roads with concentrated public use (e.g. Cow Creek Backcountry Byway) Major intersections	Long	Imminent and likely
Medium	Local and Resource with access to private lands Areas where people stop and congregate (e.g. landings, major intersections, parking areas)	Short	Imminent and likely
Low	Resource	Intermittent	Imminent

2.3.1.2. Railroad Right-of-Way Safety

The Central Oregon and Pacific Railroad (CORP) regularly hauls freight through the Rabbit Mountain Fire LSR Recovery project area. Eleven acres of potential hazard tree treatment areas have been identified above the railroad right-of-way (Appendix A, Figure A- 3). Hazard tree identification and felling may occur 1.5 tree heights above the railroad right-of-way on slopes less than 35 percent, and 2.5 tree heights above the railroad right-of-way on slopes greater than 35 percent. Felled hazard trees may be removed, if operationally possible.

2.3.1.3. Quarry Safety

There are three large rock quarries at Rabbit Mountain, Hare Creek, and Quartzite Creek that are the primary sources of aggregate for road construction and resurfacing of existing roads in the watershed. Hazard tree identification and felling would occur 1.5 tree heights below quarry footprints, 1.5 tree heights above quarry footprints on slopes less than 35 percent, and 2.5 tree heights above quarry footprints on slopes greater than 35 percent (Appendix A, Figure A- 3). Felled hazard trees may be removed. Where there is an excess of felled hazard trees (greater than 10 tons/acre (i.e. 10 logs/acre, 16 feet in length)), removal may occur in order to: provide access for future fire suppression, decrease firefighter suppression hazards, decrease future fire severity potential, and reduce hazardous fuel loading (USDA and USDI 1994c, p. C-13-14).

2.3.2. Roadside Fuels Reduction

2.3.2.1. Machine Piles

Activity fuels along roadside safety treatment areas would be machine-piled at landings and covered in preparation for burning, accounting for up to 60 acres of activity fuels reduction. Machine piles would be burned during late-autumn and winter when soil and duff moistures are high (ROD RMP, p. 139). Equipment used to pile activity fuels would be restricted to roads.

2.3.2.2. Hand Piles

Fuels less than nine inches diameter may be chipped, removed from the site, or hand piled and burned during late-autumn and winter when soil and duff moistures are high (ROD/RMP, p. 139). Small fuels reduction may occur along roads identified for roadside safety treatments, within the first 50 feet of the road edge, where practicable (Appendix A, Figure A- 3). Small fuels reduction may also occur within the first 50 feet of no-removal riparian buffers, where possible (Chapter 2.3.5, #5). Up to 138 acres of small fuels reduction may occur.

2.3.3. Habitat Restoration

The South River Field Office identified 1,392 acres for potential silvicultural habitat restoration treatments, out of the 2,671 acres (52 percent) of the LSR land use allocation that burned under moderate and high severity in the Rabbit Mountain Fire. In 2014, 246 acres of the identified acres were planted (Appendix A, Figure A- 3). Up to 500 trees per acre may be planted using a variable spacing technique. Seedlings may be tubed and mulched to increase the likelihood of survival. A mixture of approximately 50 percent minor species (ponderosa pine, sugar pine, Jeffrey pine, and incense-cedar) along with Douglas-fir may be planted to promote native species recovery. Stocking surveys would be completed prior to and after planting, as needed, to determine whether stocking levels (200 trees/acre, well dispersed throughout an area) have been met.

2.3.3.1. Young Forest Planting

Out of 1,060 acres of stands less than 50 years old (young forests) within the project area, a total of 683 acres burned under moderate and high BARC severity (Appendix A, Figure A- 4). Approximately 486 acres of young forests, which burned under moderate and high BARC severity, were identified for potential planting; approximately 246 acres of which were planted in 2014.

2.3.3.2. Older Forest Planting

There were approximately 5,143 acres of stands greater than 50 years old (older forests) within the project area. An estimated 1,981 acres of older forests burned under moderate and high severity. After further identifying older forests that burned under moderate and high BARC severity and were greater than 650 feet from a natural seed source (stands classified as unburned/very low and low BARC severity), approximately 414 acres (21 percent) were identified for potential planting (Appendix A, Figure A- 3). The older forest planting criteria may be modified for reasonable treatment boundaries or project design features (PDFs) identified by resource specialists. Up to ten hazard trees/acre may be felled for the safety of planting crews, but not removed. Areas with a greater number of hazard trees/acre would not be planted.

2.3.3.3. Roadside Treatment Area Planting

Up to 492 acres of roadside hazard tree treatment areas may be planted (Appendix A, Figure A-3). Planting in cutbanks and fill slopes would not occur.

2.3.4. Road Decommissioning

To restore site productivity to roads no longer needed, approximately three (3.0) miles of roads have been identified for potential decommissioning (Table 2-3; Appendix A, Figure A- 3). Roads selected for potential decommissioning met some or all of the following criteria: road is a short, dead end; road begins and ends on BLM land and does not cross onto private land; road is unlikely to be used for access onto private land in the future; road has no record of private rights-of-way; road is unlikely to be used for a BLM project in the near future; road is unlikely to be needed as a fire break; road is not a significant financial investment of the BLM; road is native surfaced and does not meet current best management practices (BMPs) for road drainage.

Individual evaluations would be conducted to determine the manner of decommissioning essential to meet resource needs. Decommissioning may consist of removing drainage structures, constructing waterbars, blocking roads to vehicular use, mulching and/or seeding over disturbed areas, slashing to discourage off-highway vehicle use and subsoiling. If equipment is needed, road decommissioning would be restricted to the dry season, typically mid-May through mid-October, when soils are least susceptible to compaction. This operational period may be extended if spring and late-autumn conditions are dry, or shortened in the event of abnormally wet weather.

Table 2-3. Proposed road decommissioning within the Rabbit Mountain Fire LSR Recovery project area, South River Field Office, Roseburg BLM

Road Number	Road Segment	Road Segment Location (Township/Range/Section)	Road Segment Length (miles)
31-7-29.4	A	31-7-29	0.4
31-7-30.2	B	31-7-19	0.5
31-7-30.3	B	31-7-19	0.3
31-7-31.1	A	31-7-31	0.3
31-7-31.4	A	31-7-31	0.4
31-8-15.4	A	31-8-15	0.1
31-8-21.1	A	31-8-21	0.2
31-8-21.2	A	31-8-21	0.1
32-7-5.1	A	32-7-5	0.1
32-8-1.4	A	32-8-1	0.2
Spur 1	A	32-8-3	0.1
Spur 2	A	31-7-19	0.1
Spur 3	A	31-7-19	0.1
Spur 4	A	31-8-21	0.1

2.3.5. Project Design Features of the Action Alternatives

1. Post-fire Tree Mortality Criteria

The Southwest Oregon Forest Insect and Disease Service Center (SWOFIDSC) Guidelines for selecting fire-injured trees that are likely to be infested by insects in southwest Oregon forests (2001) would be used in all situations for identification of trees judged likely to die in the next three to five years as a consequence of injuries sustained in the fire, as determined by an objective set of standards related to percent of crown scorch, percent of bole circumference with cambium damage, and height of charred, spongy bark (Appendix B).

2. Hazard Tree Identification

The OSHA Field Guide for Danger Tree Identification and Response (Toupin *et al.* 2008) would be used in all situations for determination of whether individual trees judged likely to die in the next three to five years (see Post-fire Tree Mortality Criteria section above), and whether individual trees that experienced immediate post-fire mortality, are hazard trees. Trees would be evaluated by a qualified individual, as defined above, from Oregon OSHA and BLM policies.

There are five steps a qualified person would take when evaluating potential hazard trees (Toupin *et al.* 2008):

a. Identify tree defects and determine the tree's potential to fail based on three levels of failure potential (low, likely and imminent). Failure potential is a function of tree condition. Trees with likely or imminent future potentials may be classified as hazard trees depending on the work activity, and whether the work activity is in the tree's potential failure zone (pp. 11-12).

b. Determine the type of work activity. There are three categories of work activities (pp. 14-17):

    i. Traffic on roads. All hazard trees that can fall or slide onto the roadways must be felled (OAR 437-007-0500). The qualified person should consider traffic frequency and exposure duration when determining whether a tree poses a danger to people.

    ii. Activities that do not impact the tree such as walking or conducting non-motorized activities that do not involve tree contact (such as planting or surveys).

    iii. Motorized activities near the tree or activities that may cause the tree to be contacted (such as running equipment, culvert work, road construction, trail construction, and helicopter operations).

c. Determine the potential failure zone. This is the area that could be reached by any part of a failed tree. The failure zone of a particular tree is a minimum of one and one half (1.5) times the tree height. On sloped ground where the dislodged section may roll downhill, the potential failure zone must be extended on the downhill side of the tree for whatever distance is necessary to protect people (analytical assumption extends up to two and one half (2.5) times the tree height on slopes greater than 35 percent, although the potential failure zone may occur up to or beyond that distance depending on environmental factors) (pp. 18-21).

d. Determine if the tree poses a danger to people. Not all trees with a likely or imminent potential to fail would be hazard trees. If the work activity is outside the potential failure zone, the tree is not a hazard tree. If the work activity is mechanized, the tree has a likely failure potential, and the work is within the potential failure zone, the tree could be considered a hazard tree (pp. 22-24).

e. If it is determined that the tree posed a danger to people, the tree either needs to be taken down or the work arranged so that people are not exposed to the danger.

3. Hazard Tree Removal Methods

Where there is an excess of felled hazard trees (greater than 10 tons/acre (i.e. 10 logs/acre, 16 feet in length)), removal may occur in order to: provide access for future fire suppression, decrease firefighter suppression hazards, decrease future fire severity potential, and reduce hazardous fuel loading (USDA and USDI 1994c, p. C-13-14).

For ground-based hazard tree removal:

- Hazard tree removal would be restricted to the dry season, typically mid-May through mid-October, when soils are least susceptible to compaction. This operational period may be extended if spring and late-autumn conditions are dry, or shortened in the event of abnormally wet weather.

- Hazard trees would be felled such that trees could be long-lined to existing roads, where practicable.

- Where skid trails would be essential for hazard tree removal, all ground equipment (harvesters and skidding equipment) would operate on spaced, pre-designated trails, using existing trails to the greatest degree practicable.

- Operations would generally be limited to slopes of 35 percent or less. Operations on steeper pitches between gentler benches could be authorized where appropriate.

- Use of ground equipment outside of roads or designated skid trails would not be allowed.

- Equipment would avoid perennially wet areas.

- After skidding operations, newly created and reused old skid trails, and native surface landings free of slash piles would be rehabilitated, as needed. Rehabilitation may include tilling, hand piling brush, hand construction of waterbars, and/or placement of topsoil over the treated trail areas.

For cable-based hazard tree removal:

- Yarding to and hauling off of unsurfaced roads would be restricted to the dry season, typically mid-May through mid-October, subject to circumstances described above.

- Hazard trees would be felled such that trees could be yarded to existing roads, where practicable.

- Equipment would be capable of maintaining a minimum one-end log suspension.

- Following yarding operations, deeply furrowed or otherwise heavily disturbed corridors would be rehabilitated if needed. Rehabilitation may include above road cut placements of straw wattles, hand piling brush, and/or hand construction of waterbars; all of which would be designed to prevent sediment from reaching the roadside ditchline.

4. Noxious Weeds and Invasive Non-native Plants

Preventative measures would be implemented that focus on minimizing the risk of introducing new weed infestations or spreading existing ones, and would include:

- Steam cleaning or pressure washing equipment before working in the project area to remove soil and materials that could transport weed seed or root fragments.

- Scheduling work in un-infested areas prior to work in infested areas.

- Seeding and mulching disturbed areas with native grass seed; or re-vegetating with native plant species where natural regeneration is unlikely to prevent weed establishment.

Given that regular weed treatments would continue, there would be no perceptible difference in the risk of weed establishment and spread across the alternatives. New noxious weed or invasive non-native plant infestations could be treated using methods such as manually pulling weeds, mowing, or use of approved herbicides. BLM herbicide application treats individual plants. Application methods are limited to truck-mounted sprayers, backpack and hand sprayers, and wick wipers. Time and location of application is also restricted based upon forecast weather conditions, proximity to live water and riparian areas, and proximity to residences or other places of human occupation. Any new infestations would be treated and periodically monitored to determine whether further treatments or alternative treatments are indicated.

5. Riparian Areas

- Felled hazard trees would not be removed within the following distances (Appendix A, Figure A- 5) (NMFS 2011, p. 18):
    - 100 feet from listed fish habitat (LFH[1]);
    - 50 feet from perennial and intermittent streams within 1 mile of LFH.
- Hazard trees greater than 30 inches d.b.h. and downslope of the Cow Creek road would be felled into Cow Creek, if possible.
- Hazard trees greater than 20 inches d.b.h. and downslope of the Middle Creek road may be felled into Middle Creek, if possible.
- Upslope from the Cow Creek and Middle Creek roads, felled hazard trees within the LFH no-removal buffer would be moved:
    - to the downhill side of Cow Creek road and left onsite; or
    - offsite, but within the basin, to be used as habitat-forming wood jams for stream restoration (NMFS 2013, p. 25).
- To address hazardous fuel build-up upslope from Cow Creek road, felled hazard trees within the perennial and intermittent stream no-removal buffers may be moved:
    - to the downhill side of Cow Creek road and left onsite; or
    - offsite, but within the basin, to be used as habitat-forming wood jams for stream restoration (NMFS 2013, p. 25).

[1] The Magnuson-Stevens Fishery Conservation and Management Act of 1996 (Federal Register 2002) designated essential fish habitat (EFH) for fish species of commercial importance. Essential fish habitat consists of streams and habitat currently or historically accessible to Oregon Coast Chinook and Oregon Coast coho salmon, and is coincident with Critical Habitat designated for Oregon Coast coho salmon in the Union Creek-Cow Creek, Middle Creek, Bear Creek-West Fork Cow Creek, and Riffle Creek-Cow Creek sub-watersheds. Essential fish habitat is also coincident for listed fish habitat (LFH) in the project area.

- Within riparian areas, if a hazard tree is within felling distance from a stream channel, efforts would be made to fell the tree into the channel to increase habitat for aquatic organisms, or to meet coarse wood requirements.

- Within riparian areas, outside of the no-removal buffers listed above, felled hazard trees may be removed, with the exception of trees felled into stream channels.

- No felling of hazard trees into stream channels would occur within a distance of 100 feet upstream of a culvert.

6. Seasonal Wildlife Restrictions

- Removal of suitable nesting, roosting and foraging habitat within one-quarter mile of known northern spotted owl sites or un-surveyed suitable habitat would be prohibited from March 1st to September 30th, both dates inclusive. This restriction could be waived until March 1st of the following year if two years of protocol surveys covering all northern spotted owl habitat within the survey area indicate no resident single northern spotted owls, territorial northern spotted owl pairs, or pairs/two northern spotted owls of unknown status and no activity centers are known to occur in the survey area, and no barred owls are detected in the survey area. Spot checks in the third and fourth years would not be required (USDI FWS 2012).

- Roadside, railroad right-of-way, and quarry safety treatment activities within applicable disruption threshold distances of known northern spotted owl sites or un-surveyed suitable habitat would be prohibited from March 1st to July 15th, both dates inclusive. This restriction may also be waived, in circumstances described above.

- Areas where roadside, railroad right-of-way, and quarry safety treatment activities that would remove suitable marbled murrelet nesting habitat may be surveyed for two years to determine occupation status. Operations that remove suitable habitat within one-quarter mile of an occupied site or un-surveyed habitat would be prohibited from April 1st to September 15th. The restrictions would be waived if two years of surveys indicate there is no occupancy.

- Roadside, railroad right-of-way, and quarry safety treatment activities would be subject to Zone 2 Daily Operating Restrictions, the prohibition of operations until two hours after sunrise, and cessation two hours before sunset, from April 1st to August 5th. These restrictions would be waived if two years of surveys indicate there is no occupancy.

7. Visual Resource Management

Along the Cow Creek Back Country Byway and adjacent to Cow Creek Recreational Gold Panning Area, hazard tree removal should follow along the contours of the landform.
Along the Cow Creek Back Country Byway and adjacent to Cow Creek Recreational Gold Panning Area, care should also be taken to not cut large pockets of hazard trees, where practicable, creating large openings that would attract attention.

2.4. Alternatives Considered but not Analyzed in Detail

The following alternatives, identified during the external scoping period, were considered but not analyzed in detail. These alternatives, and the rationale for not analyzing them, are addressed in this section.

2.4.1. Salvage and Restoration on All Affected Land

Alternative Two analyzed the entire project area (6,266 acres) for potential habitat restoration treatments. The analysis dropped areas which burned under very low and low severity. Of the areas that burned under moderate to high severity (2,671 acres), 1,392 acres (52 percent) were selected for habitat restoration treatments based on a variety of criteria (Chapter 2.3.3).

Comments submitted during scoping suggest that salvaging and conducting restoration on every piece of affected land down to ten acres in size should be considered as an alternative.
BLM received a similar request to consider designing treatments on all moderate to high intensity burn areas, which would maximize reforestation opportunities and reduce the proliferation of fire-prone brush, as an alternative.

The decision to eliminate these suggested alternatives from detailed analysis was made because they are not in accordance with management direction from the Roseburg District ROD/RMP, and hence outside the scope of the EA to consider. In the LSR management direction provides for:

- Retaining all standing live trees, including those injured (e.g., scorched) but likely to survive (p. 30).

- Retaining snags that are likely to persist until late-successional forest conditions have developed and a new stand is again producing large snags (p. 30).

Additionally, these alternatives do not respond to the purpose and need, as they are not consistent with BLM policy objectives of maintaining the natural component of fire-created snags and downed wood, and creating landscape diversity through treatment of portions of the landscape, as described in Chapter 1.

2.4.2. Restoration-only Treatment

BLM received a request to consider at least one non-commercial, restoration-only alternative that invests in restoration and recovery of the fire area by, for instance, eliminating livestock grazing, emphasizing native species recovery, not building any new roads, stabilizing soils disturbed by the fire suppression effort, decommissioning unneeded roads.

This alternative was eliminated from detailed analysis because it does not respond to the purpose and need, and it would not allow BLM to implement its policy objectives for creating a safe environment by felling and removing hazard trees, as described in Chapter 1. Action Alternative Two proposes limited removal of wood, where the abundance of CWD exceeds the desired levels identified in the revised LSRA, and where the retention of all woody debris would create a hazardous fuel loading along priority roadways.

This requested alternative proposed the elimination of livestock grazing. There are no grazing allotments on the Roseburg District. Stabilizing soils disturbed by the fire suppression effort is not relevant to the project because this action occurred during fire suppression rehabilitation. Further actions to protect soils during project implementation are discussed in Chapter 2.3.5 (project design features).

The proposed action does not propose the building of any new roads, and it proposes the limited decommissioning of unneeded roads that are unencumbered by any reciprocal use agreements. The proposed action proposes emphasizing native species recovery, as described in Chapter 1.4.3 and Chapter 2.3.3 (habitat restoration).

2.4.3. Apply Recommendations by Beschta and others (1995)

Comments submitted during scoping requested considering an alternative modeled on the recommendations of a report by Beschta and others (1995). Specifically:

- Prohibit post-fire logging and road building on all sensitive sites, including: severely burned areas (areas with litter destruction), on erosive soils, on fragile soils, in roadless/unroaded areas, in riparian areas, on steep slopes, and any site where accelerated erosion is possible. This would include late successional and riparian reserves, and protective land allocations or designations including botanical and scenic river areas.
- Protect all live trees.
- Protect all old snags over 150 years old.
- Protect all large snags over 20 inches d.b.h.
- Protect at least 50 percent of each size class of dead trees less than 20 inches d.b.h.

This alternative was eliminated from detailed analysis because it does not respond to the purpose and need, and it would not allow BLM to implement its policy objectives for creating a safe environment by felling and removing hazard trees, as described in Chapter 1. The proposed action does not propose the building of any new roads, and actions are in place to protect soils during project implementation (Chapter 2.3.5). The proposed action would only fell and remove hazard trees with imminent and likely imminent failure potentials, as discussed in the project design features section in Chapter 2.3.5.

2.4.4. Close all BLM Roads within Project Area

BLM received a request to consider an alternative that closes logging roads in the LSR to reduce public hazards, instead of logging damaged trees along roads. If roads are needed for administrative purposes, the road would be reopened later and any obstructions and hazards at that time would be removed.

The decision to eliminate this alternative from detailed analysis was made because it is not in accordance with management direction from the Roseburg District ROD/RMP that provides for:

- Continuing to make BLM-administered lands available for needed rights-of-way (p. 69).

- Access to non-federal lands through LSR will be considered and existing right-of-way agreements, contracted rights, easements and temporary use permits in LSR will be recognized as valid uses (p. 32).

- Reciprocal rights-of-way agreements will continue to be used to identify conditions of use that are equitable and nondiscriminatory and facilitate management of the road network. Most of the lands where logging road right-of-way agreements are appropriate are now covered by reciprocal agreements. The 140 individual agreements and permits will continue to be subject to the regulations in effect when they were executed or assigned (p. 71).

Closing all roads would also be inconsistent with management direction providing for fire suppression response that includes:

- Limiting the size of all wildfires (p. 76).

- Suppressing wildfire to avoid loss of habitat and to maintain future management options (p 76).

- Providing appropriate fire suppression responses to wildfires that will help meet resource management objectives and minimize the risk of large scale, high intensity wildfires (p. 75).

2.4.5. Broadly Define and Remove Hazard Trees along all BLM Roads within Project Area

Comments submitted during scoping requested consideration of an alternative that broadly defines hazard trees and mandates that hazard removal occur on all roads within the fire area. BLM also received a request to consider an alternative that hazard tree removal should apply to the entire road system, within two tree lengths of the road.

This alternative was eliminated from detailed analysis because it would not be in accordance with management direction from the Roseburg District ROD/RMP which requires the preparation of late-successional reserve assessments (LSRAs) that provide criteria for developing appropriate treatments, and for:

- Retaining all standing live trees, including those injured (e.g., scorched) but likely to survive (p. 30).

- Retaining snags that are likely to persist until late-successional forest conditions have developed and a new stand is again producing large snags (p. 30).

In Alternative Two, hazard trees would be identified based on the OSHA Field Guide for Danger Tree Identification and Response (Toupin *et al.* 2008), and hazard tree felling would occur within individual tree potential failure zones, as described in the project design features (Chapter 2.3.5). The same risk is not considered to exist along all roads, and Action Alternative Two is tailored to take into account the level of risk associated with hazard trees located above or below a road, and the influence of slope gradient in increasing or decreasing the risk.

Although priority roads have been identified in the Action Alternative Two based on a variety of criteria (see Chapter 2.3.1.1), hazard tree identification and felling of individual and small groups of trees may occur to ensure public and operator safety as needed throughout the project area.

2.4.6. Reduce Snag Retention and Downed Wood in High Fire Risk Areas

BLM received a request to consider an alternative to alter snag and down wood retention guidelines for the LSR by increasing salvage across the landscape in a targeted fashion that reduces snag retention and down wood in high fire risk areas, particularly higher on the slope where snags are more prone to lightning strikes.

Comments submitted during scoping also requested considering an alternative that leaves a minimum amount of snags and other fuels in moderate to high severity bum areas to prevent the risk of future large-scale fire. Specifically, develop an alternative that deviates from snag and coarse wood retention guidelines in the Northwest Forest Plan to address the risk of high intensity fire across the landscape and to neighboring properties and infrastructure.

The decision to eliminate this alternative from detailed analysis was made because it outside the scope of the EA to consider. Further, it would not be in accordance with management direction from the Roseburg District ROD/RMP which requires the preparation of LSRAs that provide criteria for developing appropriate treatments, and for:

- Retaining all standing live trees, including those injured (e.g., scorched) but likely to survive (p. 30).

- Retaining snags that are likely to persist until late-successional forest conditions have developed and a new stand is again producing large snags (p. 30).

Snag and down wood objectives are established in the LSRA, and changes to the current recommendations would require review and acceptance by the Regional Ecosystem Office. The LSRA was recently updated to discuss and analyze changes that occurred to the LSR 259 block resulting from the Rabbit Mountain Fire (USDA and USDI 1998), (Appendix C). The LSRA updated the amount of CWD recommended for retention within roadside treatment areas, based on reducing hazardous coarse wood buildup (Chapter 2.3).

2.4.7. Strategic Fuel Breaks

BLM received a request to evaluate creation of strategic fuel breaks within the project area. This was evaluated in conjunction with the Douglas Forest Protective Association. This evaluation concluded that, within the project area, it would not be feasible to construct effective fuel breaks working only on BLM lands.

2.5. Resources not Present or Affected

2.5.1. Cultural Resources

Cultural resource inventories within the proposed project area are complete as of June 13, 2014. Eighteen pedestrian surveys resulted in the identification of one historic mining shaft (OR-10-

323) located approximately 200 feet or more upslope from any of the proposed treatment areas (CRS No. SR1412, SR1405, SR1402, SR0114, SD9492, DW9301, 039304, 039207, 039102, 039008, 038818, 038816, 038806, 038801, 038719, 038703, 038614, 038514). The site is geographically separated from the proposed project, and there would be little chance of impact during project implementation. As a result, the proposed project will have no effect on known cultural resources.

Any cultural resources located during project implementation would be appropriately managed either through avoidance or mitigation. In this way, no cultural resources would be adversely affected by this project. Thus, the BLM is in compliance with Section 106 of the National Historic Preservation Act under the guidance of the 2012 National Programmatic Agreement and the 1998 Oregon Protocol. In accordance with BLM policy and legal requirements, the locations of these sites are not disclosed in public documents in order to diminish the potential for violations of the Archaeological Resources Protection Act.

2.5.2. Botany

Proposed activities have been determined to be non-habitat disturbing activities for all BLM OR/WA special status or Survey and Manage vascular, non-vascular, or lichen species. Therefore, there would be no effect on any of these species.

2.5.3. Noxious Weeds and Invasive Non-Native Plants

As per the required design features described above (Chapter 2.3.5, #4) and continued actions to contain, control and eradicate existing infestations as implemented under the Roseburg District Integrated Weed Control Plan (USDI BLM 1995b), the proposed action alterative would result in no perceptible difference in the establishment or spread of non-native plant populations from that expected under Alternative One.

Actions taken to contain, control and eradicate existing infestations are implemented under the Roseburg District Integrated Weed Control Plan (USDI BLM 1995b). These actions include inventory of infestations, assessment of risk for spread, and application of control measures in areas where management activities are proposed or planned. Control measures may include release mowing, hand-pulling, and limited use of approved herbicides.

2.5.4. Recreation

Some of the project area is within a designated BLM Back Country Byway and Oregon State Scenic Tour Route. Proposed roadside, railroad right-of-way, and quarry safety treatments, roadside fuels reduction, habitat restoration, and road decommissioning would not degrade the values used to identify and designate a byway. The Cow Creek Recreational Gold Panning Day-Use Area is also located within the project area, although the proposed activities would not affect the sites. Felling and removal of hazard trees along the BLM Back Country Byway and Cow Creek Recreational Gold Panning Day Use Area would only impact recreationalists for a short period of time.

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Chapter 3. Affected Environment and Environmental Consequences

3.1. Introduction

This chapter summarizes the current condition of specific resources present, or with reasonable potential to be present in the project area that could be affected by proposed project activities. Anticipated short-term and long-term effects that may result from implementation of the alternatives are addressed, including those effects that are direct, indirect and cumulative. The Chapter concludes with a "Monitoring" section (Chapter 3.10).

The discussion is organized by resource, addressing the interaction of the effects of hazard tree felling and removal, roadside fuels reduction, habitat restoration, and road decommissioning with current conditions of this environment. This analysis describes potential effects, how they might occur, and the incremental result of those effects, focusing on direct and indirect effects with a realistic potential for cumulative effects, rather than those of a negligible or discountable nature.

The Council on Environmental Quality (CEQ) provided guidance on June 24, 2005 as to the extent which agencies of the Federal government are required to analyze the environmental effects of past actions when describing the cumulative environmental effect of a proposed action in accordance with Section 102 of the National Environmental Policy Act (NEPA). The CEQ noted the "[e]nvironmental analysis required under NEPA is forward-looking," and "[r]eview of past actions is only required to the extent that this review informs agency decisionmaking regarding the proposed action." This is because a description of the current state of the environment inherently includes effects of past actions. Guidance further states 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 historic details of individual past actions."

3.2. Introduction to the Cumulative Effects Analysis

For all analyzed resources, Alternative One (no action) would have no cumulative effects because no proposed activities would occur at this time.

Past actions and previous decisions are included in the description of existing condition for each resource. Ongoing BLM actions in the project area include precommercial thinning, pruning, manual maintenance, dispersed recreation, special forest products gathering, road maintenance, fire suppression, weed control, and the Medford District's Douglas Fire Complex Recovery Project. Other ongoing actions in the project area include reciprocal rights-of-way road safety on BLM-managed lands, as well as private land management.

The Douglas Fire Complex Recovery project would salvage harvest 1,276 acres of fire-injured and fire-killed trees on matrix lands within the Medford District. These activities occur in units and along 14 miles of BLM-managed roads. Connected activities include construction of 4.1 miles of temporary routes (to be decommissioned after use). Salvage harvest would not occur in Riparian Reserves, 100-acre Northwest Forest Plan northern spotted owl activity centers, and 0.5-mile northern spotted owl nest cores.

Reciprocal rights-of-way road safety actions on BLM-managed lands are ongoing. Under the reciprocal rights-of-way agreements, these actions are considered non-discretionary for the BLM. There are 32.6 miles of road on BLM-managed lands within the project area. Of these, 9.4 miles of road access private land, and are outside the proposed roadside safety treatment areas. Up to 367 acres of imminent hazard trees could be felled and removed along these 9.4 miles of road under reciprocal rights-of-way agreements, only partially overlapping the proposed treatment areas but within the project area.

It is assumed that most fire-injured and fire-killed forest stands on private land have been salvage harvested and converted to early successional conditions, and large industrial owners will continue to manage primarily for timber production on a rotation of 40-65 years. Intensive timber management on private land will include the use of herbicides for control of competing vegetation, resulting in highly simplified vegetative communities.

Cumulative effects analyses are included in the environmental consequences for each resource below.

3.3. Forest Vegetation

3.3.1. Introduction

The Roseburg District BLM manages approximately 43,600 acres within the Lower Cow Creek 10th field watershed (Appendix A, Figure A- 2). Prior to the Rabbit Mountain Fire there were 1,239 acres or approximately 3 percent classified as non-forest. Early-seral stands in the 10 to 40 ten-year age class made up 11,477 acres or approximately 26 percent of the BLM-managed lands in the watershed. Stands within the 50 to 110 ten-year age class accounted for 9,309 acres or roughly 21 percent older stands, 120-year age class and greater, totaled 21,573 acres or about 50 percent of the BLM lands in the watershed.

3.3.2. Affected Environment

3.3.2.1. Introduction

All BLM-managed lands within the project area are allocated as LSR. The South Coast-North Klamath LSRA (USDA, USDI 1998) details the desired future conditions of the project area.

3.3.2.2. Vegetation Types within the Project Area

The vegetative potential for forest development is characterized by plant series. This classification is based on the concept of potential natural vegetation. Plant series are based on the dominant, most shade tolerant regenerating tree species on the site (Hickman 1994). The project area includes the Tanoak Series, Grand Fir Series, and Cool Douglas-fir/Hemlock Series, which are detailed below.

Tanoak Zone: The majority of the project area is in the Tanoak Zone, which has an abundance of tanoak in tree form on north aspects, and tanoak in shrub form on south aspects. Douglas-fir is the primary associate and usually dominates the composition, except for the presence of tanoak, sugar pine, ponderosa pine, incense-cedar, California black oak, Pacific madrone and canyon live oak are important in this zone.

Grand fir, western redcedar and red alder are much less common and often absent, with white alder beginning to replace red alder in many of the drainages. Golden chinquapin in tree form continues to be a component on some north aspects.

Shrub cover consists of Pacific poison oak common on south aspects, and canyon live oak in either tree or shrub form is often present, with the addition of evergreen huckleberry on north aspects. The occurrence of a shrub form of tanoak on south slopes, in contrast with the tree form on north slopes, points out the dramatic environmental difference between aspects.

Grand Fir Zone: As a result of the frequent disturbance in southwestern Oregon, Douglas-fir, an early-seral species, is the dominant overstory tree in the Grand Fir Series. Grand fir is the dominant tree species in the understory, and is particularly abundant in older stands with a low frequency of disturbance. In wetter areas of the Cascade Range and Siskiyou Mountain areas, western hemlock is present. Tree species found in this zone on drier sites include Pacific madrone, California black oak and incense-cedar. On wetter sites big-leaf maple and western redcedar can be found. Dwarf Oregon-grape and common prince's pine are widespread throughout the Series. Pacific rhododendron and salal are common in moist, high productivity areas. Incense-cedar, golden chinquapin, ponderosa pine and whipple vine are present on dry sites.

Cool Douglas-fir/Hemlock Zone: This zone occurs in the highest elevations within the project area and accounts for a small percentage of the area. This zone is typically dominated by Douglas-fir; but can support some stands dominated by western hemlock. There are some sporadic occurrences of western redcedar, incense-cedar, sugar pine, Pacific yew and grand fir. Minor amounts of Pacific madrone can occur on warmer positions but are not very common. Soils with high amounts of rock fragments support a great deal of canyon live oak on both north and south aspects. Other vegetation species found in this zone include Pacific rhododendron, salal, cascade Oregon-grape, red huckleberry and usually golden chinquapin.

3.3.2.3. Existing Condition

Acres Impacted by the Fire

The acres discussed below refer to BLM lands administered by the South River Field Office. Fire occurring in non-forested land accounted for 61 acres or less than 1 percent of the fire area.

Within approximately 6,300 acres that burned from the Rabbit Mountain Fire on the South River Resource Area, fire intensity impacts to the forest vegetation resulted in substantial changes to the pre-fire forest vegetation seral stage communities. Current conditions were classified through utilization of FVS modeling and RAVG Canopy Cover Loss analysis. In forest stands that experienced greater than 50 percent loss of canopy cover, complete or near complete mortality of all conifer vegetation occurred; majorities of shrub and hardwood species experienced dieback of their vascular tissue, but did not experience complete mortality and are rapidly regenerating from the pre-existing root structure. The successional pathway in these stands has been reset to early-seral conditions. Within the project area, early seral conditions— which are defined in this case by the absence of live tree crown cover, presence of dead structural stand components, and high vegetative competition from the dominant presence of shrubs, forbs and grasses— account for approximately 27 percent (1,709 acres) of the project area. Areas within the project area that experienced between 50 percent and 0 percent canopy cover loss—typically characterized by surface fires with isolated and individual tree and shrub mortality—account for approximately 73 percent (4,558 acres) of the project area (Table 3-1; Appendix A, Figure A- 6).

Table 3-1. RAVG canopy cover loss analysis

Canopy Cover Loss	Acres	Percent of Project area	Seral Condition
0%	3,567	56.9	No Change
0% - 25%	951	15.2	No Change
25% - 50%	40	0.6	No Change
50% - 75%	7	0.1	Reset to Early Seral
75% to 100%	1,702	27.2	Reset to Early Seral
Total	**6,267**	**100**	

Utilizing Roseburg BLM Forest Operations Inventory ten-year age class data and the Rabbit Mountain RAVG Canopy Cover Loss dataset, analysis was preformed to estimate the pre- and post-fire impacts to age class distributions within the project area (Table 3-2).

Table 3-2. RAVG canopy cover loss post-fire conditions

Age Class	Canopy Cover Loss[1] (ac)			
	0-25%	**25-50%**	**50-75%**	**>75%**
Non-forest	19	0	0	16
200+ years	685	34	5	923
80-200 years	79	6	2	272
40-79 years	32	0	0	42
0-39 years	136	0	0	449
Total	**951**	**40**	**7**	**1,707**

[1]Based upon Rapid Assessment of Vegetation Conditions after Wildfire (RAVG) data

Stand Attributes

FVS modeling was run to estimate the previous and current conditions of stand attributes before and after the Rabbit Mountain Fire. Stand attributes such as snags and down wood were analyzed among three groups of pre-existing stand types that experienced two different levels of fire severity; total mortality and less that 50 percent mortality. Two fire severity model runs were applied to three stands grouped into three size categories (Table 3-3). Due to limitations of the model the snag variable is described by snags per acre in ten-year increments starting one year prior to the Rabbit Mountain Fire in 2013; while down wood is described in tons per acre annually.

Table 3-3. Post-fire snag and down wood attributes

Pre-Fire Stand Type	Size Class (d.b.h.)	Fire Severity	Hard Snag (snags/acre) 2023 estimates	Soft Snag (snags/acre) 2023 estimates	Hard Down Wood (tons/acre) 2014 estimates	Soft Down Wood (tons/acres) 2014 estimates
Small Tree 0-39 years	< 10 inches	Mixed Severity	145.6	47.5	1,027.7	792.3
		High Severity	177.8	67.2	965.2	536.8
Medium Tree 40-90 years	10-20 inches	Mixed Severity	273.4	34.7	1,131.3	854.9
		High Severity	346.9	50.3	950.4	549.5
Large Tree 91+ years	> 20 inches	Mixed Severity	142.0	10.2	1,844.6	705.9
		High Severity	177.7	16.1	1,454.2	424.3

Insects and Disease

Bark beetle and woodborer insect groups are present inside and within one mile of the fire area. Due to the nature of insect migration and progeny, it is impossible to fully estimate the current and future extent of insect outbreaks in live and dead trees within the project area. Bark beetle outbreaks typically occur when there is an abundance of host material from fire-killed and injured trees. They are readily capable of propagating within fire areas and then dispersing subsequent generations into lightly burned or adjacent green stands (SWOFIDSC 2014). Bark beetles are strongly associated with attacks on large fire-injured trees in dense stands with moderate levels of bole char and light to moderate levels of crown scorch (Hood and Bentz 2007, Fettig *et al.* 2007, Parker *et al.* 2006). Woodborers, particularly the flatheaded fir borer (*Phaenops drummondi*), although less aggressive than bark beetle species, commonly breed in felled trees or those weakened by fire, defoliation, drought, or other types of disturbance (SWOFIDSC 2014, Shaw *et al.* 2009, p. 5).

The 2012 and 2013 Insect and Disease Aerial Detection Surveys show no evidence of large-scale bark beetle populations active within the footprint of or within one mile of the perimeter of the Douglas Fire Complex in those years (USDA *et al.* 2012, 2013). Some activity was detected affecting small areas or individual trees. These levels are indicative of scattered, low-level bark beetle and flatheaded fir borer populations with no concentrated activity (SWOFIDSC 2014).

3.3.3. Environmental Consequences

3.3.3.1. Alternative One – No Action

Hazard Tree Safety Treatments

Under Alternative One, none of the approximately 6,300 acres of the Rabbit Mountain Fire that burned on the BLM’s South River Resource Area would receive hazard tree safety treatments for likely hazard trees. Likely hazard trees throughout the project area would remain. Imminent hazard trees would be felled to ensure public safety as described in Chapter 2 and as stated in the RMP (p. 73).

Snags levels would continue to increase over the next ten years as trees injured but not yet killed by fire, insects or disease continue to die (Table 3-3).

Trees weakened or killed by the fire would contribute to snags and CWD. Falling snags may destroy emerging regeneration and would increase fuel loads. Post-fire studies in Oregon demonstrate that while fires provide a large volume of snags, post-fire snag fall and fragmentation add so much wood to the forest floor that it constitutes a disturbance in itself (Brown *et al.* 2013), potentially exceeding pre-fire fuel accumulations by 20 percent (Tappeiner *et al*. 2007, p. 274). Any subsequent wildfire events would exhibit increased fire intensity and duration; thereby potentially killing any natural regeneration that may have become established. This accumulation of both fine and large fuels increases the fire hazard in both the short- and the long-term (Peterson *et al.* 2009).

Roadside Fuels Reduction

Under Alternative One, post-fire deterioration as well as the failure of tops, limbs, and boles of snags would reduce access to planting sites, pose safety hazards to tree planters, and increase susceptibility of the stand to future severe fires (Tappeiner *et al.* 2007, pp. 256 and 289). Oliver and Larson (1996, p.106) state that overstory and understory stems killed, but not consumed by the fire remain as standing, dry, combustible fuels for another fire and greatly reduce forest productivity. The retention of all snags and CWD fuels under Alternative One causes an increased risk of secondary burns. No action would contribute to more intense burning conditions, complicating firefighting efforts. Peterson *et al.* (2009) suggest that without treatment or removal of post-fire deadwood density, "high fuel loads may complicate the reintroduction of low-severity fire to the recovering forest".

Habitat Restoration

Under this alternative, no further restoration planting designed to initiate a trajectory of accelerated stand development toward late-seral habitat characteristics would occur. Taking no action would likely result in a higher proportion of hardwoods and shrubs, particularly tanoak, than drought and fire resistant conifer species such as incense-cedar, sugar pine and ponderosa pine, and Douglas-fir. Research by Sessions *et al.* (2004) states:

> "…without management intervention, hardwoods and shrubs in general – and tanoak in particular – are likely to dominate post-fire succession for decades in areas where conifer seed sources were greatly reduced by wildfire, especially if re-burns occur before early-seral conifers become large enough to resist fire damage"

Timely management in the first one to two years post-fire is critical in the future outcome of the forest because fires facilitate the rapid establishment of hardwoods and shrubs. Alternative One would rely on natural recruitment and establishment of conifer germinant, predominately Douglas-fir; this would only occur if a viable seed source is available. However, natural conifer regeneration is neither predictable nor reliable to meet stocking objectives or ensure desired future conditions of the development of late-seral habitat characteristics. A recent post-fire study in southwest Oregon demonstrated, at distances greater than 0.25 mile from a seed source a substantial decrease in abundance and stocking of conifer germinant occurred (USDA, USDI 2014). Furthermore, desired minor conifer species such as ponderosa pine only produce large seed crops every 4-8 years; during off-years the competing flush of regenerating vegetation can inhibit their establishment (Tappeiner *et al.* 2007, p.283). No action would result in delaying or not achieving long-term desired future conditions within the project area as described in the South Coast-North Klamath LSRA (USDA, USDI 1998).

Road Decommissioning

Alternative One would not implement road decommissioning activities on proposed roads, and therefore, would not produce a significant change to the vegetative resources. Existing roads would continue to be in place. Without decommissioning, vehicular traffic would remain on the proposed roads and vegetation would not occupy the site.

Summary

Mitigation of imminent hazard trees would continue per RMP direction to reduce hazards to humans along roads and trails and in or adjacent to recreation sites (RMP, p. 30), however trees felled would not be removed, creating an increased fuel load (Chapter 3.4.3). Additionally, trees deemed to be a likely hazard would not be mitigated and could create additional public safety concerns within the analysis area. Failure to initiate habitat restoration does not meet the purpose and need to initiate stand development on a trajectory to attain late-seral habitat characteristics through (1) accelerating stand initiation phase; (2) restoring historical tree species composition through planting of minor tree species to complement the natural seeding of Douglas-fir. Additionally, failure to initiate habitat restoration would not meet management direction established in the RMP (p. 153) to protect and enhance conditions beneficial to the creation of late-seral forest conditions, including reforestation; nor would it exhibit practices that initiate or maintain stands on desired developmental pathways.

Short-term effects of no treatment would result in increased competition between desired conifer species and colonizing and sprouting hardwoods and shrubs. The first few post-fire years are critical to the outcome of a recovering site. In a no-treatment scenario, natural establishment of conifer germinant may occur if a seed source is available within 0.25 mile. However, conifer ingrowth is neither predictable nor reliable to meet stocking objectives or to assure regeneration standards and species composition for desired future conditions for the LSR. Limited conifer establishment is expected where hardwoods and shrubs, particularly aggressive tanoak, pioneer the post-fire site.

3.3.3.2. Alternative Two – Proposed Action

Hazard Tree Safety Treatment and Roadside Fuels Reduction

Hazard trees felled and removed under Alternative Two would include up to 524 acres of fire-killed and fire-injured trees, either conifer or hardwood, that are an imminent or likely a hazard to public safety (Chapter 2.3.1; Appendix A, Figure A- 3). Cutting and removing hazard trees from proposed roadside, railroad right-of-way and quarry safety treatment areas would result in near complete reduction of standing fire-killed and fire-injured trees within these areas. However, treatment intensity would vary relative to measured hazard tree height; a greater number of treatable hazard trees would be cut and removed close to the road, railroad right-of-way or quarries while fewer hazards would be treated further away. The intensity of this gradient would be relative to the tree heights adjacent to the road, railroad right-of-way or quarry. Figure 3-1 provides a graphic representation of this estimated gradient and effect.

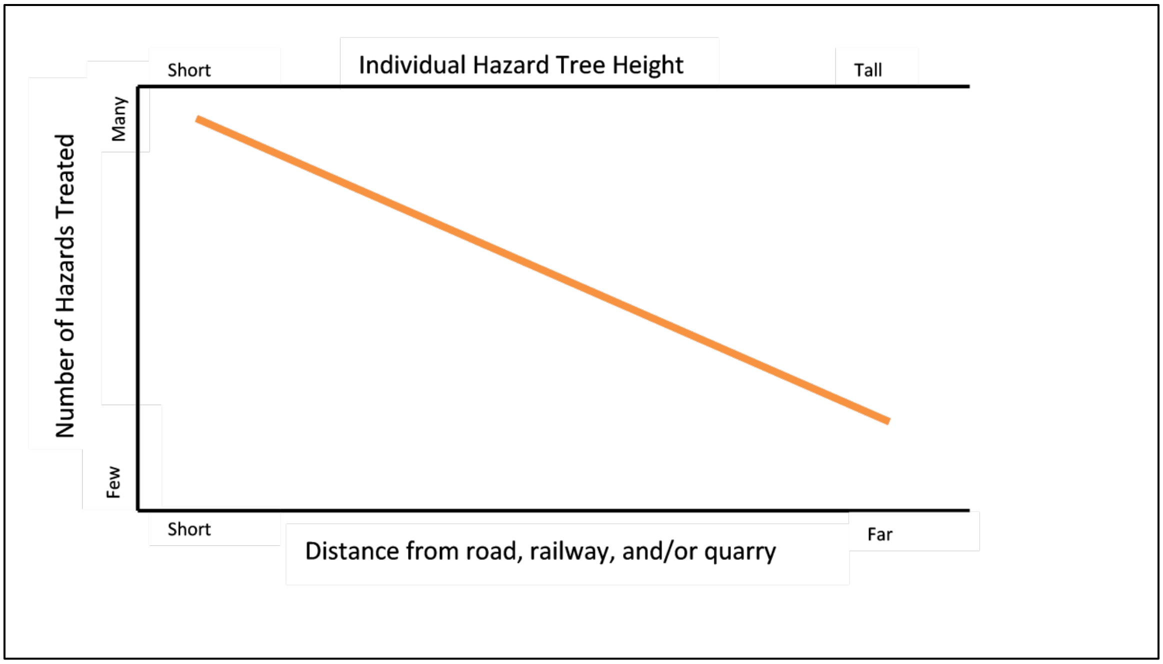

Figure 3-1. Representative gradient of hazard trees removed

Due to high fire severity and the current lack of established vegetation one year after the fire in the project area, impacts to vegetation from hazard tree felling and removal, in addition to roadside activity fuels reduction, are expected to be minimal. Where existing shrub or hardwood root systems are present and sprouting and recolonization is occurring, vegetation may be damaged as hazard trees are felled and removed and fuels reduction projects are implemented. Naturally regenerating conifer trees may also be affected during hazard tree felling and removal. However, post-fire studies from southwest Oregon have demonstrated that disruption of sprouting vegetation did not result in the loss of those shrub species from the sites or decrease the diversity of the developing plant communities (USDA, USDI 2014).

Hazard tree mitigation would impact the number of standing fire-killed and fire-injured trees within the proposed treatment areas as well as reduce the future recruitment of down woody debris. Large, down woody debris purposely left on site would provide micro-climates of shade and moisture for sprouting and colonizing vegetation.

Habitat Restoration

Alternative Two would result in a more balanced proportion of hardwoods, shrubs and conifers. Such an affect would initiate a stand trajectory to attain the desired late-successional habitat characteristics described in the South Coast-North Klamath LSRA (USDA, USDI 1998). Planting a varying proportion of fire resilient conifer species such as ponderosa pine, sugar pine, incense-cedar and Douglas-fir would both accelerate the stand initiation phase and restore historical tree species composition, which would drive the stands toward the expected future conditions as defined by the RMP to develop a functional, interacting, late-successional forest ecosystem (p. 153).

The 486 acres proposed for planting in young forest (younger than 50 years-old) would return stocking levels and species composition to that of pre-fire conditions. Of the 1,709 acres analyzed using the RAVG model that experienced stand-replacing fire in stands greater than 50 years-old, 414 acres are proposed for planting due to a lack of available seed sources within 650 feet and no assurance that natural conifer regeneration would take place. Conifer regeneration without active reforestation may have little or no opportunity for regeneration amid the rapidly regenerating shrubs and hardwoods (Sessions *et al.* 2004). Furthermore, research from Zhang *et al*. (2006) and Sessions *et al*. (2004) demonstrate that early planting of conifers maximizes the trajectory of development in terms of tree density, survival, and growth in the early years of stand development.

Road Decommissioning

Road decommissioning would take place on up to three miles of roads within the project area (Appendix A, Figure A- 3). Decommissioning roads would restrict vehicular access thereby allowing natural vegetation to revegetate the original road surface.

Cumulative Effects

Private Land Management

Intensive post-fire timber management on private land will include the use of herbicides for control of competing vegetation, resulting in highly simplified vegetative communities.

Roseburg District BLM Actions

Ongoing Roseburg District BLM actions, described in the Cumulative Effects Introduction (Chapter 3.2), have been determined to have no cumulative effect when combined with activities proposed for Alternative Two, and would not add to cumulative effects on the vegetation resources analyzed in Alternative Two.

Medford District BLM Douglas Fire Complex Recovery Project

Actions proposed by the BLM's Medford District, including salvage, would not have a cumulative effect on the vegetative resources analyzed in Alternative Two.

Reciprocal Rights-of-Way Road Safety Actions

Reciprocal rights-of-way road safety actions on BLM-managed lands are ongoing, and are described in the Cumulative Effects Introduction (Chapter 3.2). These non-discretionary actions requested by the right-of-way holder are not reasonably predictable in their scope or location; each individual request is unique and depends on the right-of-way holders proposed action, level of danger, and fire severity in the proposed location. Such actions may add to cumulative impacts on the vegetation resources. These potential actions would cumulatively add to the proposed hazard tree felling and removal acres, thereby reducing fire-killed trees and future down wood in areas not currently being analyzed under Alternative Two.

Summary

Treatment of hazard trees along roads, railroad right-of-way and quarries as described in Alternative Two (Chapter 2.3.1) would meet management direction established in the RMP (p. 73) to remove trees along rights-of-way if they are a hazard to public safety, as well as reduce fuel loads by removing felled trees. Alternative Two meets the purpose and need established in

Chapter 1 to provide a safe environment and travel conditions for members of the public, and to reduce and modify fuel hazards and potential fire ignition and spread.

Habitat restoration described in Alternative Two (Chapter 2.3.3) would meet management direction described in the RMP and the purpose and need described in Chapter 1.3.3 and 1.4.3. Planting trees for habitat restoration on up to 1,392 acres would ensure late-successional characteristics are more rapidly achieved than under Alternative One.

3.4. Fire and Fuels Management and Air Quality

3.4.1. Introduction

When discussing the fire environment, there are five main parameters of concern; fire behavior, fuel models, fuel conditions, ignition risk, and fire suppression. These five parameters are interrelated and dependent upon each other, so modification of one usually results in changes to others. Fire behavior is predicted by categorizing an area with a fuel model, based on current fuel conditions. This prediction, added to the risk of human-caused fire ignition, determines fire suppression concerns. By modifying the fuel model in strategic locations (e.g., roadsides), we can modify the predicted roadside ignition risk and fire behavior and, congruently, the fire suppression concerns.

3.4.1.1. Fire Behavior

Potential surface fire behavior characteristics such as rate of spread, flame length, and fireline intensity are influenced by three environmental factors; fuels, weather, and topography. Of those, fuels are the only factor that can be manipulated by land management and fire suppression activities. Firefighting is usually focused on breaking up the horizontal continuity of the fuels, creating a fire break that will stop fire spread. Hazardous fuels treatments focus on disrupting fuel continuity and increasing the ease of line building related to fuel loading and fuel size classes.

Fire behavior dictates which fire suppression strategy may be safely and effectively implemented and serves as a threshold. Table 3-4 displays the different thresholds for different suppression actions. These fire suppression actions directly relate to flame length and the types of suppression action taken by ground crews to where fire control efforts are ineffective.

Table 3-4. Relationship of surface fire, flame length, and intensity to suppression actions[1]

Flame Length (ft)	Fire intensity (Btu/ft/s)	Actions	
< 4	< 100		Fires can generally be attacked at the head or flanks by persons using hand tools. Hand line should hold the fire.
4-8	100-500		Fires are too intense for direct attack on the head by persons using hand tools. Hand line cannot be relied on to hold the fire. Equipment such as dozers, pumpers, and retardant aircraft can be effective.
8-11	500-1000		Fires may present serious control problems—torching out, crowning and spotting. Control efforts at the fire head will probably be ineffective.
> 11	> 1000		Crowning, spotting and major fire runs are probable. Control efforts at head of fire are ineffective.

[1]Andrews and Rothermel 1982

3.4.1.2. Fuel Models

Fuel models are systems used to classify vegetation pertaining to local site conditions and assist land managers in predicting potential fire behavior. These models are sets of parameters that describe physical properties including loading, fuel bed depth, and moisture of extinction (Anderson 1982, Scott and Burgan 2005).

Each model, although a bit generalized, allows managers and firefighters to determine a range of fire behavior predictions based upon changes in environmental conditions such as fuel moisture, wind, and slope.

Fire behavior fuel models are grouped by the primary burning fuel type, i.e. grass, shrubs, timber understory, timber litter, or timber slash. The general predicted fire behavior can be inferred by describing the fuel model grouping. Figure 3-2 shows the predicted fire behavior for the five fuel model groups under identical environmental conditions. Three of the groups, shrubs (SH), timber understory (TU), and timber litter (TL) are shown as a range of fuel loading for that fuel model group. Prior to the fire, the majority of the project area was best described by timber litter (TL) and timber understory (TU) fuel models.

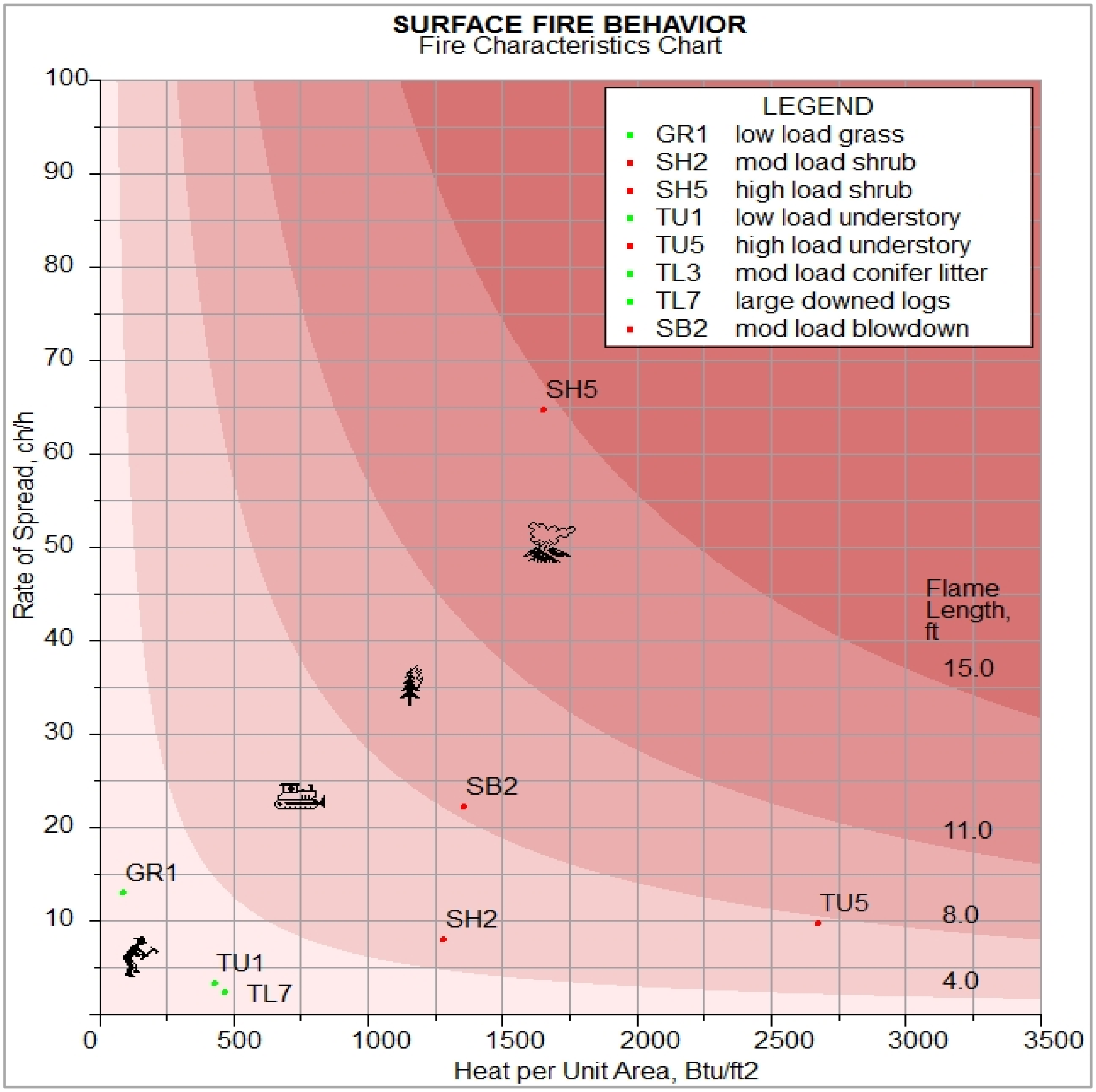

Figure 3-2. Fire characteristics chart for fuel model groups (Andrews *et al.* 2011)
Note: the predicted flame length is depicted on the curved lines with the value listed on the right side of the graph.

3.4.1.3. Fuel Conditions

Fire hazard generally refers to the difficulty of controlling potential wildfire. Fire behavior characteristics, such as rate of spread, intensity, torching, crowning, spotting, fire duration, and resistance to control commonly determine fire hazard (Brown *et al.* 2003). The contribution of fuels to fire hazard is determined by seven characteristics; vertical arrangement, horizontal continuity, size and shape, loading, compactness, moisture content, and chemical content. Of those seven, five can be reasonably influenced by management; vertical arrangement, horizontal continuity, size and shape, loading, and compactness.

Small fuels, those less than three inches in diameter, are generally the primary carrier of a fire and the most easily ignited. Coarse woody debris, fuels greater than three inches in diameter, do not generally contribute to fire ignition or spread but can greatly influence potential fire severity, fire duration and fire suppression tactics. Continuous fuels, whether surface litter, shrubs, or tree crowns, allow the fire to burn continuously, influenced only by weather and terrain.

Heavy fuel loading makes building of fire line during initial attack very difficult. Different size classes of downed wood have different influences on fire line construction. Small fuels provide little difficulty to fire fighters building line as they are easily moved, disrupting the horizontal continuity to bare soil. Dense mid-sized fuels, between three and nine inches in diameter, can considerably slow fire line construction. A thick layer of these fuels are difficult to separate and can be impossible to clear with just hand tools.

Larger fuels greater than nine inches in diameter, which are dispersed (i.e. not continuous) throughout an area, can be avoided by firefighters building line. The denser and more continuous the larger fuels, the more difficult these ‘pockets’ can be to avoid during line construction. Sandberg and Ward (1981) quantified line building rates in different fuel types using a Resistance to Control (RC) rating (on a scale from 1 to 40). The RC rating can be translated to an estimate of the amount of line construction (chains/hour) one person can build. Therefore, the more CWD present, the higher the RC rating, and the slower the line construction rate. For example, “high” resistance to control means “slow work for dozers, very difficult for hand crews; line holding will be difficult” and “extreme” resistance to control means “neither dozers nor hand crews can effectively build and hold line” (Fischer 1981).

The South Coast-North Klamath LSRA (USDA, USDI 1998) cites not only the risk of wildfire in the LSR, but also the risk of wildfire causing damage to existing stands. “Controlling the fuel bed with proper fuel treatment of natural stands, and after forest management activities, is the key to managing the survivability of the LSRs from fire. Heavy ground fuels are also a threat to the survivability of a stand. Course woody debris should be distributed throughout an area to avoid creating ‘jackpots’, which would produce areas of intense heat, thereby producing lethal temperatures to the stand.” (USDA, USDI 1998).

Fuel loading also influences predicted fire behavior. This influence is directly related to the proportions of each size class, as well as the total fuel load. Small fuels (less than three inches diameter) can increase the predicted rate of spread, mid-sized fuels (three to nine inches in diameter) can increase predicted flame lengths, while fuels larger than nine inches in diameter contribute to fire intensity, fire duration, and resistance-to-control. It is generally accepted that initial attack firefighters with hand tools cannot direct attack fires with flame lengths greater than four feet (Andrews and Rothermel 1982) (Figure 3-2).

Table 3-5 demonstrates this dichotomy. Example One has a lower total fuel loading, but 90 percent of the fuel is less than 9 inches in diameter so the estimated fire behavior includes flame lengths beyond the capabilities of firefighters with hand tools. Example Two has almost twice as much total fuel loading, but only 45 percent of the fuel is less than 9 inches in diameter, resulting in a lower predicted flame length. Conversely, the fireline building rate in Example Two is 61 percent slower than Example One.

Table 3-5. Examples of fuel loading and resulting predicted fire behavior

Example number	Photo series number*	Total fuel loading (tons/ac)	Flame length (ft)†	Rate of spread (ch/hr)†	Resistance to control rating‡	Fire line construction (ch/hr/person)‡
1	4-DF-4-PC	27.9	6.4	6.4	9	1.3
		<3” fuel = 33%, 3”-9” fuel = 57%, >9” fuel = 10%				
2	7-DF-4-PC	61.8	3.4	5.4	15	0.8
		<3” fuel = 21%, 3”-9” fuel = 24%, >9” fuel = 55%				

*Photo series from Maxwell and Ward 1976
†Estimates of fire behavior modeled using BehavePlus 5.0.5 (Heinsch and Andrews 2010) at 6% fine fuel moisture and 4 mph mid-flame wind speed
‡Resistance to control rating and fire line construction rate estimates from Sandberg and Ward 1981

3.4.1.4. Human-caused Ignition Risk

The majority (75 percent) of wildfires in Douglas County for the period of 2004-2013 were human caused, primarily accidental (e.g., equipment malfunctions, unattended campfires, and incorrect debris burning). Of the 900 wildfires during that time in the county, 369 (41 percent) occurred in South Douglas District, Douglas Forest Protective Association DFPA which includes the LSR affected by the Rabbit Mountain Fire. Of those 369 fires, 61 percent were human caused. Of the fires determined to be caused by human equipment (i.e. automobiles), approximately 48 percent were roadside ignitions (ODF FireStats 2013). This EA does not address lightning-caused fires in the purpose and need as they are impossible to predict with accuracy.

3.4.1.5. Suppression of Fires

Under the Western Oregon Protection Contract with the DFPA, 94 percent of all fires are to be suppressed at less than 10 acres. This results in aggressive and often successful, initial attack by DFPA resources on every ignition.

3.4.2. Affected Environment

3.4.2.1. Existing Condition

Fuels

The Rabbit Mountain Fire burned with varying degrees of severity (Appendix A, Figure A- 4 and Figure A- 6) and therefore retains varying levels of surface fuels. The fire produced large expanses of fire-killed trees in some areas. On BLM-managed lands, approximately 900 acres of fire-killed trees are far enough away from low severity seed source areas (greater than 650 feet) to make natural regeneration unlikely. Generally, younger trees were less able to survive in areas of high intensity fire but entire stands of older trees were also killed. In areas of low intensity fire most of the vegetation survived and only small dead fuel was consumed. These areas may serve as an example of how forests burned prior to long-term fire suppression as the fire effects were mild.

Vegetation is responding as expected post-fire based on severity in a given area. Enduring plants, (i.e. hardwoods) are re-sprouting and fire resistant or adapted plants (i.e. thick bark pine trees) have survived the fire if conditions allowed (Chapter 3.3). Where fire conditions were extreme and crown fires occurred, many if not most of the normally resistant vegetation was completely killed. These areas generally still have enduring plants present amidst dead trees. The re-sprouting (top-killed) hardwoods and young conifer plantations are considered brush fuel models until sufficient time has elapsed so that the crowns of the trees have separated from the ground.

Air Quality

The Oregon Department of Forestry – Smoke Management Plan (Oregon SMP) identifies areas sensitive to smoke where impacts should be avoided. The Smoke Sensitive Areas in proximity to the project area are the cities of Roseburg, Coos Bay/North Bend, and Grants Pass.

3.4.3. Environmental Consequences

3.4.3.1. Methodology

- The geographic scope used in this analysis focused on lands within the Rabbit Mountain Fire perimeter only on the Roseburg District while more landscape-level processes were considered at the HUC 10 scale (Appendix A, Figure A- 2).

- Fuel models (Scott and Burgan 2005) and photo series were used to estimate and predict surface fuel loading as well as resistance to control.

- Rapid Assessment of Vegetation Conditions after Wildfire (RAVG; Appendix A, Figure A- 6) process was used for assessing post-fire vegetation mortality (http://www.fs.fed.us/postfirevegcondition/whatis.shtml) and Burned Area Reflectance Classification (BARC; Appendix A, Figure A- 4)) assessing post-fire vegetation condition using soil burn severity (http://www.fs.fed.us/eng/rsac/baer/barc.html).

3.4.3.2. Assumptions

The following assumptions were made to generate more accurate surface fuel loading estimates post-fire and post-hazard tree mitigation.

- Cut trees of all sizes would remain on site unless unstable on the slope or where large accumulations of fuels prove a concern to future fire. Where there is an excess of felled hazard trees (greater than 10 tons per acre (i.e., 10 logs per acre, 16 feet in length)), removal may occur in order to: provide access for future fire suppression, decrease firefighter suppression hazards, decrease future fire severity potential, and reduce hazardous fuel loading (USDA and USDI 1994c, p. C-13 &14).

- Heavy concentrations of large, greater than nine inch diameter, fuel inhibits initial attack firefighting capacity and safety.

- Under the Western Oregon Fire Protection Services contract between the BLM and Oregon Department of Forestry (ODF), all initial attack fires will be immediately and completely suppressed. The ODF shall control 94 percent of all fires before they exceed 10 acres in size.

- Hazard trees outside of the project area would be felled and covered under the Oregon and the Federal Occupational Safety & Health Administration (OSHA), who have administrative rules about hazard trees and the work environment. The Oregon rules are called Oregon Occupational Safety and Health Code Division 7 Forest Activities and apply to all types of forest activities. Federal OSHA rules regarding federal employees are called General Duty Standard (29 CFR 1960.8).

- Due to higher levels of human activity, roadways and worksites are considered the highest probability areas for injury or property damage.

- The probability of a serious accident or injury to the public, including forest workers, is assumed to be moderate due to recreation activities and safety compliances required by forest workers under OSHA and BLM policy.

- To comply with OSHA requirements, imminent hazard trees would be felled as identified.

- The Cow Creek area, where the Rabbit Mountain Fire occurred, is not within the Wildland Urban Interface (WUI) boundary originally described in the Douglas County Community Wildfire Protection Plan of 2004; but is identified in the 2011 Appendix B update as WUI and a priority fuels treatment area. This change was implemented to recognize Cow Creek Road as an important escape route and recreation area.

3.4.3.3. Fire and Fuels Management

Effects Common to All Alternatives

Direct and Indirect Effects

In the event of an ignition that spreads away from roadways, fire fighters may be required to fell a number of hazard trees to safely reach and initially attack the fire. Due to previous and future felling of imminent threat hazard trees, there are and would be heavy pockets of CWD, increasing the resistance to control and causing many areas to become inaccessible for fire fighters. As described in the affected environment (Chapter 3.4.2), concentrations of fuel, both small and large diameter, are a fire hazard. Since the Douglas Forest Protective Association (DFPA) is contractually obligated to initial attack and fully suppress all fires at the smallest size possible; fuel loading, safe access, and resistance to control is a concern in the entire project area, not just roadways and access points.

Alternative One – No Action

Direct and Indirect Effects

No direct or indirect effects from project activities would occur under Alternative One. The areas that are nearer to live seed sources would have some natural regeneration, however, without supplemental planting, these stands would take considerable time to reproduce conifers that can compete with vigorously re-sprouting hardwood and brush species (Chapter 3.3.3). This would create a multifaceted concern for fire management.

The establishment of shrubs and hardwoods would convert what were conifer-dominated timberlands prior to the fire into hardwood and shrub-dominated stands (Chapter 3.3.3), radically altering the fire environment and habitat. Under the current ROD/RMP for the Roseburg District, this area is designated as LSR, for which the goal is protection and enhancement of old-growth forest ecosystems. Without the manual establishment of conifers, parts of the area would take much longer to reach old-growth characteristics, if at all. Type conversion to hardwoods and shrubs (e.g. tanoak) would be self-perpetuating by burning more frequently and at higher intensity than conifer-dominated stands. An ignition in tanoak/madrone brush would be more likely to establish and rapidly spread due to the configuration of shrub fuels and the flammability of the vegetation itself. Tanoak litter is two and one-half (2.5) times more flammable than Douglas-fir litter (Fonda *et al*. 1998, Engber and Varner 2012). The fire-return interval is shorter than it would be for an old-growth, mixed conifer stand. Small patches of these shrub areas are part of the natural environment, but interspersed in LSR habitat, not as the dominant fuel type.

In areas that burned under moderate to high severity, contiguous brush fuels, once established and reaching four to six feet in height are described as fuel model SH5 – High load, dry climate shrub (Scott and Burgan 2005). This model is shown on the fire behavior characteristics chart in (Figure 3-2). Fuel model SH5 is considered to have very high spread rates and flame lengths. Even under moderate fire weather conditions, fires in this fuel bed are not safely attacked using direct attack fire suppression tactics. If a fire were to start at the base of a slope, brush fuels would rapidly carry the fire uphill, potentially impacting remaining live trees and private lands.

Alternative Two – Proposed Action

Direct and Indirect Effects

Under Alternative Two, felling hazard trees would create an accumulation of fuels in various size classes concentrated along roads and near access points. Due to the steepness of the area, many of the trees, once cut, would slide or roll downslope to the road. In most areas, there is no shoulder or other buffer between the slope and the road surface, so many cut trees would need to be removed completely. If a downed hazard tree is stable on the slope, it could be considered for retention. Once a tree is confirmed as stable, a decision would be made on overall CWD density. While reducing concerns of resistance to control, LSRA recommendations for CWD are still being met (Appendix C).

Treatment of fuels less than 9 inches in diameter within 50 feet of the road edge would lower the risk of roadside, human caused ignition by removing the fuels in the area most susceptible to human caused fires. The rocky nature of the project area would allow this roadside treatment to be effective for several years.

Planting conifers in areas that are away from viable seed sources would help increase the likelihood and speed of conifer reestablishment in the area. These conifers, over time, could shade out enough of the underbrush to reduce the continuity of understory vegetation, reducing the potential of type conversion to hardwoods.

Decommissioning roads as identified in this EA, would have no effect on firefighting capabilities because the identified roads are not strategic for access or suppression needs. The roads were not determined to be ‘critical’ according to DFPA.

Cumulative Effects

Private Land Management

Due to the checkerboard nature of the land ownership in the fire area, federal land management decisions can have lasting impacts to private land. The DFPA provides fire protection for all ownerships in this area and sees the fire scar as a contiguous landscape of concern. Private land owners in the area have salvaged and replanted any areas that burned in moderate or high severity. These plantations have a similar predicted fire behavior to shrubs until such time as the tree crowns separate from the ground and begin to shade out understory species (McGinnis *et al.* 2010). The greatest difference between the potential fire behavior in plantations versus brush fields would be the absence or presence, respectively, of large snags and downed logs.

The interaction of private and federal land management decisions would change over time as plantations grow or hardwoods dominate areas that were late-successional habitat. From planting to 20-25 years old, predicted fire behavior between typical plantations and brush fields is similar. On private lands, however, managers have additional tools to increase success and growth of planted trees. Under current accepted practices the private land plantations may show a difference in predicted fire behavior within 15-20 years. The proposed treatment to the BLM lands would reduce the chances of hardwood conversion but likely at a lower speed and slightly lower success rate than private lands.

Roseburg District BLM Actions

At the watershed scale (Lower Cow Creek hydrological unit 10), this project would not appreciably add to fuel loading. It does increase the risk of fire in the watershed due to the probable dominance of shrubs in large portions of the fire area. The safety treatments proposed in this EA would need to be maintained over time, otherwise fuels would begin to build up along roads, which would increase the risk of human-caused fires.

Medford District BLM Douglas Fire Complex Recovery Project

The proposed actions in the Medford District EA do not interact with those proposed in this EA. Not only are the projects removed from each other, they are within different watersheds, falling outside the methodology of this analysis.

Reciprocal Rights-of-Way Safety Actions

Trees that pose an imminent threat to forest workers or the public would be felled as identified using OSHA guidelines (Toupin *et al.* 2008). Reciprocal rights-of-way hazard tree felling and removal on BLM-managed lands are ongoing (Chapter 3.2). As a result, small- and large-diameter wood has and would continue to become concentrated along roads and near access points. In areas with heavy accumulation of CWD, the probability of reburn is higher, to an unknown extent, due to longer fire duration characterized by decayed CWD (Brown *et al.* 2003).

3.4.3.4. Air Quality

Alternative One – No Action

Direct and Indirect Effects

Under this alternative, there would be no machine piling and burning or decked logs, or hand piling and burning of roadside fuel, therefore smoke production would not be a concern. There would, however, be an increased risk of fire ignition, which could result in another large wildfire. Wildfires produce large amounts of particulate matter and can contribute to carbon production (Hardy *et al.* 2001).

Alternative Two – Proposed Action

Direct and Indirect Effects

All burning of machine piles and roadside small fuel would be done under an approved Prescribed Fire Burn Plan in accordance with the Oregon Smoke Management Plan. Burning would occur in the fall or winter months during unstable weather conditions, when winds and atmospheric instability favor rapid smoke dispersion. Potential impacts to air quality in areas within 0.25 mile to 1.0 mile of the burning piles would persist for 1-2 days and would be characterized by some haziness.

Cumulative Effects

There would be no cumulative effects to air quality because there are no additional ongoing or future foreseeable activities that would influence air quality within the project area.

3.5. Wildlife

3.5.1. Introduction

This section addresses three principle categories of wildlife species that receive special consideration in the planning and implementation of BLM management actions.

1. Special Status Species

Special status species addressed in this environmental assessment include federally-listed threatened or endangered species, candidate species or species proposed for listing by the U.S. Fish and Wildlife Service, under the Endangered Species Act (ESA), and special status species managed under BLM Manual 6840 policy, which includes species eligible for Federal or State listing, species with candidate status under the ESA and Bureau sensitive species. Three species covered by this program are also designated for management under the survey and manage program and are discussed there, as they are subject to other management considerations.

Twenty-three Bureau sensitive wildlife species known or suspected to occur on the Roseburg District were considered in this environmental assessment. Sixteen of the species are eliminated from detailed discussion for reasons documented in Appendix D, Table D- 1. The remaining nine species were analyzed in detail and are listed in Appendix D, Table D- 2.

2. Survey and Manage

The second category consists of wildlife species designated for protection under the Survey and Manage Standards and Guidelines established in the Northwest Forest Plan (USDA, USDI. 1994b). This project applies the 2001 ROD (USDA, USDI 2001) species list.

3. Land Birds

The third category consists of bird species subject to protection under the Migratory Bird Treaty Act of 1918, as amended; the Bald and Golden Eagle Protection Act; focal species identified by Partners In Flight in the Habitat Conservation for Landbirds in the Coniferous Forests of Western Oregon and Washington (Altman and Alexander 2012) and "Birds of Conservation Concern" and

"Game Birds Below Desired Condition," as defined by the U.S. Fish and Wildlife Service, are included in Appendix D, Table D- 1 and Table D- 2.

3.5.2. Affected Environment

3.5.2.1. Threatened and Endangered Species

Northern Spotted Owl

Suitable Habitat

The northern spotted owl generally inhabits forests older than 80 years that provide habitat for nesting, roosting and foraging. Stands that fulfill all of these needs are commonly referred to as suitable habitat.

Suitable habitat for nesting, roosting and foraging typically consists of multi-layered, multi-species canopies dominated by large overstory trees greater than 20 inches in diameter breast height; canopy cover of 60-80 percent; open spaces within and below the canopy of the dominant overstory; presence of trees with large cavities and deformities such as broken tops and dwarf mistletoe infections; numerous large snags; and large amounts of down wood (Thomas *et al.* 1990, Forsman *et al.* 1984, Hershey 1997, USDI FWS 1990). The project area (the Rabbit Mountain Fire perimeter, in the Roseburg District buffered by 2.6 miles (1 northern spotted owl home range)) contains approximately 15.028 acres of suitable habitat.

Post-fire Foraging Habitat

Post-fire foraging habitat (PFF) conditions for the northern spotted owl is habitat that functioned as nesting, roosting and foraging habitat (NRF) before the fire, then burned at high and moderate burn severity levels according to BARC soil severity data. Even with the loss of canopy cover and key habitat components, these areas may still provide some foraging habitat after the fire, depending on patch size, edge type, and proximity to known owl sites (Bond *et al.* 2002, Bond *et al.* 2009, Clark *et al.* 2011, and Clark *et al.* 2013), but no longer meet the full function of suitable habitat. Research has indicated that the quantity and configuration of "older forest" (analogous to suitable habitat) provides a valid inference into the likelihood of occupancy (Hunter *et al.* 1995), survival, and reproduction. (Franklin *et al.* 2000, Zabel *et al.* 2003, Olson *et al.* 2004, Dugger *et al.* 2005, Dugger *et al.* 2011). Post-fire foraging habitat doesn't provide "older forest" conditions described in the research. The increased vulnerability of small rodents provides a temporary increase in prey availability for several years particularly near the edges of the disturbance. There are 2,365 acres of PFF in the project area (Table 3-6).

Dispersal Habitat

Dispersal habitat is typically represented by forest stands 40-79 years old. These stands usually lack habitat components suitable for nesting. Function is limited to providing some roosting and foraging opportunities as well as habitat for dispersal (USDI FWS 2008a). Dispersal habitat is essential to the movement of juvenile and non-territorial (e.g., single birds) northern spotted owls enabling territorial vacancies to be filled, and providing adequate gene flow across the range of the species (ibid.).

Dispersal habitat is defined as conifer-dominated forest stands with canopy closure exceeding 40 percent, and an average diameter breast height of 11 inches or greater (Thomas *et al*. 1990). Dispersal habitat may contain snags, CWD, and prey sources that allow owls to move and forage between blocks of suitable habitat (USDI FWS 2009). The project area contains approximately 3,124 acres of dispersal habitat (Table 3-6).

Table 3-6. Northern spotted owl habitat available on federal land within the project area

Total Area (acres)	Total Federal (acres)	Habitat				
		Non-Habitat (acres)	Capable (acres)	Dispersal (acres)	NRF (acres)	PFF (acres)
60,610	29,162	699	7,928	3,124	15,028	2,365

A known northern spotted owl site is defined as a location with evidence of continued use. Habitat condition is generally assessed by evaluating available suitable and dispersal habitat at three analytical scales: home range, core area, and nest patch.

Home Range

The home range is represented as a circle centered on a nest site, representing the area northern spotted owls are assumed to use for nesting, roosting, and foraging when occupying the site. Home ranges frequently overlap, and habitat may be shared by adjacent resident and dispersing northern spotted owls (USDI FWS 2009).

Home range size varies by physiographic province. In the Klamath Province a home range has a radius of 1.3 miles, encompassing approximately 3,340 acres (USDI FWS 2008b). The suitable habitat threshold considered essential to maintain northern spotted owl life functions is 40 percent of the total home range acres (USDI FWS 2008b). The threshold is 1,336 acres in the Klamath Province.

Proposed units do overlap 22 northern spotted owl home ranges. Table C-3 in Appendix C illustrates that currently available suitable habitat is below viability thresholds in 16 of the 22 home ranges.

Core Area

The core area is represented by a 0.5-mile radius circle centered on the nest tree, encompassing an area of approximately 500 acres, and is the most heavily used area during the nesting season Appendix A, Figure A- 7). Core areas are defended by territorial northern spotted owls and generally do not overlap the core areas of other home ranges (USDI FWS 2008a). The suitable habitat threshold considered essential to maintain northern spotted owl life functions is 50 percent (250 acres) of total core area acres (USDI FWS 2008b). Proposed harvest units overlap six core areas; three of the six sites where proposed units overlap core areas have been unoccupied since 2009. Table C-3 in Appendix C shows two core areas associated with the 22 owl sites overlapping the project area that are above viability the threshold.

Nest Patch

The 70-acre nest patch is centered within the core area and represented by a circle with a 328-yard radius that is centered on the nest tree (Appendix A, Figure A- 7). Management actions that modify suitable and dispersal habitat within the nest patch are considered likely to affect reproductive success (USDI FWS 2008b). Table C-3 in Appendix C illustrates that all of the 22 nest patches in home ranges overlapping the proposed units have less than 70 acres of suitable habitat. Roadside safety treatments are proposed in the two nest patches of site (2043A and 2046O). Neither site is currently occupied (Table 3-7).

Site Occupancy

The northern spotted owl site occupancy analysis focuses on the 22 known northern spotted owl sites that are within the project area and considers only the occupancy data since 2009. Table 3-7 provides a 6-year summary of occupancy status and nesting activity for the analyzed northern spotted owl sites that overlap proposed hazard tree safety units. An unoccupied site is one which has had no resident birds (pair or single) detected in the last two survey seasons (2013-2014).

Table 3-7. Recent occupancy summary for analyzed northern spotted owl sites

IDNO	Northern Spotted Owl Status Summary			
	Last year of Known Pair Status	**Last year of Known Nesting/ Reproduction**	**Summary of Site Status 2009-2014**	**Occupancy Status of INDO for this Analysis**
0369O	Prior to 1994	Prior to 1994	Unoccupied (2014,2012-2009) [1]Floater (2013)	Unoccupied
0375C	2014	2014	Pair (2014(alt. C) Pair (2013(alt. B) 2012-2009 (alt. O))	**Occupied**
0376O	1986	1986	Floater (2012) Unoccupied (2014-2013, 2011-2009)	Unoccupied
0906A	2008	2005	Floater (2011-2010) Unoccupied (2014-2012, 2009)	Unoccupied
0919O	1980	Prior to 1980	Resident Single (2011) Unoccupied (2014-2012, 2010-2009)	Unoccupied
1911C	2011	2009	Pair (2011, 2009) Floater (2010) Unoccupied (2014-2012)	Unoccupied
1989A	1999	1999	Floater (2013-2011) Unoccupied (2014, 2010-2009)	Unoccupied
2043A	2002	2002	Floater (2009) Unoccupied (2014-2010)	Unoccupied
2044O	1990	1990	Unoccupied (2014-2009)	Unoccupied
2046O	Prior to 1989	Prior to 1989	Unoccupied (2014-2009)	Unoccupied
2072O	2014	2014	Occupied (2014-2009)	**Occupied**
2094A	2003	2003	Floater (2009) Unoccupied (2014-2010)	Unoccupied
2101O	2007	2004	Floater (2011-2010) Unoccupied (2014-2012, 2009)	Unoccupied
2209C	2011	2010	Pair (2011-2009) Unoccupied (2014-2012)	Unoccupied

IDNO	Northern Spotted Owl Status Summary			
	Last year of Known Pair Status	Last year of Known Nesting/ Reproduction	Summary of Site Status 2009-2014	Occupancy Status of INDO for this Analysis
2213O	2007	2005	Floater (2013) Unoccupied (2014, 2012-2009)	Unoccupied
2298O	2013	2012	Pair (2013-2009) Resident Single 2014	**Occupied**
2407A	2009	2001	Pair (2009) Unoccupied (2014-2013)	Unoccupied
2622A	2010	2009	Pair (2010-2009) Single (2012) Floater (2013, 2011) Unoccupied (2014)	Unoccupied
2662O	1994	Prior to 1991	Floater (2013-2010) Unoccupied (2014, 2009)	Unoccupied
4047A	2010	2010	Pair (2010) Floater (2011,2009) Unoccupied (2014-2012)	Unoccupied
4051O	2010	2010	Pair (2010-2011) Resident Singe (2012) Floater (2014, 2009) Unoccupied (2013)	Unoccupied
4507C	2011	2011	Pair (2011-2009) Single (2012) Unoccupied (2014-2013)	Unoccupied

[1]Floater: a nonresident individual, typically a vocalization on a one or two separate occasions; usually a dispersing bird or a bird from an adjacent site.

Prey Species

Northern spotted owls prey primarily on small mammals like woodrats, flying squirrels, and voles (Forsman *et al.* 1984, Forsman *et al.* 2004). In the South Coast Area, which includes the project area, Forman *et al.* (2004) found flying squirrels comprise about 39 percent of the northern spotted owl prey biomass. Flying squirrels are associated with stands possessing high canopy cover, large trees, snags, CWD, understory cover, and availability of fungi (Wilson 2008). Woodrats and rabbits/hares are associated with early-and mid-seral forest habitat (Maser *et al.* 1981, Sakai and Noon 1993, Carey *et al.* 1999) and comprise nearly 49 percent of the prey biomass (Forsman *et al.* 2004).

All units burned under moderate to high severity and have very little developed understory components. Hardwoods, shrubs, and other herbaceous materials are expected to develop in the upcoming years, improving prey species habitat.

2012 Northern Spotted Owl Critical Habitat

In 2012, the U.S. Fish and Wildlife Service published the latest version of Critical Habitat for the northern spotted owl (USDI FWS 2012), identifying four Critical Habitat units (CHUs) with multiple subunits on the Roseburg District. The proposed hazard tree safety units are located in the Klamath West subunit 1 (KLW-1). The primary functions of the KLW-1 subunit are to facilitate northern spotted owl movements between the western Cascade Range, coastal Oregon Mountains and the Klamath Mountains, and to provide demographic support (USDI FWS 2012).

The Roseburg District has 53,118 acres of habitat within the KLW-1 subunit. Within the project area there are 12,822 acres of NRF, 2,347 acres of PFF, and 2,684 acres of dispersal habitat within Critical Habitat unit KLW-1(Table 3-8).

Table 3-8. Acres of habitat within the Rabbit Mountain Fire LSR Recovery project area within northern spotted owl Critical Habitat unit on the Roseburg District

CHU	Total Area (acres)	NRF (acres)	PFF (acres)	Dispersal (acres)	Capable (aces)
KLW-1	24,961	12,822	2,347	2,684	6,607

Principle Threats to the Northern Spotted Owl

The two main threats to the northern spotted owl's continued survival are; habitat loss from timber harvest and catastrophic fire, and competition from the barred owl for habitat and prey (USDI FWS 2011a, I-6 through I-9).

Lint (2005) indicated that the Northwest Forest Plan recognized wildfire as an inherent part of managing northern spotted owl habitat in certain portions of the range. He further noted that loss of northern spotted owl habitat did not exceed the rate expected under the Northwest Forest Plan, and that habitat conditions were no worse, and perhaps even better, than expected. In particular, the percent of existing northern spotted owl habitat removed by harvest during the first decade was considerably less than expected.

Courtney and Gutiérrez (2004) also identified the primary source of habitat loss as catastrophic wildfire. Although the total amount of habitat affected by wildfires has been small, there is concern for potential losses associated with uncharacteristic wildfire in a portion of the species range. Courtney and Gutiérrez (2004) noted that the risk to northern spotted owl habitat from uncharacteristic stand replacement fires is sub-regional, confined to the dry eastern and to a lesser extent the southern fringes of the northern spotted owl range. Wildfires accounted for 75 percent of the natural disturbance loss of habitat estimated for the first decade of Northwest Forest Plan implementation.

Courtney and Gutiérrez (2004) also indicated that models of habitat growth suggested significant in-growth and development of habitat throughout the federal landscape.

The barred owl (*Strix varia*) is considered a threat to the northern spotted owl because it is a direct competitor for prey and habitat. Growing evidence suggests that northern spotted owl populations decline in areas where barred owls move into their range (Wiens *et al*. 2014). The probability that a pair of northern spotted owls would occupy a territory after occupancy by a barred owl declined 12 percent in the Coast Range Study Area and 15 percent in the Tyee Study Area (USDI BLM 2010).

Detection of barred owls within northern spotted owl home ranges within the project area has increased from 1 in 2003 to 27 in 2013 (10 different northern spotted owl sites).

Marbled Murrelet

Habitat

Marbled murrelets are small seabirds that feed offshore and nest in trees within older coastal forests with canopies dominated by large overstory trees. Mossy branches of large-diameter dwarf mistletoe brooms, natural depressions on large limbs, and old stick nests can serve as platforms for egg laying (Lank *et al.* 2003, Hamer and Nelson 1995).

Availability of platform trees is critical for nesting (McShane *et al.* 2004, USDI FWS 2011b). The quality and abundance of trees with platforms and the number of platforms per tree are more apparent in conifer stands over 150 years old, but may be present in younger stands. Some younger stands have scattered trees with suitable platforms, but are not considered to provide suitable nesting habitat because the numbers and distribution of trees is below thresholds outlined in the Residual Habitat Guidelines (USDI BLM 2012).

Occupancy

Marbled murrelet presence is detection of flight over potential habitat, but sub-canopy flight behavior is not observed. In contrast, an *occupied* marbled murrelet site is one determined, in part, by observation of sub-canopy flights below, and into or out of the forest canopy (Mack *et al.* 2003) or circling above the canopy (USDA and USDI 1994b).

Marbled Murrelet Recovery Plan

The recovery plan for the marbled murrelet (USDI FWS 1997) identifies six recovery zones along the coast of Washington, Oregon, and northern California. Oregon Coast Recovery Zone 3 extends 35 miles inland.

In Oregon, there are two marbled murrelet management zones. Management Zone 1 is coincident with Recovery Zone 3. Management Zone 2 is located 35 to 50 miles inland (Appendix A, Figure A- 8). Although marbled murrelet generally nest within 28 miles of the coast (Lank *et al.* 2003), surveys from 1993 to present have identified one occupied site approximately 2 miles north-northwest of the project area.

The project area is located in Management Zone 2. Burned, denuded trees do not provide suitable nesting sites for the marbled murrelet; nor do they contribute significantly to adjacent suitable nesting platforms, lacking the canopy cover necessary to provide horizontal cover and micro-climate support.

Critical Habitat

Critical habitat for the marbled murrelet was designated by the U.S. Fish and Wildlife Service in 1996 (USDI FWS 1996) and later revised in 2011 (USDI FWS 2011b). The designation is presently being challenged in a lawsuit filed by timber industry interests. The proposed project area does not contain designated Critical Habitat for the marbled murrelet and will not be analyzed in this environmental assessment.

3.5.2.2. Bureau Sensitive Species

American Bald Eagle

The American bald eagle (*Haliaeetus leucocephalus*) was delisted under the Endangered Species Act in 2007 (Federal Register 2007, 37345) in Oregon. Breeding and wintering populations occur throughout the project area and are addressed in the Pacific States Bald Eagle Recovery Plan (USDI FWS 1986).

Bald eagles in the Pacific Northwest nest predominantly in conifer stands adjacent to or near large rivers or other large bodies of water (Anthony *et al.* 1982, USDI FWS 1986, Buehler 2000, Federal Register 2006, 71 FR 8239). Distances to water bodies from nests varies but could extend up to 1,378 yards in portions of the project area (Anthony *et al.* 1982, USDI FWS 1986, Buehler 2000). Isaacs and Anthony (2011) modeled potential nesting habitat up to 1.9 miles away from water.

Nesting habitat can encompass a wide range of stand types, but they all can be described has having a variety of canopy layers and some component of large-diameter or old-growth trees. Anthony *et al.* (1982) found that the diameters of nesting trees vary by forest types, but invariably they were some of the largest trees in the stand. The average diameters of nesting trees varied between:

- 41 inches d.b.h. in Oregon mixed conifer stands
- 46 inches d.b.h in ponderosa pine forests
- 69 inches d.b.h in Douglas-fir forests

Douglas-fir is the dominant species for nesting trees west of the Cascade Mountains, while ponderosa pine is dominant east of the Cascade Mountains (Anthony *et al.* 1982).

Fish, waterfowl, jackrabbits, and carrion provide the most common source of food for eagles in the Pacific Northwest (USDI FWS 1986). Nesting sites, roosts, and wintering areas tend to be associated with sources of food (Anthony *et al.* 1982, USDI FWS 1986, Buehler 2000, Federal Register 2006, 8242), although overwintering area locations may also be driven by remoteness (Federal Register 2006, 8239; USDI FWS 1986).

Communal roosts are selected for and favor those stands that have a high degree of stratification (Anthony *et al.* 1982). Roost trees are the largest trees in the stand or have open branching patterns, provide visibility, and may be close to a consistent food source (Anthony *et al.* 1982, Buehler 2000). There are no communal roosts known in the project area.

Purple Martin

The purple martin (*Progne subis*) is a secondary cavity nester that utilizes cavities excavated by woodpeckers, as well as birdhouses and other artificial structures. Nest trees are typically found in open areas near water (Brown 1997, Horvath 2003). They may occur singly or in colonies. They are insectivores, consuming insects in flight (Horvath 2003).

Fringed Myotis, Pacific Pallid Bat, Townsend's Big-eared Bat

The fringed myotis (*Myotis thysanodes*), Pacific pallid bat (*Antrozous pallidus pacificus*) and Townsend's big-eared bat (*Corynorhinus townsendii*) are insectivorous bats found in the Pacific Northwest (Verts and Carraway 1998).

Hibernacula and roost sites include caves, mines, buildings, large snags and hollow trees (Weller and Zabel 2001, Lewis 1994, Fellers and Pierson 2002). No caves or mines are known to be present in the treatment units. Some units contain trees and snags that may provide roosting opportunities.

These species are known to forage in open areas, including forest edges and roads (Christy and West 1993) and along streams and in riparian zones (Cross and Waldien 1995, Marshall 1996, Verts and Carraway 1998, Fellers and Pierson 2002).

Small ponds, marshy areas, and other riparian areas are expected to provide foraging habitat. Dense forest stands generally do not provide quality foraging habitat as they are less open making navigation difficult. Also, stands with poor understory development do not provide for foraging because they do not support abundant populations of insects that bats eat. Open stands with a well-developed understory supporting diverse and abundant populations of insects provide high quality foraging conditions.

Data from the GeoBOB database (GeoBOB 2014) documents that the Townsend's big-eared bat occurs in the project area, but that fringed myotis and Pacific pallid bats do not.

Oregon Shoulderband Snail and Chace Sideband Snail

Oregon shoulderband snail (*Helminthoglypta hertleini*) is endemic to northwestern California and southwestern Oregon (Burke 2013), using openings in rock-on-rock habitat, talus, soil fissures, the interior of large woody debris, herbaceous vegetation, or deciduous hardwood leaf litter as refugia from desiccation during dry periods (Weasma 1998a, Weasma 1998b, Frest and Johannes 2000, Duncan *et al.* 2003, Duncan 2004). There are no known Oregon shoulderband snail occurrences in the project area (GeoBOB 2014) although suitable habitat may exist in the project area.

The Chace sideband snail (*Monadenia chaceana*) is Bureau Sensitive and a Survey and Manage mollusk species with potential habitat in the project area. This snail is endemic to northwestern California and southwestern Oregon and utilizes the same habitat as the Oregon shoulderband snail. In the Klamath Province the species is associated with down wood where rock substrates occur (Duncan and Ballard 2006), but can be found in areas without rocky substrates (GeoBOB 2014). There are no known sites in the project area, although suitable habitat may exist in the project area.

3.5.2.3. Survey and Manage

For details regarding conformance to Survey and Manage species, see Chapter 1.9.3.

Chace Sideband Snail

There are no known sites of Chace sideband snail in the project area, although suitable habitat may exist in the project area.

Red Tree Vole

The **Oregon red tree vole** (*Arborimus longicaudus*) is an arboreal rodent endemic to moist coniferous forests of western Oregon and extreme northwest California. It nests, forages, and travels through the canopies of conifers (Forsman and Swingle 2007, Carey 1991). Red tree voles primarily feed on the needles and bark of Douglas-fir, and use materials such as twigs, needles, and lichens for nest building (Maser 1998, pp. 213-225, Verts and Carraway 1998).

Mature and old-growth forests appear to provide optimum habitat. Tall, multi-layered forest canopies retain humidity and intercept fog, which moderates climate and provides a source of free water. Large branches provide stable support for nests, protection from storms, and travel routes (Gillesberg and Carey 1991).

The “Survey Protocol for the Red Tree Vole (*Arborimus longicaudus*), Version 3.0 (Huff *et al.* 2012, pp. 5-10)” lists the following criteria that must be met to require pre-disturbance surveys.

- The project is within the Northern Mesic, Mesic, or Xeric survey zones.
- Suitable habitat that contributes to a reasonable assurance of red tree vole persistence is present when the quadratic mean diameter is greater than 18 inches breast height, canopy closure is greater than 60 percent, and there are two or more predominant trees per acre greater than 80 years of age.
- The proposed project is habitat-disturbing activity that has the potential to cause a “significant negative effect on the species habitat or the persistence of the species at the site.”

The Rabbit Mountain LSR analysis area is in the Mesic survey zone. Dead trees and small groups of dead trees do not constitute suitable nesting habitat; their removal will not impact the use of the adjacent habitat by red tree voles. No further analysis will be conducted.

3.5.2.4. Landbirds

Guidance for meeting agency responsibilities under the Migratory Bird Treaty Act and Executive Order 13186 Responsibilities of Federal Agencies to Protect Migratory Birds is provided by Instruction Memorandum OR-2008-050 (USDI BLM 2008). The guidance identifies lists of “Game Birds Below Desired Condition” and “Birds of Conservation Concern” to be addressed during environmental analysis of agency actions and plans. “Game Birds Below Desired Condition” are included in Appendix D, Table D- 1and Table D- 2.

“Game Birds Below Desired Condition” documented or suspected in the project area is the wood duck (*Aix sposa*). Other species documented or suspected in the Roseburg District but not analyzed in detail are documented in Appendix D, Table D- 1 and Table D- 2.

Game Birds below Desired Condition

Wood Duck

The wood duck nests in tree cavities (Lewis and Kraege 1999) in the vicinity of wooded swamps, flooded forests, marshes or ponds (Ehrlich *et al.* 1988), and riparian areas of rivers and large streams. At least 10 acres of wetland or other aquatic habitat in a contiguous unit or in isolated parcels, separated by no more than 100 feet of upland and in close proximity to nesting habitat, is needed (http://www.abirdshome.com/wdwater.htm). Open water makes up 25 percent of brood-rearing area with the remainder a mixture of shrubs and herbaceous emergent plants and trees (Hepp and Bellrose 2013). Snags and large-diameter trees with cavities adjacent to Cow Creek and Middle Creek would provide nesting habitat now, and into the future.

Birds of Conservation Concern

Olive-sided Flycatcher

The most recent "Birds of Conservation Concern" list (USDI FWS 2008c) identifies thirty-two species of concern in Region 5 (North Pacific Rainforest). Habitat for one of these species—olive-sided flycatcher—is present in the project area and may be affected by proposed activities.

The olive-sided flycatcher (*Contopus borealis*) requires juxtaposition of late- and early-seral habitat, particularly with high-contrast edges. It is a neo-tropical migrant that typically nests in western hemlock and true fir. An aerial insectivore, it generally forages in early-seral areas, but requires tall adjacent trees for singing perches (Altman 2003).

Partners in Flight Focal Species

The Habitat Conservation for Landbirds in the Coniferous Forests of Western Oregon and Washington (Altman and Alexander 2012) provides information on habitat used by species native to the Pacific Northwest, and is used as a guide by the BLM. Lazuli bunting, northern flicker, olive-sided flycatcher (see above), pileated woodpecker, and Vaux's swift are focal species—identified in Altman and Alexander (2012)—being analyzed in detail for this analysis.

Lazuli Bunting

The Lazuli bunting (*Passerina amoena*) inhabits brushy field, grassy savannahs, and post-fire habitats. Features key to their occurrence include trees and snags that provide elevated perches above the brush and shrub layers (Dowlan 2003, Altman and Alexander 2012).

Northern Flicker

The northern flicker (*Calaptes auratus*) is associated with open-canopy forests, savannahs and forest edges associated with open habitat. Key habitat features are large-diameter snags and live trees exhibiting high levels of decay or broken tops (Simmons 2003).

Olive-sided Flycatcher

Olive-sided flycatcher is discussed in the Birds of Conservation Concern section above.

Pileated Woodpecker

The pileated woodpecker (*Dryocopus pileatus*) requires snags, large live trees, and to a lesser extent downed wood for foraging habitat. It is a resident species that nests in large snags and decadent live trees. It is an insectivore that forages on both hard and soft snags as well as live, particularly defective trees. Early-seral habitat can be used for foraging when snags or down logs are present.

Vaux's Swift

Vaux's swift (*Chaetura vauxi*) requires large-diameter snags and hollow, live trees for nesting. The species is a neo-tropical migrant that breeds throughout coniferous forests in western Oregon. It forages above the forest canopy and in open areas, feeding on flying insects.

3.5.3. Environmental Consequences

Conditions in the project area provide a wide range of habitats for wildlife species. The analysis indicators for wildlife resources are displayed in Table 3-9 and were used to assess direct and indirect effects. Current conditions reflect all past natural disturbances and management activities, and while this discussion considers those current conditions, it only specifically addresses the effects of the analyzed alternatives.

Table 3-9. Wildlife analysis indicators

Species	Analysis Indicator
Northern Spotted Owl	Acres of suitable habitat modified/removed
	Acres of dispersal habitat modified/removed
	Number of northern spotted owl home ranges/core areas/nest patches affected
	Acres of critical habitat modified/removed
Marbled Murrelet	Acres of suitable habitat modified/removed
	Acres of recruitment habitat modified/removed
American Bald Eagle	Roosting habitat modified
	Snag habitat modified within one mile of Cow and Middle Creek
Purple Martin	Habitat acres removed/modified
Fringed Myotis Pacific Pallid Bat Townsend's Big-eared Bat	Habitat removed/modified
Oregon Shoulderband Chace Sideband	Habitat removed/modified
Wood Duck	Habitat acres removed/modified
Northern Flicker	Habitat acres removed/modified
Lazuli bunting	Habitat acres removed/modified
Olive-sided Flycatcher	Habitat acres removed/modified
Pileated Woodpecker	Habitat acres removed/modified
Vaux's Swift	Habitat acres removed/modified

3.5.3.1. Alternative One – No Action

Under Alternative One, there would be no direct or indirect effects to wildlife resources because no management actions would occur. Stand development would proceed along trajectories described in Forest Vegetation (Chapter 3.3).

At the unit-scale, habitat conditions would remain generally unchanged in the short term unless an additional major disturbance such as fire, wind, ice, insects, or disease occurred. Otherwise, the primary influence on long-term habitat development would be the regeneration of conifer trees and the progression of the snag/down wood cycle. Fire mortality would contribute large amounts of standing dead trees persisting for 30 to 40 years. Figure 3-3, Figure 3-4 and Figure 3-5 illustrate results of snag recruitment modeling of unburned stands and stands that burned under high severity (100 percent mortality). Differences in initial stand densities among the three graphs are due to varying stand ages.

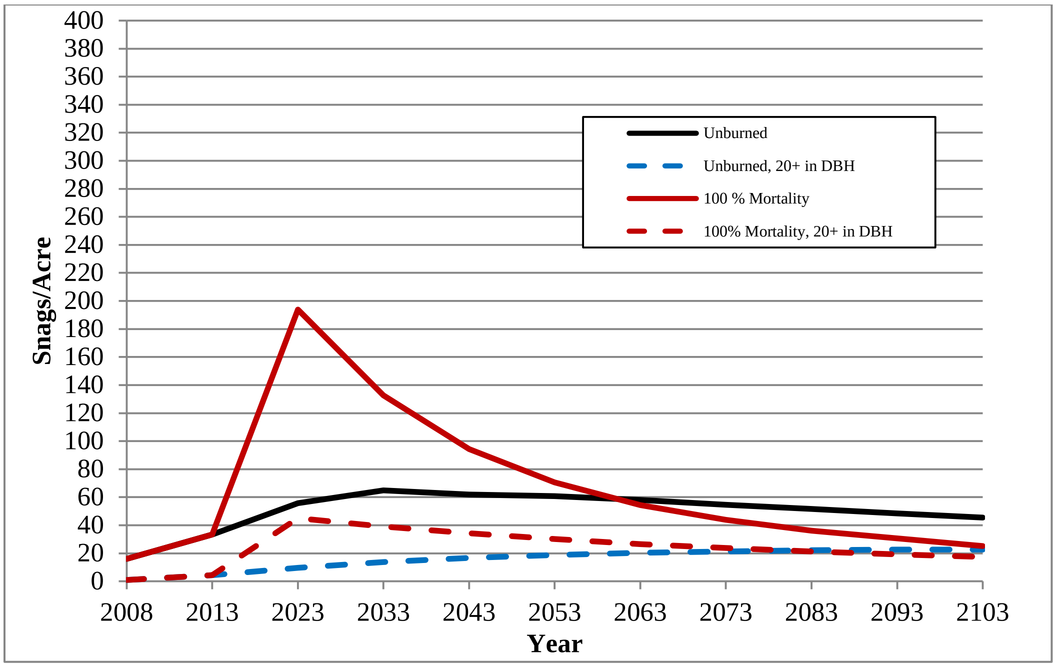

Figure 3-3. Densities of all snags modeled for a 158-year-old stand

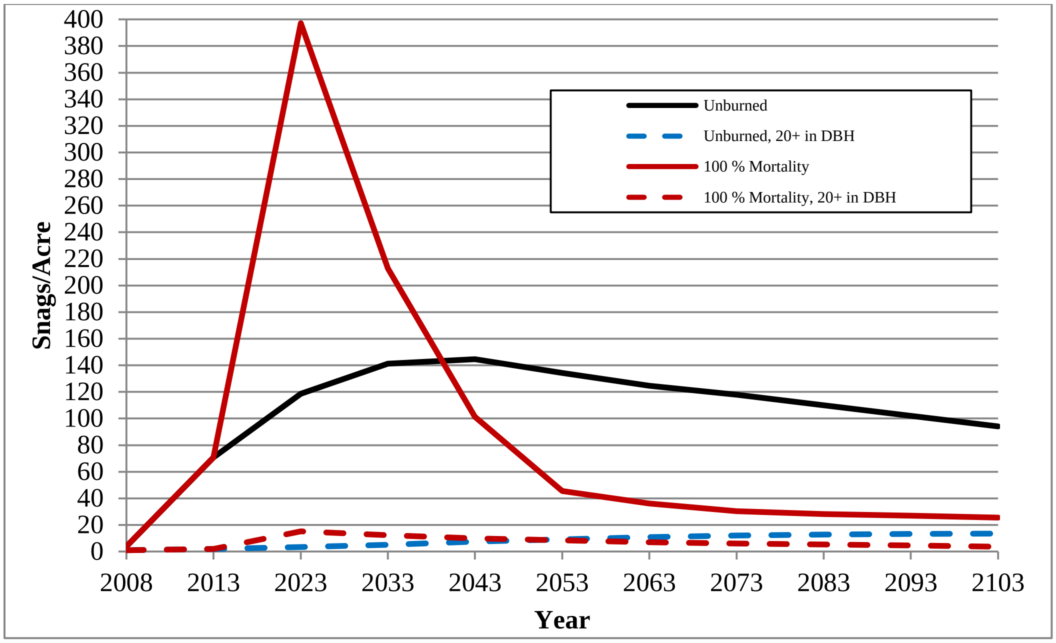

Figure 3-4. Densities of all snags modeled for a 90-year-old stand

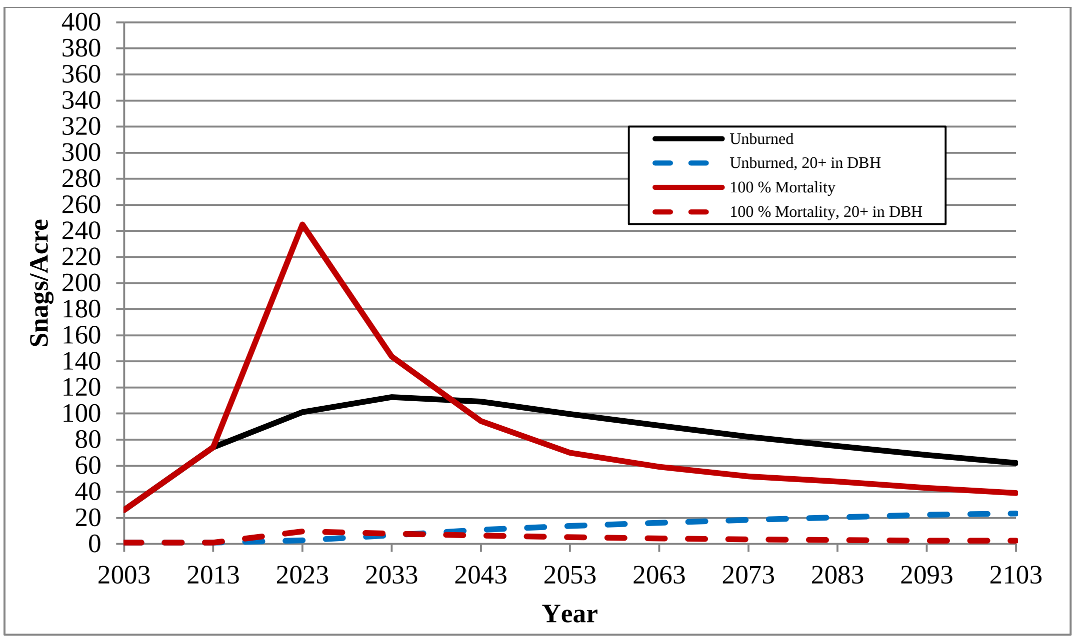

Figure 3-5. Densities of all snags modeled for a 36-year-old stand

Coarse woody debris levels, after the initial dip due to fuel consumption during the fire, exceed those found in unburned stands from year 15-50 post-fire (Figure 3-6, Figure 3-7 and Figure 3-8). Minimal regeneration is demonstrated, but additional inputs of downed woody material from the regenerating stands would be expected to mimic the levels attained by the unburned stand, if not continue to exceed them.

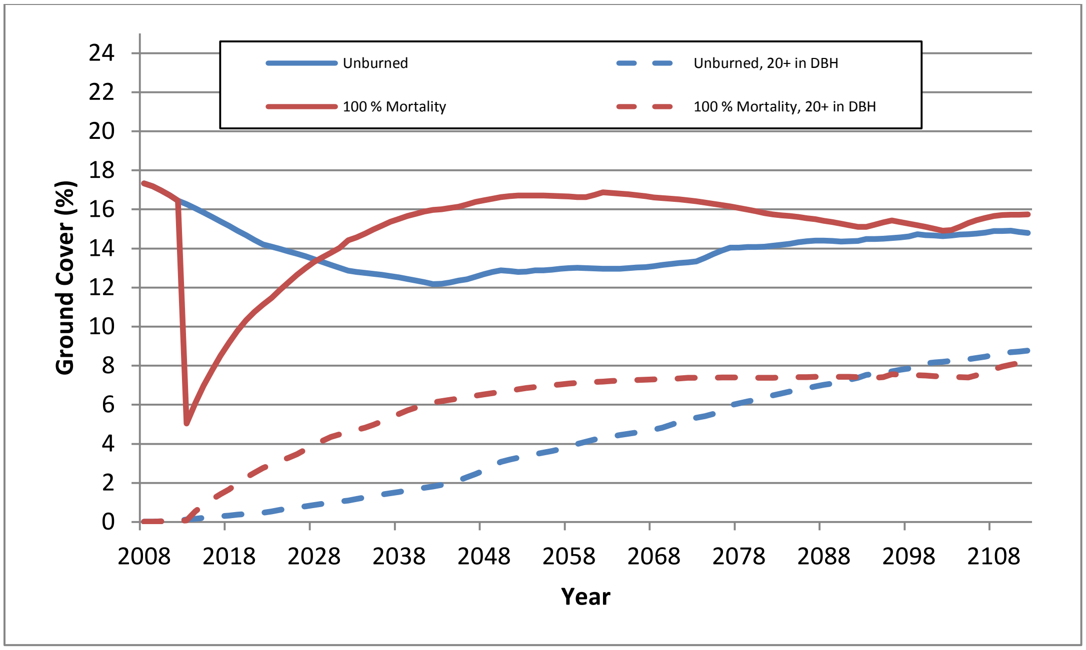

Figure 3-6. Percent ground cover of all coarse woody material, modeled for a 158-year-old stand

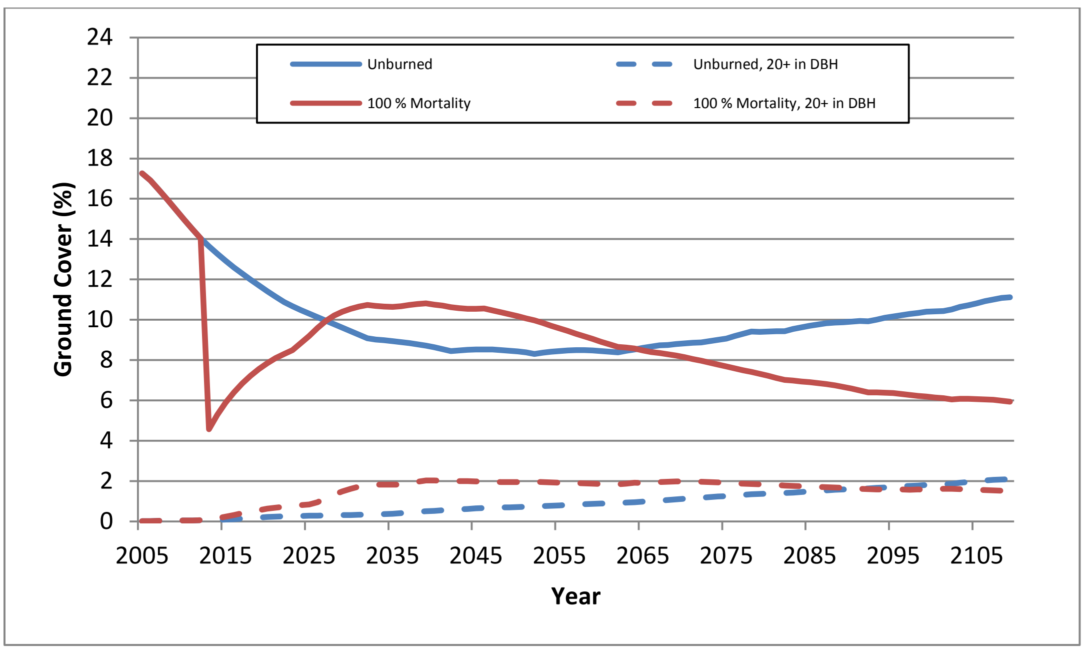

Figure 3-7. Percent ground cover of all coarse woody material modeled for a 90-year-old stand

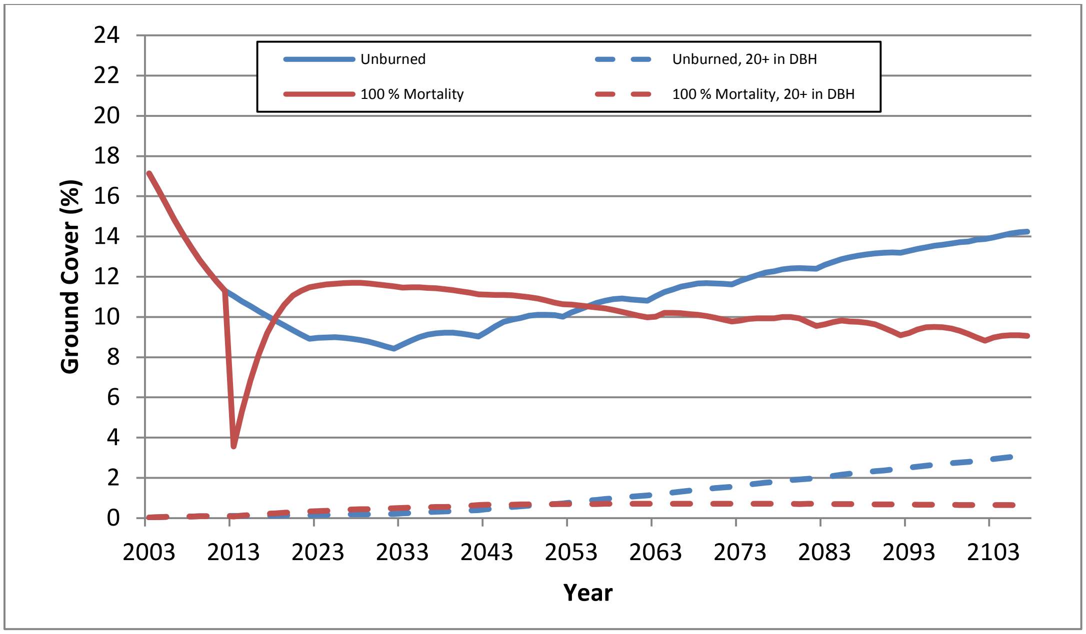

Figure 3-8. Percent ground cover of all coarse woody material modeled for a 36-year-old stand

No action would likely result in a higher proportion of hardwoods and shrubs, particularly tanoak, than drought and fire resistant conifer species such as incense-cedar, pine, and Douglas-fir (Chapter 3.3).

Selecting Alternative One would potentially forestall the establishment of a diversity of desirable conifer species in a timely manner that meets timeframes for desired future late-successional conditions. However, under this alternative, retaining all of the snags and coarse woody material would provide habitat components and thus a more biologically diverse habitat.

Threatened and Endangered Species

Northern Spotted Owl

No habitat modification or removal would occur which would affect the existing condition of home ranges and core areas within the burned area. It is expected that individual and small groups of hazard trees would be removed as they are identified as imminent threats. These events are not expected to diminish the overall habitat quality or function of the treatment areas.

Forest development would proceed along trajectories described in Forest Vegetation (Chapter 3.3).

The favorable habitat conditions found in PFF habitat would eventually deteriorate and be replaced by unsuitable habitat. Habitat conditions may therefore decline in the short term. In the long-term, as illustrated above, the high levels of snags and coarse woody materials would increase the value of remaining dispersal and NRF habitat and accelerate their developments for the next 30-50 years (Figures 3-8).

Independent of the proposed alternative, the barred owl would remain in the project area and is expected to continue increasing its distribution and numbers, displacing northern spotted owls.

There is no data indicating a relationship between forest treatments or lack of treatments and an increase or decrease in the distribution of the barred owl.

Site Occupancy

Current northern spotted owl occupancy and home range viability would not be directly affected by proposed activities, but may be affected by harvest on private timber lands. Indirectly, occupancy may be affected by the degradation of PFF habitat on federal lands that may reduce available habitat, rendering some home ranges unable to support northern spotted owl life functions.

Prey Species

Under Alternative One, prey species habitat would not be removed. As succession occurs, prey species composition would change within fire-created, early-seral habitat; from mice and voles to woodrats, and finally to flying squirrels and other arboreal species as regenerating forests begin to interact with the remaining snags (Fontaine 2007).

Consistency with the 2011 Northern Spotted Owl Recovery Plan

This alternative would be consistent with recommendations of the 2011 Northern Spotted Owl Recovery Plan for habitat management (USDI FWS 2011a, p. III-13).

Marbled Murrelet

No habitat modification or removal would occur that could affect the existing. It is expected that individual and small groups of hazard trees would be removed as they are identified as imminent threats. The felling of individual and small groups of snags would not be expected to measurably decrease the overall canopy cover and the associated vertical and horizontal cover they contribute to the residual green canopy. These effects are not expected to diminish the overall ability of the stand to continue to provide nesting habitat for the marbled murrelet.

Bureau Sensitive Species

American Bald Eagle

There would be no potential for the loss of roost trees used by wintering bald eagles in the project area because no treatments are proposed. Ongoing removal of individually identified hazard trees on roads may incrementally remove potential roost trees along Cow Creek and Middle Creek but winter roosting habitat would not be lost.

Purple Martin

There would be no potential for the loss of snags utilized as nest trees in the project area because no treatments are proposed. Ongoing removal of individually identified hazard trees on roads may incrementally remove potential nest trees along roadways.

Fringed Myotis, Pacific Pallid Bat, and Townsend's Big-eared Bat

There would be no potential for the loss of snags and other large-diameter trees utilized by bats in the project area because no treatments are proposed. Ongoing removal of individually identified hazard trees on roads may incrementally remove potential nest trees along roadways but this small decrease in roosting habitat will not measurably diminish the ability of the stand to provide roosting habitat.

Tree growth would continue, though at reduced rates, extending the period of time until large trees with deeply fissured bark are available as roosting habitat during foraging periods.

Stands would continue to support insect populations that are forage for bats, but as early-seral habitat ages and becomes less diverse in composition, specifically with respect to hardwood trees and flowering plants, prey diversity and abundance would eventually decline.

Oregon Shoulderband Snail

There would be no potential for the disturbance of talus and down wood habitats utilized by this species because no treatments would occur that would render habitat unsuitable. Large down wood, leaf litter, and development of a duff layer where is remained after the fire will continue to benefit the snail. The removal of individual and small groups of snags would not sufficiently increase canopy cover to render the stand unsuitable; the creation of down wood will benefit snail habitat.

Survey and Manage

Chace Sideband Snail

There would be no potential for the disturbance of talus and down wood habitats utilized by this species because no treatments would occur that would render habitat unsuitable. Large down wood, leaf litter, and development of a duff layer where is remained after the fire will continue to benefit the snail. The removal of individual and small groups of snags would not sufficiently increase canopy cover to render the stand unsuitable; the creation of down wood will benefit snail habitat.

Landbirds

Game Birds Below Desired Condition

Wood Duck

The wood duck would not be directly affected because existing nesting habitat would continue to be available. The amount and quality of nesting habitat for the wood duck is expected to increase as decay and breakage progresses, and cavity formation in snags and damaged live trees continues. Ongoing removal of individually identified hazard trees along roads may incrementally remove potential nest trees along Cow Creek and Middle Creek but not decrease the value of the streamside habitat, so as to make it unsuitable.

Birds of Conservation Concern

Olive-sided Flycatcher

The flycatcher would not be directly affected because existing nesting/foraging habitat would continue to be available. The high contrast edges, created by the patches of high severity fire, coupled with the diverse early-seral habitat are expected to provide high quality habitat.

Partners In Flight Focal Species

Lazuli Bunting

The Lazuli bunting would not be directly affected because existing nesting/foraging habitat would continue to be available. The loss of individual and small groups of snags will not restrict the developing early-seral habitat; which is expected to increase in quality in the next 5-10 years, and will have little to no effect to the Lazuli bunting.

Northern Flicker

The flicker would not be directly affected because existing nesting/foraging habitat would continue to be available. The amount and quality of nesting/foraging habitat for the flicker is expected to increase as decay and breakage progresses, and cavity formation in snags and damaged live trees continues. Ongoing removal of individually identified hazard trees on roads may incrementally remove potential nest trees along roadways but will not decrease the overall habitat value of the stand as not all snags in the stand will be lost.

Olive-sided Flycatcher

Olive-sided flycatcher is discussed in the Birds of Conservation Concern section above.

Pileated Woodpecker

The pileated woodpecker would not be directly affected because existing nesting/foraging habitat would continue to be available. The amount and quality of nesting/foraging habitat for the woodpecker is expected to increase as decay and breakage progresses, and cavity formation in snags and damaged live trees continues. Ongoing removal of individually identified hazard trees on roads may incrementally remove potential nest trees along roadways but will not decrease the overall habitat value of the stand as not all snags in the stand will be lost.

Vaux's Swift

The swift would not be directly affected because existing nesting habitat would continue to be available. The amount and quality of nesting habitat for the swift is expected to increase as decay and breakage progresses, and cavity formation in snags and damaged live trees continues. Diverse early-seral habitat in the regenerating burned area would provide high quality foraging. Ongoing removal of individually identified hazard trees on roads may incrementally remove potential nest trees along roadways but will not decrease the overall habitat value of the stand as not all snags in the stand will be lost.

3.5.3.2. Alternative Two – Proposed Action

Treatments would fell standing imminent and likely hazard trees, treat fine and coarse surface fuels, and replant those stands (or portions) not meeting adequate stocking standards for conifer regeneration (Chapter 2.3.3); creating approximately 130 acres of early-seral habitat (Table 3-10). The remaining snags would be those far enough away from federal or private infrastructure so as to not pose an imminent risk; the level of remaining snags is unknown at this time, and for analysis purposes will be assumed to be comprised of shorter snags (assumed smaller diameter). Coarse woody materials in the treated areas may be 10 tons per acre of materials greater than 9 inches diameter; (for comparative purposes this would equate to 10 logs per acre, 16 feet long; approximately 3.4 percent ground cover).

Planting in roadside treatment areas and in restoration units would be utilized to accelerate conifer regeneration on and up to, approximately 1,392 acres of early-seral habitat found to be below adequate stocking levels for conifer seedlings, out of a total 1,702 acres reset to early seral conditions (Chapter 2.3.3, Table 3-1).

Road decommissioning would have beneficial impacts to wildlife species by creating linear strips of early-seral habitat that would then transition through the various successional stages, as described in Forest Vegetation (Chapter 3.3), to potentially become/contribute to adjacent habitat values. The physical act of decommissioning would have little to no impacts to wildlife habitat.

Effects to Threatened and Endangered Species

Northern Spotted Owl

Habitat

The BLM would treat up to 524 acres of forests adjacent to roadways, railroad, right-of-way and quarries to remove those trees that currently pose an imminent risk of failure, and those trees likely to become an imminent risk in three to five years (Table 3-10). See Chapter 2.3.1 for details of the proposed roadside, railroad right-of-way, and quarry safety treatments. Habitat would be modified as dead trees are removed, the loss of canopy cover provided by the dead tops, will result in a decrease in the overall stand canopy cover, and the associated habitat values (i.e., vertical and horizontal hiding cover and shading) to a point that the habitat quality may be downgraded or lost. In addition to the loss of hazard trees, additional green trees necessary as tailhold and guyline trees may be damaged or felled.

Roadside safety treatments remove 14 acres of NRF, 126 acres of PFF, and 9 acres of dispersal habitats due to the removal of canopy cover below stand levels shown to provide the vertical and horizontal cover necessary of protection from predators and amelioration of harsh environmental conditions (Table 3-10); making the stand viable for nesting, roosting, foraging, and/or dispersal. Habitat loss would be less than one percent of the available northern spotted owl habitat in the project area (Table 3-6).

Ninety-six acres of NRF, 162 acres of PFF, and six acres of dispersal habitats may be treated and maintained (Table 3-10); the removal of canopy cover will not decrease the overall stand canopy cover below those levels shown to provide the vertical and horizontal cover necessary of protection from predators and amelioration of harsh environmental conditions (Table 3-10);

making the stand viable for nesting, roosting, foraging, and/or dispersal. Less than one percent of the available spotted owl habitat in the project area would be affected (Table 3-6).

Table 3-10. Summary of effects to northern spotted owl habitat

Treatment Affects	Northern Spotted Owl Habitat (acres)					Grand Total
	Non-Habitat	**Capable**	**Dispersal**	**NRF**	**PFF**	
Roadside Safety Treatments						
Maintained	33	77	6	96	162	375
Removed	0	0	9	14	126	149
Total	**33**	**77**	**15**	**110**	**288**	**523**
Planting						
Maintained	6	451	31	0	410	899

Fuels treatments would reduce the risk of roadside ignition and potential reburn in the area, and reduce the risk to further loss of habitat (Chapter 3.4.3).

Treatment areas would be replanted where adequate regeneration standards are not met, with a mixture of conifer species, weighted heavily to pines and incense-cedar, should post-treatment inspection identify the need to re-establish conifer species (Chapter 2.3.3). Replanting would accelerate the transition from early seral habitat to dispersal and NRF by 20-30 years.

Disruption associated with safety treatments would be minimized by application of project design features that impose operating restrictions during the critical breeding season within disruption distances of unsurveyed suitable habitat or northern spotted owl sites (Chapter 2.3.5, # 6).

Site Occupancy

Roadside safety treatments overlap 12 northern spotted owl home ranges, 4 core areas, and 2 nest patches (Table 3-11).

No effects from potential disturbance to nesting northern spotted owls or their young would be anticipated because seasonal restrictions described in Chapter 2.3.5 #6 would be applied where proposed activities would occur.

None of the 12 home ranges overlapped by roadside safety treatments contain NRF habitat levels that are above the suitable habitat threshold considered important to maintain life functions for the northern spotted owl (Table 3-11). Nesting, roosting, foraging habitat loss would occur in 10 home ranges (2 occupied sites); PFF loss would occur in nine home ranges (2 occupied sites). All of the home ranges contained less than the desired amounts of habitat prior to treatments, habitat modification and loss at the home-range scale would not bring any owl home range below an identified threshold amount (Table 3-11).

Key to Using Table 3-11

[1] Occupancy Status – occ = occupied; un = unoccupied.
[2] Habitat Limited? – yes, if core area contains less than 250 acres, or home range contains less than 1,336 acres.
Green fill represents impacts to northern spotted owl habitat.
Blue bold text represents occupied sites

Table 3-11. Effects of roadside safety treatments on spotted owl home ranges

IDNO	Occupancy Status[1]	Nest Patch						Core Area							Home Range						
		Dispersal		NRF		PFF		Dispersal		NRF		PFF		Habitat Limited? [2]	Dispersal		NRF		PFF		Habitat Limited? [2]
		Maintained	Removed	Maintained	Removed	Maintained	Maintained	Maintained	Removed	Maintained	Removed	Maintained	Removed		Maintained	Removed	Maintained	Removed	Maintained	Removed	
0369O	un	0	0	0	0	0	0	0	0	0	0	0	0	yes	0	0	0	0	0	0	yes
0375C	**occ**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**2**	**2**	**0**	**1**	**10**	**no**	**13**	**4**	**21**	**1**	**11**	**30**	**yes**
0376O	un	0	0	0	0	0	0	0	0	0	0	0	0	yes	0	0	0	0	0	0	yes
0906A	un	0	0	0	0	0	0	0	0	0	0	0	0	yes	0	0	0	0	0	0	yes
0919O	un	0	0	0	0	0	0	0	0	0	0	0	0	yes	0	0	0	0	0	0	yes
1911C	un	0	0	0	0	0	0	0	0	0	0	21	0	yes	0	6	34	7	51	18	yes
1989O	un	0	0	0	0	0	0	0	0	0	0	0	0	yes	0	0	0	1	0	0	yes
2043A	un	0	0	0	0	0	0	0	0	20	1	11	17	yes	0	3	57	10	41	44	yes
2044O	un	0	0	0	0	0	0	0	0	12	1	3	12	yes	0	0	55	9	32	65	yes
2046O	un	0	3	2	0	3	16	00	3	17	0	7	18	yes	0	3	30	6	92	26	yes
2072O	**occ**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**no**	**0**	**0**	**0**	**0**	**0**	**0**	**yes**
2094A	un	0	0	0	0	0	0	0	0	0	0	0	0	yes	0	0	6	0	0	0	yes
2101O	un	0	0	0	0	0	0	0	0	0	0	0	0	yes	0	0	0	0	0	0	yes
2209C	un	0	0	0	0	0	0	0	0	0	0	0	0	no	0	0	0	0	0	0	yes
2213O	un	0	0	0	0	0	0	0	0	0	0	0	0	yes	0	0	0	1	0	0	yes
2298A	**occ**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**yes**	**0**	**3**	**4**	**2**	**10**	**1**	**yes**
2407A	un	0	0	0	0	0	0	0	0	0	0	0	0	yes	0	0	0	0	0	0	yes
2622A	un	0	0	0	0	0	0	0	0	0	0	0	0	yes	1	0	0	2	21	8	yes
2662O	un	0	0	0	0	0	0	0	0	0	0	0	0	yes	0	0	0	0	0	0	yes
4047A	un	0	0	0	0	0	0	0	0	0	0	0	0	yes	3	0	3	1	0	5	yes
4051O	un	0	0	0	0	0	0	0	0	0	0	0	0	yes	0	0	0	0	0	0	yes
4507C	un	0	0	0	0	0	0	0	0	0	0	0	0	yes	0	0	16	0	1	10	yes

Prey Species

Post-fire, small mammal populations within the high-severity fire areas transitions to deer mice and other small rodent species that are capable of utilizing the simplified habitat (Fontaine 2007). Small mammal species diversity declines with little change in overall abundance. Roadside safety treatments and the associated fuels treatment would retard habitat development by further disturbing the woody and herbaceous materials that have accumulated on the ground, but overall this effect would be short and localized, and the successional changes and habitat development expected would be set back for a short period of time. Important prey species for the northern spotted owl—northern flying squirrel and bushy-tailed and dusky-footed woodrats—would be expected to come back into the stands as habitat develops; the woodrats first, then followed later by northern flying squirrels once the overstory canopy recovers.

Long-term, the loss of snags would have the biggest impact to flying squirrel recovery. The development of large-diameter snags sufficient to provide denning habitat for flying squirrels would take many years to recover. The small size of the treatment areas and their interspersion with green stands and untreated high severity areas would lessen the overall effect by allowing the treated areas to benefit from the refugia and recolonization potential of woodrat and flying squirrels provided by the adjacent unburned habitat and the untreated high severity fire areas.

The small size of the treatment areas and their interspersion with green stands would also allow the treated stand to continue to provide potential foraging opportunities to owl foraging on woodrats from the unburned edges (Zabel *et al.* 1995, Bond *et al.* 2009).

Effects on Northern Spotted Owl 2012 Critical Habitat

Roadside, railroad right-of-way and quarry safety treatments would affect 518 acres of northern spotted owl critical habitat. The loss of canopy cover due to roadside safety treatments will result in the reduction of canopy cover below the 40 percent threshold necessary to provide the nesting, roosting, foraging, and dispersal conditions that those stands provide; roadside safety treatments will remove 14 acres of NRF habitat, 122 acres of PFF, and 9 acres of dispersal. Even with the loss of canopy cover and other key habitat components typically found in NRF habitat (e.g., down wood, soft snags, green canopy), studies indicate that burned areas would continue to provide foraging habitat after a fire, depending on patch size, edge type and proximity to known owl sites (Bond *et al*. 2002, Bond *et al.* 2009, Clark 2007, Clark *et al.* 2011, Clark *et al.* 2013). Results from radio telemetry studies of spotted owls in post-fire landscapes indicate that spotted owls use forest stands that have been burned, but generally do not use stands that have been burned and logged. Studies suggest a negative influence of high-severity fire on spotted owl occupancy, and survival may be compounded by prior forest management or post-fire management activities (Clark *et al.* 2011, Clark *et al.* 2013, Jenness *et al.* 2004, Roberts *et al.* 2011).

One hundred-eighteen acres of NRF and 6 acres of dispersal habitats may be treated and maintained; canopy cover loss due to the removal of single tree and small groups is not expected to reduce canopy closure below the 60 and 40 percent thresholds for functioning NRF and dispersal habitats. An additional 215 acres of capable habitat would be treated and maintained. Planting would assist in insuring the timely regeneration of conifer habitat—accelerating attainment of canopy closure by 20-30 years and providing a more diverse assemblage of conifer species.

Table 3-12. Activities in northern spotted owl dispersal, suitable and PFF habitat in Critical Habitat for Alternative Two

Treatment Affects	Northern Spotted Owl Habitat (acres)					Grand Total
	Non-Habitat	Capable	Dispersal	NRF	PFF	
Roadside Safety Treatments						
Maintained	33	77	6	96	162	375
Removed	0	0	9	14	122	149
Total	**33**	**77**	**15**	**110**	**284**	**518**
Planting						
Maintained	6	451	31	0	410	899

2011 Northern Spotted Owl Recovery Plan

Recovery Action 6

> "In moist forests managed for spotted owl habitat, land managers should implement silvicultural techniques in plantations, overstocked stands and modified younger stands to accelerate the development of structural complexity and biological diversity that will benefit spotted owl recovery."

BLM is proposing to remove 14 acres of NRF, 126 acres of PFF, and nine acres of dispersal habitats (Table 3-11). These habitats would be removed where it constitutes a threat to employee and public safety; 0.2%, 6%, and 0.6 % of the available NRF, PFF, and dispersal habitats in critical habitat subunit KLW-1, respectively). The loss of these habitats is limited to those areas within 1.5 tree heights (up to 2.5 tree heights on slopes in excess of 35 percent) of those road segments that experienced moderate- and high-severity fire, and receive relatively high use.

Planting would occur on 1,392 acres of moderately and severely burned forests with a goal of establishing a variably spaced and diverse conifer forest 20-30 years sooner than natural regeneration. Within all planting units, legacy structures would be retained; although up to ten snags/acre may be felled where they pose safety concerns to tree planters.

While the District would be removing suitable NRF, PFF, and dispersal habitat, impacts at the home-range scale are small. Additionally, the District proposes to accelerate the development of conifer habitat, maintain structural legacy where it can be achieved safely, and limit roadside safety treatments to only those road segments subject to moderate- and high-severity fire, and where risks to federal and private woods workers and the recreating public may occur. The District located and configured the proposed activities to minimize impacts to the northern spotted owl, and met the intent of Recovery Action 6.

Recovery Action 10

> "Conserve spotted owls sites and high value spotted owl habitat to provide additional demographic support to the spotted owl population."

None of the 22 home ranges are above the suitable habitat threshold considered important to maintain life functions for the spotted owl (Table 3-11). Nesting, roosting and foraging habitat and post-fire foraging habitat loss would occur in 10 home ranges (2 occupied sites). All 22 home ranges currently contain less than 40 percent NRF habitat, habitat modification and loss at the home-range scale would not bring any owl home range below an identified threshold amount (Table 3-11).

NRF, PFF, and dispersal habitat would be lost from within two occupied home ranges. The level of impacts is one percent or less of the available NRF habitat in all three occupied sites. Of the three occupied spotted owl sites in the project area, no nest patches would be affected by the proposed activities. The intent of Recovery Action 10 has been met by maintaining the amount of NRF habitat within any home range or core area of any occupied site at, or near, pre-treatment levels. The District, with the assistance of the Fish and Wildlife Service, located and configured the proposed activities to minimize impacts to the northern spotted owl and met the intent of Recovery Action 10; at the same time removing the safety and fuel loading hazards posed by the fire-killed and fire-injured hazard trees.

Recovery Action 12

> "In lands where management is focused on development of spotted owl habitat, post-fire silvicultural activities should concentrate on conserving and restoring habitat elements that take a long time to develop (e.g., large trees, medium and large snags, downed wood)."

Action 12 recommends that post-fire activities should focus on the conservation and restoration of habitat elements that take a long time to develop (e.g., large trees, medium and large snags, downed wood). These areas should promote habitat elements to support northern spotted owls and their prey, including retention of large trees, snags, defective trees, and CWD. The BLM worked to meet the intent of Recovery Action 12 by retaining 93 percent of all stands on which 25 percent or more of the basal area was killed. Levels of snag retention, as modeled, indicate that 10-44 snags/acre (20+ inch DBH) will be retained, (models assumed complete mortality of a 36, 90, and 158 year old stand).

Reforestation would also occur on approximately 900 acres of habitat that received moderate- and high-severity wildfire; this includes areas of previous plantations and older stands. The total acres planted would be based on available funding, and the prescriptions would be based on site conditions and current stocking levels of conifer seedlings. Additionally, areas treated for safety hazards would be planted where necessary to meet seedling stocking requirements.

The BLM is limiting the loss of habitat elements that take a long time to develop (e.g., large-diameter snags and down wood) to less than eight percent of the area impacted by wildfire (greater than 25 percent basal area loss), and is accelerating the regeneration of a conifer canopy on approximately 900 acres of forest that suffered a greater than 25 percent loss of basal area.

Recovery Action 32

> "Because spotted owl recovery requires well distributed, older and more structurally complex multi-layered conifer forests on Federal and non-Federal lands across its range, land managers should work with the Service as described below to maintain and restore such habitat while allowing for other threats, such as fire and insects, to be addressed by restoration management actions. These high- quality spotted owl habitat stands are characterized as having large-diameter trees, high amounts of canopy cover, and decadence components such as broken-topped live trees, mistletoe, cavities, large snags, and fallen trees."

No RA32 habitat was identified in the Action Area prior to the 2013 fire. It is unknown whether or not roadside safety treatments would occur in RA32 habitat, no inventories have been completed. Roadside safety treatments would remove approximately 106 acres of NRF habitat that may comprise portions of "older and more structurally complex, multi-layered conifer forest". For example, 102 acres have at least one canopy component over 120 years of age (based upon birthdate) and may indicate conditions similar to conditions described in Recovery Action 32. However, treatments would occur along the periphery of stands and adjacent to roads, areas where habitat quality is already impaired by edge effect and fire impacts. Minimal impacts to interior habitat are anticipated. Additionally, individual hazard trees may be removed from older stands but the overall function/Recovery Action 32 value of those stands will not be lost.

Marbled Murrelet

There would be no effects to occupied marbled murrelet habitat due to proposed actions.
The BLM is proposing to treat up to 524 acres of forests adjacent to roadways, railroad right-of-way, and quarries to remove those trees that currently pose an imminent risk of failure, and those trees likely to become an imminent risk in three to five years (Chapter 2.3.1). The majority of the hazard trees to be felled would be dead, although hazard tree removal will not remove potential murrelet nest trees, the removal of hazard trees adjacent to potential nest trees and stands providing nesting would reduce canopy cover that provide vertical and horizontal cover that provide protection from predators and amelioration of environmental conditions. Hazard tree removal activities may occur outside of those defined areas, but would typically be single tree or small group removals. Within marbled murrelet nesting and recruitment habitats the felling and removal of dead trees would modify the habitat and may result in the loss of habitat function due to reduction in the overall canopy closure, and reducing both vertical and horizontal cover.

Post-fire foraging habitat are completely killed stands and do not provide either nesting or recruitment habitat for the marbled murrelet (post-fire foraging habitat is a classification for northern spotted owls and does not indicate use by murrelets as foraging habitat).

Bureau Sensitive Species

American Bald Eagle

Roadside safety treatments would remove potential roosting trees from up to 200 acres of potential roosting/foraging perches habitat within 1 mile of Cow Creek and Middle Creek; approximately 2.5 percent of that available within the project area.

Noise disturbance caused by roadside safety treatments along Middle Creek and Cow Creek could cause bald eagles to avoid roosting in areas adjacent to the treatment. Cow Creek and Middle Creek roads were major haul routes prior to the fire, therefore, it might be expected that eagles roosting in these areas are accustomed to noise disturbance and the increased effects of noise from the roadside safety treatments may be minimal. Bald eagle roosting habitat may be affected during roadside safety treatments; however, there would be sufficient habitat unaffected that overall roosting behavior would not be lost in the project area.

Purple Martin

Roadside safety treatments would remove current and potential nest trees from up to 524 acres of nesting and roosting habitat. Snags, especially large-diameter snags, provide critical nesting opportunities for purple martin. These snags would provide the cavities and hollows necessary for nesting martin colonies as the snags decay. Smaller, shorter snags may be left further from the road; but the larger, higher-value snags would be lost from the treatment areas. The loss of this snag habitat would be felt for 30-50 years. Roadside safety treatments would affect eight percent of burned habitat on BLM land in the project area.

Fringed Myotis, Pacific Pallid Bat, and Townsend's Big-eared Bat

Roadside safety treatments will remove current and potential roost trees from up to 524 acres of nesting and roosting habitat. Snags, especially large-diameter snags, provide critical nesting opportunities for bats as they decay. These snags would provide the cavities and hollows necessary for roosting and breeding bats, and also the sloughing bark, cavities and hollows necessary for bat occupancy. Smaller, shorter snags may be left, further from the road; but the larger, higher-value snags would be lost from the treatment areas. The loss of this snag habitat would be felt for 30-50 years. Roadside safety treatments would affect eight percent of burned habitat on BLM land in the project area.

Oregon Shoulderband Snail

There will be no shoulderband sites impacted by the proposed action. As a species dependent on talus and down wood, the majority of negative effects occurred as a result of the wildfire. However, as talus-dependent species, individuals may have survived the fire deep in the rocky substrate or in isolated unburned islands. Roadside safety treatments and their associated fuel treatments would impact potentially occupied habitat. Ground skidding logs and the use of heavy equipment for fuel treatments would remove the coarse woody materials necessary for recovering habitat quality, and would potentially disrupt the talus habitat. Possible compaction of the talus and movements of rocky substrate may render the habitat unsuitable or physically crush individuals (Duncan 2005). Surveys of suitable habitat will be completed prior to treatment and occupied sites will be protected, as necessary, to maintain site integrity.

Survey and Manage

Chace Sideband Snail

There will be no Chace sideband snail sites impacted by the proposed actions. As a species dependent on talus and down wood, the majority of negative effects occurred as a result of the wildfire. However, as talus-dependent species, individuals may have survived the fire deep in the rocky substrate or in isolated unburned islands. Roadside safety treatments and their associated fuel treatments would impact potentially occupied habitat. Ground skidding logs and the use of heavy equipment for fuel treatments would remove the coarse woody materials necessary for recovering habitat quality, and would potentially disrupt the talus habitat. Possible compaction of the talus and movements of rocky substrate may render the habitat unsuitable or physically crush individuals (Duncan 2005).

Surveys of suitable habitat will be completed prior to treatment and occupied sites will be protected, as necessary, to maintain site integrity.

Land Birds

Game Birds Below Desired Condition

Wood Duck

Roadside safety treatment would remove hazard trees from approximately 1.9 miles of streamside habitat along Cow Creek. Safety treatments would not remove any known wood duck nesting habitat; it would, however, remove hazard trees (greater than 12 inches d.b.h.) that could provide nest cavities in the future (Soulliere 1988). Overall, streamside nesting habitat will continue to function at similar levels after roadside safety treatments and plantings are completed.

Birds of Conservation Concern

Olive-sided Flycatcher

As an open canopy forager, it is expected that olive-sided flycatchers would respond positively to the gap and stand replacement that occurred as a result of this wildfire (Meehan and George 2003, Smucker *et al.* 2005). As aerial foragers, olive-sided flycatchers are not dependent on snags; but they do utilize trees and snags in openings and along adjacent edges as perches. This is consistent with the findings of Chambers *et al.* (1999). Habitat quality appears to develop with time post-fire (Meehan and George 2003). Roadside safety treatments would remove hazard trees from 524 acres of potential habitat. The loss of snags in these stands will not preclude them from functioning as olive-sided flycatcher habitat.

Roadside safety treatments would affect eight percent of burned habitat on the federal landscape. Even with snag removal, the small size and interspersed nature the treatments may lessen the overall effects of the treatment on the olive-sided flycatcher because of the overall edge created.

Partners In Flight Focal Species

Lazuli Bunting

Lazuli bunting responded positively to the fire areas, nesting on the hardwood shrubs that develop post-fire (Fontaine *et al.* 2009, Donaghy Cannon 2011 , Fontaine 2007 , Smucker *et al.* 2005). Roadside safety treatments would not impede the development of hardwood shrubs.

Northern Flicker

Flickers would respond positively to the fire areas, keying in on snags as both foraging and nesting habitat; flickers respond especially well to those live trees and snags displaying signs of advanced decay (Donaghy Cannon 2011, Simmons 2003, Fontaine *et al.* 2009, Fontaine 2007). Roadside safety treatments would remove hazard trees from 524 acres of potential habitat; impeding the future development of snags in advance stages of decay. Localized impacts from the remove potential nest trees along roadways will not decrease the overall habitat value of the stand as not all snags in the stand will be lost

Roadside safety treatments would remove up to 14 acres of older forest habitat.

Olive-sided Flycatcher

See the previous discussion for olive-sided flycatcher under the Birds of Conservation Concern section.

Pileated Woodpecker

Pileated woodpeckers utilize snags and green trees in mature and late-successional forest for foraging, roosting, and nesting habitat (Bull 2003b). As the largest woodpecker in the western United States, they typically utilize trees greater than 25 inches d.b.h. (Aubry and Raley 2002). The small size and interspersed nature of the roadside safety treatments may enable these patches to function as foraging habitat for the pileated woodpecker. Roadside safety treatments would remove hazard trees on up to 524 acres. A longer-term impact is the loss of large-diameter snags that would not be onsite when canopy closure occurs and the stand reaches the mature and late-successional structure favored by the pileated woodpecker (Bull 2003b).

Roadside safety treatments would remove up to 14 acres of older forest habitat.

Vaux's Swift

Vaux's swifts are positively associated with mature and late-successional conifer forests in western Oregon; typically nesting and roosting in large-diameter hollow trees and snags (greater than 30 inches d.b.h.) (Bull and Collins 2007). Roadside safety treatments would not remove suitable roost or nest trees, and would not cause the loss of foraging habitat because Vaux's swift are aerial foragers.

Roadside safety treatments would remove up to 14 acres of older forest habitat.

Cumulative Effects

Private Land Management

Private timber lands in the fire area are being salvaged where commercially viable, and will provide little to no large-diameter snags and coarse wood into the future eliminating the value of this habitat to those species that depend upon snags and down woody materials (Chapter 3.5.2). These stands are anticipated to be managed under intensive forest management practices; planted and treated with herbicide as necessary to attain full site occupancy by a commercial conifer species a quickly as possible. The simplification and short duration of early seral conditions on private lands would eliminate habitat for those species that depend on the heterogeneity of early seral habitat (e.g., snags, residual trees, down wood, forbs, grasses, deciduous shrubs, hardwoods). Private land management would emphasize Douglas-fir dominance. It is expected that any remaining late-seral forests on private timber lands will be converted to early seral forest over the next 20 to 30 years, and that private lands will cease to support species dependent on older-forest habitat.

Roseburg District BLM Actions

Ongoing Roseburg District BLM actions, described in the Cumulative Effects Introduction (Chapter 3.2), have been determined to have no cumulative effect when combined with activities proposed for Alternative Two, and would not add to cumulative effects on the wildlife resources analyzed in Alternative Two.

Medford District BLM Douglas Fire Complex Recovery Project

Post-fire recovery projects in the Medford District would remove nesting, roosting, and foraging habitat and PFF habitat from the home ranges of eight northern spotted owl sites analyzed above; four of those sites are considered occupied. Effects of these actions are considered in habitat values used for analyzing the effects of the proposed Roseburg actions to the northern spotted owl.

These actions are considered outside of the analysis area for the other species.

Reciprocal Rights-of-Way Road Safety Actions

The incremental loss of snags and down wood habitat due to the removal of imminent threat hazard trees, as a result of requests from intermingled landowners under existing rights-of-way agreements, have caused, and will continue to cause, habitat losses on federal lands similar to those described above.

3.6. Soils

3.6.1. Introduction

The soil resources that may be affected by the proposed activities are those within the proposed project area, and those immediately downslope of the project area boundaries in adjacent areas.

The time frame for the analysis of ground disturbing activities, fuels treatments and surface soil erosion is about ten years, or to the time of recovery of vegetative ground cover. The potential for slope failures would generally be within the first decade or until rooting strength in the soil is reestablished (USDI BLM 2008, p. 348, Robison *et al.* 1999). Soil compaction could persist for decades (Amaranthus *et al.* 1996, Powers *et al.* 2005); however, the benefits from subsoiling would be immediate (Luce 1997).

3.6.2. Affected Environment

Topography within the project area varies mainly from moderately steep to very steep side slopes with areas of rock outcrops and cliffs, and some headwalls (Johnson *et al.* 2004). Slopes range from 30 to 90 percent, with shallow to moderately deep soils of less than 20 inches up to 40 inches deep. Areas with very shallow soils less than 10 inches depth also occur on rock outcrops and moderate to very steep slopes up to 100 percent or more. The soils are well drained except for the very shallow and shallow soils, which are somewhat excessively drained.

Within the 12,100 acres of private and public lands in the project area boundary, about 4,100 acres are characterized by shallow soils less than 20 inches deep, and about 350 additional acres with very shallow and shallow soils adjoining rock outcrops (Douglas County Soil Survey, as updated by the Natural Resources Conservation Service).

The bedrock materials are sandstone, siltstone and metamorphic rock, and are stable to moderately stable in terms of slope stability, depending on slope steepness.

The soils on steep to very steep slopes are classified as fragile due to the slope gradients, and may be subject to soil and organic matter losses from surface erosion or some mass movement resulting from forest management activities unless measures, such as project design features and best management practices, are used to protect the soils/growing sites (USDI BLM 1986). Slope failures can result from natural or management-related causes. The types of failures can include headwall failures, shallow debris slides, and debris slide tracts.

The soils have a moderate to high surface erosion potential, depending on the organic matter content, soil texture and structure, rock content, and slope steepness (Robichaud *et al*. 2010, p. 7). The soil textures include sandy loams, coarse loams and loams. Although the sandy loam soils have a high precipitation infiltration capacity that helps prevent surface runoff, these soils are generally low in clay soil cohesion and weaker in soil structure, which makes them vulnerable to soil detachment by water when all ground cover is removed. The medium textured loam soils have moderate surface soil erosion potential when all ground cover is removed.

Most of the soils contain moderate to very high amounts of rock fragments from 35 percent to upwards of 80 percent, consisting of gravels and cobbles with some stones. The rock fragments within and atop the soils are mainly moderately hard to very hard, and angularly shaped. Rock fragments larger than one inch in diameter can act as surface ground cover protecting finer-grained soil material from water erosion (Robichaud *et al*. 2013). However, on steep to very steep slopes, coarse surface soils or those with high to very high amounts of rock fragments can be more subject to raveling when disturbed, or when all other ground cover, such as duff, litter, and woody debris, is removed (Robichaud *et al.* 2010, pg. 8).

A small portion of the project area contains gentle, ridgetop topography with slopes up to 30 percent and moderately deep to deep soils from 40 to upwards of 60 inches in depth which tend to have lower amounts of rock fragments, and clay content that may exceed 35 percent. These soils are stable, but are moderately to highly susceptible compaction depending on the amount of rock fragments and clay content (Johnson *et al.* 2004, Williamson and Neilsen 2000).

Areas that were previously ground-based yarded contain old skid trails that are compacted to varying degrees and topsoil has generally been removed. Existing primary skid trails exhibit heavily compacted and exposed gravels and some cobbles, or gravelly/cobbly subsoil with dense and massive to platy soil structure to depths of five inches or more over the running surface. The primary skid trails are vegetated to varying degrees with forbs, moss, or shrubs with some conifers. Secondary skid trails are generally compacted to depths of three to four inches within tread areas, which are three to four feet wide per tread and have varying coverage of conifers, forbs and shrubs.

3.6.2.1. Timber Production Capability Classification System

The Timber Production Capability Classification (TPCC) is a land classification system used to partition all public lands within the Sustained Yield Unit (SYU) boundaries of BLM-administered lands. These partitions are based on the physical and biological capability of the site to support and produce forest products on a sustained yield basis (TPCC Handbook 1986). Areas are classed based on soil limitations, such as slope steepness or stability, low soil moisture or nutrients, or on reforestation problems, such as moisture or temperature factors.

Areas that are not suitable for timber management are withdrawn from the timber land base for intensive management, since these withdrawn lands would likely incur unacceptable resource damage from timber management, even with the application of Best Management Practices and project design features. However, on TPCC withdrawn lands, timber harvest is allowed to remove trees killed or substantially damaged by fire, windthrow, other natural disturbance (Roseburg District ROD/RMP 1995, page 62).

In the withdrawn non-suitable woodland areas within the project area, there are approximately 1,257 acres of fragile non-suitable lands based on very steep slope gradient or limited soil moisture or nutrients. High rock content, coarse textured soils and shallow soil depth account for the low water-holding capacity (droughty) and low nutrient levels in the soils. Other withdrawn areas contain about 81 acres of nonforest land, which includes roadways, water courses (Cow Creek and Middle Creek), and rockland.

The remaining BLM acres are fragile, restricted, suitable woodland areas that can be intensively managed, but with requirements for applying best management practices and project design features to minimize the effects to the resources. These areas of suitable woodlands include 1,545 acres of fragile restricted lands based on slope, or limited soil moisture or nutrients and 3,375 acres of reforestation problem areas based on moisture (plant competition) and temperature factors.

3.6.2.2. Fire Severity

As stated in the Emergency Stabilization and Burned Area Rehabilitation Plan (USDI BLM 2013), approximately 17,000 acres within the Douglas Complex burned at high to moderate severity. Natural resources located within or downstream of the fire may be subject to damage from flooding, ash, mud and debris deposition, as well as hill-slope erosion (USDI BLM 2013).

The project area experienced mixed-severity fire with a variety of impacts. Within the BLM LSR in the project area about 1,308 acres were high soil burn severity, 1,363 acres moderate burn severity, 1,215 acres low severity, and 2,368 acres very low severity or unburned (Appendix A, Figure A- 4).

In areas of high soil burn severity (Figure 3-9) there was generally little to no effective ground cover, besides existing rock fragments, as most of the litter and duff was consumed. Little to no canopy cover remained with little to no needle cast or leaf fall on the ground.

Figure 3-9. High soil burn severity with exposed rock fragments

In the surface soil, organic material helps to bond soil particles into aggregates or peds, as a part of soil structure. When the soil organic matter in the upper soil is consumed by fire, the soil can lose its structure and become disaggregated into separate particles, and as a result, become more erodible.

In high burn severity areas, when the high temperatures oxidized the soil and consumed the surface and soil organic material, the soils exhibited areas of distinct color change with the top layer of mineral soil turning various shades of red. These areas commonly occur where large down wood, stumps and roots burned out. In moderate soil burn severity areas (Figure 3-10), the duff and litter was partially to completely consumed, while tree crowns were partially scorched or if completely scorched, retained some dead needles and leaves, which later fall as needle cast and leaf fall.

Figure 3-10. Burned forest area covered with needle cast

In general, in low soil burn severity areas, the fire partially burned the litter and duff, and tree crowns were unburned to partially-scorched with the majority of blackened needles or leaves attached.

3.6.2.3. Re-sprouting Vegetation and Established Vegetation

Since the fire, there has been substantial re-sprouting and re-growth of shrubs and hardwoods, including Pacific madrone, canyon live oak, tanoak, and chinquapin (Chapter 3.3). Various forbs and grasses have sprouted as well, and are becoming established. The amount of vegetative cover depends on the initial extent of shrub/hardwood component in each burned area, the available seed bank of the forbs and grasses, slope aspect, and soil properties such as depth and texture, and the amount of rock fragments in and on top of the soil.

3.6.2.4. Soil Erosion

The Emergency Stabilization and Burned Area Rehabilitation Plan (ESR) (USDI 2013) for the Douglas Complex estimated that the first year after the wildfire, surface erosion rates would be from 16 to 31 tons per acre within the high severity areas without the application of mulching. The ESR acknowledged that those figures were only estimates, and that slopes containing high rock surface cover have a reduced erosion potential due to increased surface roughness which disperses overland flow. This, in turn, decreases soil particle detachment and increases deposition of any transported soil particles onto the soil surface, before reaching streams (Nearing 1998 in ESR, page 16).

According to the ESR “The surface rock armoring should serve to reduce the soil loss below the values shown above. The amount of reduction is not known. However, first-year post-fire sediment transport, due to water erosion, is expected to exceed the allowable soil loss tolerance for the area.” (in ESR, page 16).

The amount of precipitation received over the fall, winter and spring months since the fire was substantially below average for the year, and the amount of erosion seen in the burned areas was less than projected. The field exams indicate that the main erosion was sheet erosion, along with rock fragment ravel and some areas of rill erosion. There were also limited small, shallow debris slides as illustrated by accumulations of transported sediment behind down woody debris, along streams or on road beds.

Surface rock fragments afforded some protection against raindrop splash and water detachment on the gentle to moderate slopes. However, some of the high soil burn severity areas with high amount of rock fragments (gravel, cobbles and stones) on the very steep slopes experienced extensive raveling, as evidenced by the accumulation of material along the main Cow Creek Road. As of April 2014, over 690 cubic yards of material were removed since the fire (SW Oregon Fire Recovery Update 2014).

3.6.2.5. Fireline Construction

During the fire suppression activities, 10.4 miles of dozer line and 6.3 miles of hand fireline were constructed on federal and non-federal lands within the project area. Dozer lines constructed on non-federal lands were waterbarred to control soil erosion, but were not otherwise rehabilitated. These areas would be subject to some continued surface erosion until enough vegetation or ground cover is reestablished.

On BLM lands, all dozer lines were waterbarred and covered with root wads, downed trees and slash, and all berms were pulled back onto cleared areas to allow for drainage. In areas where dozer lines intersected or were in close proximity to streams, weed-free straw mulch and native seed was applied to reduce erosion. With these treatments, the amount of surface erosion in the dozer lines was minimal. Hand firelines were waterbarred as needed to prevent gullying in steep terrain, but were not otherwise rehabilitated. Erosion from the hand lines was also minimal, considering the narrow width of the hand trails, and the input of litter, needle-cast and ground cover from adjacent vegetation.

Due to limited funding for maintenance, and multiple ownerships, some of the roads in the project area were not regularly maintained prior to the fire. As a consequence of fire suppression activities, a number of roads were improved for fire access. Road repairs have been completed on main roads, and materials deposited on main roadways by cutbank failures, small slides, and raveled soil and rocks have been removed.

Many old, primitive roads (non-system roads), skid roads, main skid trails and old firelines are partially covered with grasses, brush, some conifers, and other vegetation. Since the erodibility of the soils on these re-vegetating sites is trending toward improvement, these sites would generally contribute less surface erosion each year.

3.6.2.6. Soil Productivity

Compared to historical conditions where fires were more frequent, fire exclusion has allowed increased accumulation of woody debris, organic matter and soil within forested areas (Parsons and DeBenedetti 1979, Stephens *et al.* 2004, Banwell and Varner 2014). This increase in woody material resulted in increased levels of nitrogen, phosphorus, sulfur and other nutrients in the surface biomass, forest floor and surface soil. The fire reduced the amount of woody biomass, but released stored nutrients as gases or in the ash, making a portion of the nutrients available to the plants for the next several years (National Wildfire Coordinating Group 2001). This release of nutrients helps plants become re-established in the burned areas.

Organic material in the form of coarse woody material is needed for long-term soil productivity (Harvey *et al.* 1987). Down wood provides moist micro-sites for conifers, shrubs, herbs, fungi, mycorrhizae, mosses, lichens, bacteria and small animals such as earthworms, snails, millipedes and nematodes. Microbes and soil animals decompose forest litter and organic components, and contribute to the maintenance of soil organic matter and to the storage of nutrients (Cromack 1998, James 2000).

Soil displacement and compaction can reduce soil productivity, with resultant reductions in height and volume growth of conifers (Wert and Thomas 1981). Deep soil displacement removes the surface soil horizon to adjacent undisturbed areas, removing the organic-rich surface layers and associated microbial and fungal populations (Amaranthus *et al.* 1996). Inter-mixing of the upper soil layers with subsoil layers can reduce site productivity because subsoils are generally denser, and lower in nutrients and organic matter. Extensive displacement can also alter slope hydrology, increasing the potential for surface erosion (Page-Dumroese *et al.* 2009).

Compaction decreases soil pore space resulting in restricted movement of water, air, nutrients and plant roots, which in turn can decrease soil productivity and vegetative growth in many soil types. Reduced pore space also reduces water infiltration, causing an increase in surface runoff and accelerated erosion. Depending on soil textures, the effects of soil compaction can persist for 40-80 years or more (Wert and Thomas 1981).

Much of the nitrogen and other nutrients in forest ecosystems are derived from the decomposition and recycling of organic matter in the form of decayed leaves or needles, branches, fallen trees, CWD, and roots. Organic matter helps improve water retention in soils, maintains good soil structure, aids in water filtration into the soil, stores carbon, and promotes the growth of soil organisms (Rapp *et al.* 2000).

The degree of change in levels of organic matter, nitrogen and other nutrients is directly related to the magnitude of soil heating and the severity of a fire. When organic matter is burned, the stored nutrients are either volatilized or are changed into highly available forms that can be taken up readily by microbial organisms and vegetation (Neary *et al.* 2005). In fires of high burn severity the soil nutrients and microbial populations are greatly reduced (Science Findings 2010, p. 1; Fire Science Brief 2011, p. 3-4).

Carbon and nitrogen are the key nutrients affected by fire, and large amounts are lost through direct volatilization in moderate to high-severity fires. Increases in soil temperature during low severity fire are lower and of shorter duration, and the volatilization of carbon and nitrogen are greatly reduced. Low-severity fires generally have less effect on soil microorganisms as well (Neary *et al.* 2005). Other nutrients, such as cationic calcium, magnesium, sodium and potassium are not as easily volatilized and usually remain on the site in a highly available form.

Soil carbon losses lead to increased bulk density and reduced soil water-holding capacity, cation-exchange capacity and sources of energy for microbial communities (Bormann *et al.* 2008).

Besides reducing carbon and nitrogen through direct volatization, severe wildfire can cause reduced soil productivity through loss of fine mineral soil from the surface soil through combustion and fire-driven convection in large smoke plumes. The loss of the mineral soil results in shallower surface soil and increased rock fragment content in and on the remaining soil surface (Bormann *et al.* 2008). This type of soil loss, in addition to the subsequent water erosion, likely contributed to the high amounts of surface rock remaining.

In burned areas where the canopy is more open because of fire, the ground temperatures and soil moisture increases, which accelerates the decomposition rate of the remaining organic matter, humus and soil wood, depending on the available or remaining microorganisms, bacteria, and fungi (Harvey *et al.* 1987).

Mycorrhizae form symbiotic communities with the roots of conifers, and are important in aiding nutrient and water uptake, and in warding off pathogenic fungi. Mycorrhizal fungal communities and other soil microbes are important because of their role in nutrient production and transfer (Li and Strzelczyk 2000). They also contribute to soil formation and structure. Stability of soil aggregates is important for maintenance of soil pores that transmit air and water to plant roots. In exchange for water and nutrients, the fungi obtain carbon and sugars from the plants.

Most mycorrhizal roots occur in the surface soil horizons, particularly the organic soil layer, and in decaying wood, such as decomposing logs. Mycorrhizal populations would remain in decreased levels where the burn severities were highest. Although microbial and fungal populations are greatly affected and reduced by severe burning, the red soils are not sterile (Science Findings 2010).

Short-term changes in microbial function and diversity are expected after severe burning. The recolonization process by surviving micro-organisms, and by those organisms disseminated on the soil surface by wind or water, begins almost immediately following fire from adjacent vegetation (Busse *et al.* 2014).

3.6.2.7. Coarse Woody Debris and Vegetation:

Since the fire's containment, organic debris and woody material has been deposited, through available needle cast and leaf fall, and the initial falling and breakage of fire-killed and fire-damaged branches and trees. This input of CWD provides habitat for soil microbes, fungi and invertebrates, as well as nutrients to the site.

3.6.3. Environmental Consequences

3.6.3.1. Alternative One – No Action

Under this alternative, there would be no additional soil disturbance. No additional soil would be compacted, displaced or puddled. No landing construction, or yarding and skidding would take place. No additional soil would be eroded as a result of ground disturbing activities.

No organic matter or nutrients would be removed. With time, organic matter would gradually accumulate from the addition of woody material from the decaying fire-killed and fire-damaged vegetation, and from other inputs from the re-sprouted shrubs and hardwoods, and the forbs and grasses. Nutrients would gradually accumulate due to inputs from precipitation, dry deposition, weathering of soil parent material, and nitrogen fixation. Changes in soil chemistry, such as an increase in soil pH from the release of available nutrients would be short term, and would return to pre-fire levels in several years (Elliot *et al.*2001). There would be no additional effects to the microbial and fungal populations.

Effects on Soil Erosion

Exposed soils would continue to be subject to surface erosion, including dry ravel and rill erosion on steeper slopes, until the areas are revegetated. The vegetative recovery rate varies depending on burn severity and vegetation recovery (Neary *et al.* 2005).

Elliot *et al.* (2001) noted that field observations and validation studies suggest that following wildfire, the amount of exposed mineral soil is halved each year until the site is recovered. In one study, erosion rates dropped from almost 17.8 tons/acre the first year after a fire, to 1.0 ton per acre the second year, and 0.4 ton per acre the third year (Elliot *et al.* 2000).

Vegetation recovery on the more productive soils, or on low and moderate soil burn severity on gentle to moderate slopes, would be fairly rapid in one to three years (Rapp *et al.* 2000, Neary *et al.* 2005). However, areas that are moderately or severely burned on harsh, steep sites can take seven or more years for vegetative recovery (Neary *et al.* 2005). On very steep slopes with high amounts of rock fragments or shallow soils with rock outcrop, the vegetation recovery could take seven to ten years. Effects of vegetation regrowth on soil erosion are discussed in Chapter 3.6.2.4.

The re-sprouted shrubs and hardwoods and established grasses and forbs help to protect and stabilize the surface soil through cover against raindrop splash, roots binding the soil, uptake of water, and by adding organic matter to the soil.

Effects on Slope Stability

The incidence of slope failures, such as debris slides, would increase over time for about the next ten years, as roots of fire-killed and fire-damaged trees as well as other vegetation deteriorate and loose elasticity, decreasing the root-holding strength in the soil (Robison *et al.* 1999). However, the existing shrubs and hardwoods would continue to help maintain or re-establish slope stability through root establishment.

Effects on Soil Productivity

If all fire-killed trees were to remain on site, they would eventually fall to the forest floor, the majority falling over the next 10-30 years (Brown *et al.* 2003). The continued input of large and small woody debris from branch and snag fall, tree fragmentation, and tree decay by insects and disease would add to the biomass and organic matter content over time. Depending on the amount of fire-killed and fire-damaged trees, the accumulation of high amounts or large woody debris could increase the risk for a future high intensity fire, which would again reduce the site productivity in severely burned areas (Chapter 3.4).

3.6.3.2. Alternative Two – Proposed Action

Effects on Soil Erosion

Roadside, Railroad Right-of-Way, and Quarry Safety Treatment

The estimated acres of cable- and ground-based yarded areas, the yarding direction (uphill and downhill), as well as the field soil burn severity in the safety treatment areas are shown in Table 3-13. The soil burn severity and soils were field checked in the proposed treatment areas.

Soils can be displaced and compacted from forest management activities such as landing construction, hazard tree falling, and yarding and skidding trees. The soil disturbance can result in subsequent soil erosion.

The amount of soil disturbance would depend on such factors as the amount of trees removed (or volume), which is reflected in the vegetation burn severity, the age (or height) of the trees, and the yarding direction and distance of yarding. The acreage figures in the uphill and downhill yarding columns for both yarding systems also include road surface areas that are not included in the last column, "On Road Surface or Adjacent".

To help minimize the amount of soil displacement and compaction from the removal of hazard trees, PDFs identified in Chapter 2.3.5 would be implemented.

Table 3-13. Roadside safety treatment areas-yarding system and field soil burn severity

Yarding System	Field Soil Burn Severity	Gross Area (acres)	*Uphill Yarding (acres)	*Downhill Yarding (acres)	*On Road Surface or Adjacent (acres)
Cable	1 - Unburned to Very Low	74	37	36	1
	2 - Low	110	45	65	0
	3 - Moderate	186	79	105	2
	4 - High	133	77	54	2
	Subtotal Acres	**503**	**238**	**260**	**5**
Ground Base	1 - Unburned to Very Low	1	---	---	1
	2 - Low	1	1	---	---
	3 - Moderate	5	1	4	---
	4 – High	15	5	10	---
	Subtotal Acres	**22**	**7**	**14**	**1**

*Gross areas are approximations based on post-fire aerial photo analysis, soil and vegetation burn severity models, and subsequent ground reconnaissance. Gross areas may change as additional information and further field review refines the approximations.

The roadside safety treatment would include approximately 503 acres of cable yarding, and 22 acres of ground-based skidding (Table 3-13), equivalent to about 8 percent and less than 1 percent of BLM land, respectively (based on 6,266 acres of BLM land). Areas directly on or immediately next to the road surface include about five acres in cable areas, and one acre in ground-based areas.

The slope gradient of the treatment areas also affects the amount of potential soil disturbance. In cable yarding on steeper slopes, the cable line deflection or lift is greater, such that the log or tree loads have better suspension. However, on the steeper slopes, there is also a greater potential for soil and rock raveling when the ground is disturbed during cable yarding. The felling of hazard trees would cause some additional soil disturbance, particularly on the steeper slopes.

In general, downhill cable yarding can produce more soil displacement than uphill yarding, as one end of the yarded material can be touching the ground and moving in a downward direction, with the added force of gravity causing disturbed soil, rock fragments, and other material to roll down the slope.

A certain amount of ground protection against soil displacement is afforded by areas with surface gravels or cobbles, particularly with angular rock fragments. However, with thicker layers of rock fragments or on steeper slopes, there would be a greater tendency for dry ravel from yarding disturbance, with either uphill or downhill cable yarding.

Monitoring of past harvest operations for cable systems show that harvest of green timber results in about three percent or less of detrimentally disturbed soils, including landings and large slash piles, and from four to ten percent of ground-based operations (USDI Roseburg District Annual Program Summary and Monitoring Reports, Fiscal Years 2001-2013). The threshold for detrimental soil effects in ground-based operations is ten percent, including landings and large fuel piles (USDI BLM FY 2001).

However, with green sales, the duff and litter are generally initially intact, to help minimize soil disturbance. Harvested trees are green and limber, with branches bending against the ground, unless broken off during the tree felling, or unless limbed and bucked, leaving only the logs to yard.

In the burned areas, the high burn severity areas would not have any or very little remaining duff, litter or needle cast or leaf fall cover. The low and moderate severity areas would have more intact or partially intact duff and litter, as well as needle cast and leaf fall on the ground.

Whole-tree yarding of fire-killed and fire-damaged trees would have branches that are dry, hard, firm, and stiff. The tree felling would break off portions of branches from the trees, while any remaining attached branches could create a wider path of surface soil displacement as the trees are yarded in, versus yarding in logs. Broken material from the tree felling would increase the ground cover to help control soil erosion. The felling of hazard trees would cause some additional soil disturbance, particularly on steeper slopes.

Although there would be additional surface soil disturbance from the yarding of felled trees, the treatment area widths are relatively narrow. The average treatment widths for cable yard areas are 120 feet for downhill yarding, and 100 feet for uphill yarding. The cable treatment widths range from 20 feet up to 600 feet. In many cases, the felled hazard trees along the roads can be picked up directly from the roads. There would be additional, limited soil erosion from the disturbed surface soil on steeper slopes.

The cable yarding is likely to produce surface soil displacement and mixing of the top two to four inches of soil in the yarding corridors, with isolated areas of six to eight inches depth. Both uphill and downhill cable yarding would likely draw some soil and woody material onto the road ditch and road bed. The uphill cable yarding acres is equivalent to roughly four percent of the BLM lands, and the downhill cable yarded acres equate to roughly four percent of BLM lands in the project area. The amount of surface disturbance from the cable yarding would be a portion of the treated areas. The amount of detrimental soil disturbance is estimated to be three to six percent in cable yarded areas. Any vegetated areas would also be disturbed by any surficial soil disturbance from the cable yarding, as seen in currently completed hazard tree removal operations along rights-of-way (Chapter 3.6.3.2).

Ground-based hazard tree removal in low and moderate severity areas would leave more residual duff and litter on site from needle cast and leaf fall, as well as the addition of processed limbs and branches, compared to the high severity sites. The moderate burn severity areas would still be more sensitive to soil disturbance compared to unburned areas.

During ground-based skidding, depending on slope gradient, uphill skidding can produce more disturbance than downhill skidding, since machinery and skidded logs are moving against gravity, causing more force to be distributed to the ground. The ground-based yarding would include about 7 acres of uphill, and 14 acres of downhill yarding. The ground-based treatment areas would be relatively narrow. The average treatment widths for uphill ground-based treatments are 100 feet, and 150 feet for downhill. The treatment widths range from 60 feet up to 270 feet.

To minimize ground disturbance by equipment, all ground equipment, including harvesters, skidders and loaders, would stay on roads and/or designated, spaced skid trails. Felled trees would be long-lined to the skid trails (Chapter 2.3.5). The skid trails would be compacted and displaced to varying degrees, depending on the number of trips, the volume yarded and the yarding distances.

The amount of detrimental soil disturbance for ground-based treatment areas is estimated to be four to ten percent, consisting mainly of designated skid trails. In many cases, the felled hazard trees along the roads can be picked up directly off the roads. The long-lining of trees would likely produce shallow surface soil displacement or mixing of the top two to four inches, with up to six to eight inches displacement in isolated areas, as seen in currently completed hazard tree removal operations involving rights-of-way (Chapter 3.6.3.2). Any established vegetation would be disturbed within these displaced soil areas. The shallow, surface soil displacement would be in addition to the four to ten percent figure.

The soil disturbance in the treatment areas from hazard tree felling, yarding and skidding would result in localized surface soil erosion. The surface soil disturbance would extend the initial vegetative recovery periods one to three additional years, depending on the site productivity, the amount of rock fragments in and on top of the soil, soil depth, and slope gradient. The prescribed rehabilitation measures would help initiate the recovery of these affected areas (Chapter 2.3.5).

The site productivity of any landings and skid trails would be affected longer term. Any treated areas of skid trails and landings with subsoiling, slash, and topsoil placement would help to start the soil recovery process, but does not restore soil properties completely. The soil fracturing is not 100 percent through the compacted soil profile, and only some topsoil is replaced onto the treated areas, with some slash placement, so a longer period is needed for full recovery of the compacted and displaced skid trails and landings.

Roadside Fuels Reduction

The roadside fuels reduction proposed within the first 50 feet of the road edge—along roads identified for safety treatments—involves hand piling or machine piling, with machines staying on the existing roads (Chapter 2.3.2). The subsequent burning of slash piles would create additional spots of burned areas, and decreased woody material. The total area of proposed roadside fuels reduction is up to 198 acres, which is equivalent to roughly 3 percent of the BLM lands. The burn pile areas would occupy only a portion of the fuels treatment area.

Habitat Restoration

Planting conifers on 1,392 acres would accelerate the recovery of live vegetative ground cover to reduce soil erosion, with the subsequent addition of organic matter and litter to the soil and the addition of CWD over the long term as the forest regrows.

Road Decommissioning

Some road decommissioning measures including subsoiling, slash and topsoil/organic matter placement, waterbarring or road blocking, would improve the soil conditions as compacted areas are reduced, and topsoil and organic matter is replaced on treated areas. There would be localized areas of soil disturbance in the short term from the decommissioning measures. The construction of waterbars and placement of slash, topsoil and organic matter would add to the protective ground cover and reduce surface soil erosion. Over the long-term, the soil productivity would be improved as decommissioned roads would be closed to traffic, and soil and vegetation recovery would progress over time.

Effects on Slope Stability

Roadside, Railroad Right-of-Way, and Quarry Safety Treatments

There would be additional, limited soil erosion from the disturbed surface soil on the steeper slopes. However, the surficial disturbance over short distances would not increase the potential for slope failures, based on the relatively short yarding distances.

The removal of fire-killed hazard trees would have minimal effect to the slope stability, as the trees have already died, with the roots already decaying. Removal of fire-damaged hazard trees which are still living would decrease the available rooting strength of remaining vegetation, since injured, but living trees would be removed. However, the live trees that would be removed would be trees having a high probability of dying in three to five years, with short-term benefits from root strength. The high vegetation burn severity sites would have the most material removed, with the higher percentage of fire-affected trees. The moderate to low vegetation burn severity would have the least amount of trees removed. Rooting strength is generally at its lowest point in the ten years after the removal of trees (Robison *et al.* 1999).

Roadside Fuels Reduction

The roadside fuels reduction would have a minimal effect on slope stability, as the fuels reduction treatment area would be narrow strips along roads. All machines would stay on existing roads and hand piling would also occur in other areas; all within the first 50 feet of the road edge (Chapter 2.3.2). The subsequent slash pile burning would create additional spots of burned areas and decrease woody material. However, the burn pile areas would occupy a small portion of the total fuels treatment area.

Habitat Restoration

Planting conifers in the roadside treatment areas would help to re-establish rooting strength, which would increase slope stability in the habitat restoration treatment areas where fire-killed and fire-damaged hazard trees would be removed.

Road Decommissioning

The road decommissioning measures would have a minimal effect on slope stability, since the decommissioned roads are located on stable ridge tops or on stable side slopes.

Effects to Soil Productivity

Roadside, Railroad Right-of-Way, and Quarry Safety Treatments

The greatest effects to soil productivity would be from landings and skid trails. The estimated amount of area affected would be four to ten percent in ground-based areas, consisting mainly of designated skid trails.

The removal of hazard trees would reduce the total woody material component in the roadside safety treated areas, and the organic matter reserve. The reduction of a percentage of the large woody component (including current standing dead trees) and the organic matter reserve would be a long-term effect. However, compared to pre-fire suppression era conditions, where fires may have burned more frequently, although likely in a mosaic burn severity pattern, the total on-site biomass may have been less historically, than just prior to the Rabbit Mountain Fire.

Whole tree yarding would remove the majority of the boles of the hazard trees; however, recommended levels of down, CWD would be left on site in the treatment areas (Chapter 2.3.1, USDA, USDI 1998).

The potential amount of removed material is dependent on the vegetation burn severity. Areas that burned under high severity would have the most material removed, with the higher percentage of fire-affected trees. Removing a larger amount or percentage of the coarse woody debris would lower the total amount of carbon and organic matter on the site, which would lower the site productivity. However, removing woody debris would also reduce the potential for future high fire severity (Chapter 3.4.3). If a fire were to reoccur within the fire scar, soil productivity would be reduced again.

Hazard tree felling and yarding would produce some on-ground woody debris and slash from the broken branches and tops, which would be left on site except along the 50-foot roadside fuels reduction buffer. The immediate increase in the ground fuel loading is dependent on the amount of trees felled and yarded. The ground fuels would decompose more rapidly, with an increased availability of released nutrients from the decomposing ground material compared to the standing woody material in the tree boles and crowns.

Tilling landings and skid trails with slash placement, along with partial replacement of duff and surface soil organic matter during the tilling process, would help initiate the soil recovery from equipment compaction and soil displacement. Tilling would reduce soil bulk density and provide some soil aeration. Tilling would also help prevent runoff and erosion by increasing infiltration capacity. Although tillage does not bring about complete percent recovery from soil compaction, it is an important step in the recovery process (Luce 1997).

Placing slash and other organic debris, and some adjacent topsoil over the tilled areas, provides protective cover to reduce surface soil erosion, and replaces some organic material, nutrients and soil microbes to help with soil productivity. Along with the tilling, placement of available slash, duff or surface soil, the treated trails would be waterbarred as needed.

Roadside Fuels Reduction

Machine piles and hand piles would be burned in late-autumn or winter after periods of extended precipitation, when the soil and duff moisture levels are high (Chapter 2.3.2).

The subsequent slash pile burning would create additional spots of burned areas, and decreased woody material. However, the affected area would be limited to a narrow band along the roadways. Burning in landings and hand piles would create high temperatures that can cause adverse effects to soils such as volatization of organic matter and nutrients, and the loss of soil structure. However, these effects would be limited to areas directly under the piles, and the burned pile areas would occupy a small portion of the fuels treatment area.

Habitat Restoration

Planting conifers on 1,392 acres includes the roadside treatment areas, burned young plantations and burned older-forest stands (Chapter 2.3.3). Planting would accelerate the recovery of live vegetative ground cover to reduce soil erosion, with the subsequent accumulation of organic matter and litter in the soil and the eventual addition of CWD as the forest regrows. This recovery of vegetative ground cover and accumulation of above ground and below ground organic materials to the soil would improve the soil productivity over time.

Road Decommissioning

Some road decommissioning measures including subsoiling, slash and topsoil/organic matter placement, waterbarring or road blocking, would improve the soil conditions as compacted areas are reduced, and topsoil and organic matter is replaced on treated areas. There would be localized areas of soil disturbance in the short term from the decommissioning measures. Over the long-term, the soil productivity would be improved as decommissioned roads would be closed to traffic, and soil and vegetation recovery would progress over time.

Cumulative Effects

Private Land Management

Ongoing timber salvage projects are being implemented on private forest industrial land within the project planning area, particularly in the moderate to high vegetation burn severity areas, where the majority of trees are removed. These harvest operations have included both cable-yarded areas as well as ground-based yarding equipment, which have resulted in some surface soil displacement on the yarding corridor in cable-yarded areas, and soil displacement and compaction on main skid trails in ground-based harvest areas. The timber salvage activities on private forest industrial land would follow Oregon State Forest Practices in leaving large snags, large hardwoods, and large CWD.

The number of miles of new roads constructed on private lands from the salvage sales is not known. Any erosion associated with new road construction with native surface material would likely decrease each subsequent year with the regrowth of vegetation.

Many old, primitive roads (non-system roads), skid roads, main skid trails and old firelines are partially vegetated with grasses, brush, some conifers, and other vegetation. Since the erodibility of the soils on these sites is trending toward improvement, these sites would generally continue to contribute less surface erosion each year. Based on the 2013 LiDAR imagery, the total amount of old, primitive roads (non-System roads), prior, old, tractor fire lines, quarry and equipment access trails, skid roads, and visible main skid trails in the project area on both federal and non-federal land, is 33 miles. There are about 7.4 miles of such roads and trails on BLM land, and 25.6 miles on non-federal land.

Roseburg District BLM Actions

Ongoing Roseburg District BLM actions, described in the Cumulative Effects Introduction (Chapter 3.2), have been determined to have no cumulative effect when combined with activities proposed for Alternative Two, and would not add to cumulative effects on soils analyzed in Alternative Two.

Medford District BLM Douglas Fire Complex Recovery Project

The proposed actions in the Medford District EA do not interact with those proposed in this EA. Not only are the projects removed from each other, they are within different watersheds, falling outside the methodology of this analysis.

Reciprocal Rights-of-Way Road Safety Actions

Requests have been received and processed from private landowners for removal of hazard trees along roads across BLM lands for safe access to their private lands. The hazard tree removal has included mainly the direct felling of hazard trees so such that yarding and loading machinery can stay on roads. However, some areas have included some cable and ground base yarding systems, as well. Where designated skid trails were used, the skid trails have been waterbarred as needed. There will likely be further requests for hazard tree removal, and the BLM will respond to such requests in like manner.

3.7. Fish Species, Aquatic Habitat and Water Resources

3.7.1. Introduction

The 2013 Rabbit Mountain Fire killed and injured a number of trees along roadways within the project area. Because dead or dying trees adjacent to roadways could be hazardous to human safety, the Roseburg District BLM is proposing roadside safety treatments (Chapter 2.3) that involve felling of trees in these areas and associated/subsequent actions (i.e. hazard tree yarding and hauling). The primary issues that these actions could influence as they relate to fish and aquatic habitat include sediment and substrate, pool quality, instream functional wood and large wood, and water quality/stream temperature. The primary issues that these actions could influence as they relate to water resources include shade, sedimentation/turbidity, peak stream flow enhancement, and road sedimentation. Relatively few areas within the project area burned at moderate to high severity in riparian areas and less so in close proximity to perennial streams (possibly due to higher relative humidity in these areas during the fire). This analysis describes the affected environment and the effects that could result from Alternative Two.

3.7.2. Affected Environment

3.7.2.1. Fish Species

A variety of anadromous (sea run) fish are found within the project area, including Oregon Coast Chinook salmon (*Oncorhynchus tshawytscha*), Oregon Coast coho salmon (*O. kisutch*), Oregon Coast steelhead trout (*O. mykiss*), coastal cutthroat trout (*O. clarki clarki*), and Pacific lamprey (*Lampetra tridentata*). In addition, a variety of non-anadromous (resident) fish are also found within the project area, including resident rainbow and cutthroat trout (*O. mykiss* and *O. clarki clarki*), redside shiner (*Richardsonius balteatus*), speckled dace (*Rhinicthys osculus*), sculpin (*Cottus sp.*) and brook lamprey (*Lampetra richardsoni*).

Historically, large-scale disturbances, primarily in the form of wildfires (35-200-year return interval) and flooding, were likely common throughout the project area. Fish populations that persisted in geographic areas with frequent disturbances have developed a number of physiological and behavioral adaptations (Dunham *et al.* 2007). One example is in the behavior and physiology of adult coho salmon to return to their natal streams to reproduce as well as stray widely to other watersheds. Effectively, this enables the population to persist in adjacent watersheds when they may have been extirpated in natal watersheds due to extreme flooding or wildfire. Another example of an adaptation of anadromous salmon to disturbance is the protracted nature of spawning migration-run timing. Returning from the ocean to a natal stream for spawning, over a period of two to three months, rather than only one to two weeks, enables a population to avoid extirpation through isolated disturbance events such as debris torrents.

The Rabbit Mountain Fire did not change the fish species found within the project area. While localized abundance of various fish sub-populations in the project area may be relatively lower for a brief period following the fire, fish populations are typically very resilient to wildfire and would be expected to fully recover (or increase due to beneficial changes to habitat and prey availability) within a few years or less (Dunham *et al.* 2007, Heck 2007).

Federally Threatened Fish Species

In February 2008 the National Marine Fisheries Service listed the Oregon Coast coho salmon evolutionary significant unit as threatened under the Endangered Species Act. This included the designation of Critical Habitat for Oregon Coast coho salmon (Federal Register 2008). The Oregon Coast coho salmon is the only fish species on the Roseburg District currently listed under the Endangered Species Act. Within the project area, Critical Habitat is present and in many cases occupied within the Union Creek-Cow Creek, Middle Creek, Bear Creek-West Fork Cow Creek, and Riffle Creek-Cow Creek sub-watersheds (Appendix A, Figure A- 9).

Bureau Sensitive Fish Species

Umpqua chub (*Oregonichthys kalawatseti*) and Oregon Coast coho salmon (described above) are Bureau Sensitive Species present on the Roseburg District. The distribution of Oregon Coast coho salmon in the project area is largely limited to Cow Creek and its larger tributaries including Middle Creek and West Fork Cow Creek (Appendix A, Figure A- 9). Outside the project area, Umpqua chub are predominantly found in larger order streams and rivers throughout the Umpqua

River basin (Markle *et al.* 1991, Simon 2008). Informal surveys in mainstem Cow Creek identified Umpqua Chub (Sipher, pers. obs. 2005—surveyed upstream of Union Creek), but extensive surveys have not been conducted in Cow Creek nor its tributaries to further describe their distribution. Therefore, the distribution of Umpqua Chub is not shown on the Federally Threatened and Bureau Sensitive Fish Species Distribution map (Appendix A, Figure A- 9).

3.7.2.2. Aquatic Habitat, Coho Critical Habitat, & Essential Fish Habitat

Sediment and Substrate

The availability of quality spawning substrate, characterized by gravel and small cobbles relatively free from embedded sediment, is important to resident and anadromous salmonid productivity. Spawning habitat suitability varies with the amount, size and quality of substrate (Kondolf 2000). Fine sediment can fill interstitial spaces within redds increasing the possibility of embryo suffocation, entombment, and disease (Chapman 1988). The accumulation of fine sediment can also reduce availability of macroinvertebrates which may influence salmonid growth and survival (Suttle *et al.* 2004). Suspended fine sediment (turbidity) in the water column can affect visibility, foraging ability and breathing capacity in fish (Waters 1995).

Prior to the Rabbit Mountain Fire, fish-bearing streams adjacent to the proposed activities typically consisted of moderate to higher gradient reaches (about 4-10 percent) and contained substrate dominated by gravel and cobble with boulders and bedrock interspersed. Steep hill slopes and landslide scars suggest a pattern of low frequency, high magnitude transport of sediment and wood to downstream fish bearing reaches. Lower gradient (less than six percent) depositional reaches have higher accumulations of smaller particle sizes (i.e. sand, gravel, and some cobble) due to reduced water velocities that allow sediment to fall out of the water column. Within these low gradient areas, suitable spawning habitat is available in pool tails and riffles, but complex habitat for overwintering juveniles may be a limiting factor for anadromous fish due to a limited availability of instream large wood. This is important because salmonids are generally larger and found in greater abundance where pools are deeper (Rosenfeld *et al.* 2000).

Few areas within the Rabbit Mountain Fire exhibited moderate-high burn severity within riparian areas, and more specifically within close proximity to perennial streams. Relatively small portions of riparian areas of West Fork Cow Creek, Cow Creek, Middle Creek, and unnamed tributaries experienced moderate to high burn severity. In these moderate to high burn severity areas lowered soil stability would likely result in hill slope failures and landslides of varying magnitude, which would result in an initial increase in suspended sediment. After a series of flushing flows (1-5 years), fine sediment would be transported out of the project area and the beneficial effects of the landslides would be realized in the form of complex fish habitat (i.e., boulders, spawning substrate, large wood jams).

Pool Quality

Pool quality remains unaffected for the majority of streams in the project area where burn severity was low to moderate. For the few stream reaches where riparian areas burned more severely, pool quality would be expected increase over time as habitat forming boulders and wood are recruited into the channel.

Large Wood and Instream Functional Wood

Large wood plays an important role in stream morphology. In headwaters large wood can capture and store sediment, control channel morphology, form deep scour pools and retain gravel substrate (Bilby and Ward 1989). In fish-bearing streams, it captures and retains gravel for spawning and creates pool habitat during stream flows (May and Gresswell 2003).
Wood can be delivered to streams by mass wasting and bank erosion, or from episodic events like landslides and blow-down (Hassan *et al.* 2005). Adjacent riparian stands and hill slopes in steeper, confined valleys straddling headwater streams contribute greater amounts of large wood (Reeves *et al.* 2003). Lacking large episodic debris flows, wood is retained for longer periods of time in headwater streams (May and Gresswell 2003). Large wood breaks down or is transported out of mainstem reaches over time, and lacking a source of future recruitment of large wood from riparian stands, larger fish-bearing reaches may become depleted of habitat forming wood.

Field surveys indicate that small fish-bearing streams generally had large volumes of small functional wood and some large wood. This high volume of wood was derived from adjacent stands as hardwoods and small conifers, subject to blow down or mortality over time, fell toward the stream. Some larger pieces were interacting with the stream channels, but overall there were few pieces capable of trapping and storing gravel and creating deep pool habitat suitable for rearing juvenile fish. In the larger fish-bearing streams, large wood was infrequent. Based on BLM fisheries staff observations (Clark, pers. obs. 2014), as well as Oregon Department of Fish and Wildlife (ODFW) aquatic inventory habitat surveys conducted in 2002, a pattern of habitat conditions are present throughout the project area that suggest large wood was physically removed from valley bottoms or otherwise more easily accessible streams (i.e. Middle Creek), which has subsequently led to long lasting oversimplified stream conditions in locations where wood removal took place. For example, ODFW surveys indicate that a very low amount of instream large wood is present in reaches of Middle Creek (0.7 m^3/100 m) and West Fork Cow Creek (4.0m^3/100m), whereas a moderate and high amount of instream wood loading was present in Hare Creek (24.4m^3/100m) and Dutchman Creek (114m^3/100m) respectively (Appendix A, Figure A- 9).

Figure 3-11. Newly recruited down wood in Middle Creek after the Rabbit Mountain Fire

In most cases following the Rabbit Mountain Fire, instream large wood abundance is likely to be similar to before the fire due to relatively few riparian areas reaching moderate-high burn severity. An influx of instream large wood came from the few riparian areas that burned at moderate to high severity (Figure 3-11). Standing dead trees and snags are present, so further recruitment of large wood into local streams would be expected over time.

Figure 3-12. Newly recruited habitat-forming large wood in Darby Creek

Habitat Access

Access for migrating fish can be restricted at stream crossings where culvert outlet jumps exceed six inches or the outlet pool depth is less than one and one half (1.5) times the height of the jump. Adults are capable of jumping in excess of four feet, but upstream migration by juveniles is often prevented. Culverts sized less than bankfull width or installed on gradients over one-half percent can also limit fish passage by accelerating water velocities within pipes. No known anthropogenic fish passage barriers (i.e. culverts, dams) exist within the project area.

Numerous naturally formed geomorphic fish passage barriers are present within the project area. Within the project area these barriers are limited to smaller tributaries such as Union Creek, upper Darby and Dutchman Creek, Hutch Creek, and Hare Creek (Appendix A, Figure A- 9).

The Rabbit Mountain Fire did not change the habitat access found within the project area.

Oregon Coast Coho Salmon Critical Habitat

As previously discussed, Critical Habitat for Oregon Coast coho salmon was designated in the final Federal Register notice of the listing of the Oregon Coast coho salmon as threatened. Critical habitat for Oregon Coast coho salmon is coincident with the distribution of Oregon Coast coho salmon previously described. The Rabbit Mountain Fire did not change the Critical Habitat found within the project area. See Appendix A, Figure A- 9 for a visual representation of the Oregon Coast coho salmon distribution within the project area.

Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act of 1996 (Federal Register 2002) designated essential fish habitat (EFH) for fish species of commercial importance. Essential fish habitat consists of streams and habitat currently or historically accessible to Oregon Coast Chinook and Oregon Coast coho salmon, and is coincident with Critical Habitat designated for Oregon Coast coho salmon in the Union Creek-Cow Creek, Middle Creek, Bear Creek-West Fork Cow Creek, and Riffle Creek-Cow Creek sub-watersheds. Essential fish habitat is also coincident for listed fish habitat (LFH) in the project area. Streams within the project area designated as EFH include Cow Creek, West Fork Cow Creek, Middle Creek, Darby Creek and other streams accessible to coho or chinook salmon (Appendix A, Figure A- 9). The Rabbit Mountain Fire did not change the distribution of Critical Habitat or EFH found within the project area.

3.7.2.3. Water Resources

Shade

Within the project area, the riparian shade zone has been impacted by past timber harvest activities. The Rabbit Mountain Fire further impacted many portions of these water quality-limited streams as a result of the consumption of vegetation in areas burned under moderate to high severity, and removal of vegetation along streams during fire suppression actions. Fire-adapted hardwoods and shrubs (Chapter 3.3) have responded rapidly in riparian areas post-fire, and are providing some streamside shade.

Sedimentation/Turbidity

The Oregon Department of Environmental Quality (ODEQ) is responsible for establishing water quality standards to protect beneficial uses and aquatic life in Oregon streams. Currently ODEQ does not have established criteria for measuring sediment. The current water quality standards instead address turbidity, a measure of water clarity. This standard does not necessarily correlate with the amount of sediment entering the stream due to wildfire impacts. Post-fire water quality surveys on the Medford District indicate that water clarity is below five nephelometric turbidity units (NTUs), therefore water clarity does not violate the state standard (Jonas Parker, Medford BLM Hydrologist, personal observations).

The highest risk of increased erosion and stream sedimentation would be associated with steep, high intensity burn areas where soils are now exposed and prone to surface erosion and gullying, and in areas with high potential for mass wasting on hillslopes within the fire perimeter. The highest risk for mass wasting as a result of the Rabbit Mountain Fire would be where flows concentrate on steep midslope to lower slope areas, and where areas of high severity killed all or most of the overstory canopy. Where the fire consumed the protective ground litter and low-growing brush in areas with naturally sensitive soils, the risk would be even greater. Many of these areas are now lush and green with fire-adapted hardwoods and shrubs (Chapter 3.3).

Roads Sedimentation

Roads can modify peak flows by reducing infiltration on compacted surfaces, allowing for more rapid surface runoff, or by intercepting subsurface and surface runoff, and channeling it more directly into streams (Ziemer 1981). The amount of roaded area at which changes in peak stream flow become measureable varies considerably based on research (WPN 1999). The Oregon Watershed Assessment Manual assigns a low potential of hydrologic impacts in association with roads when the roads occupy less than four percent of a subwatershed. A moderate potential is assigned to areas where roads occupy between four to eight percent of the subwatershed, and a high potential is assigned to those areas that are above eight percent roaded area (WPN 1999). The project area has a very low potential for hydrologic impacts in association with roads (less than four percent roaded area).

Based on a study of several small basins, significant increases in peak flows were documented when roads occupy more than 12 percent of the watershed. This study also found that where roads occupy less than five percent of a watershed increases in peak stream flows were "small, inconsistent, and statistically nonsignificant" (Grant *et al.* 2008). Roaded area is not currently extensive enough to cause peak flow enhancement at the drainage or planning area scale (Harr 1986, WPN 1999).

Roads contribute to accelerated erosion and associated stream sedimentation at different levels depending on stream proximity, drainage type, surface type, maintenance frequency, type of use, and moisture levels of the road surface during use. Where roads cross or are in close proximity to streams, erosion from the road surface can lead to stream sedimentation. Unsurfaced or poorly surface roads which are open to public use and land management during wet conditions, and poorly located roads which have failed or are failing, are the largest chronic sediment sources in the planning area. Proper cross drain spacing and vegetated ditchlines can greatly reduce the amount of sediment that enters streams as a result of roads.

Sources of Peak Stream Flow Enhancement

The term peak flow refers to the maximum instantaneous discharge of a stream or river. In this region, natural fluctuations in stream discharge are controlled by seasonal precipitation (Grant *et al.* 2008). Peak stream flows typically occur during or immediately following intense precipitation. Changes in peak flows and low flows can also occur as a result of land management actions and large scale wildfire events that result in large openings.

Water yield is defined as the total volume of surface runoff that leaves a drainage area (Church and Eaton 2001). Increased water yield is primarily a result of reduced evapotranspiration and interception within the watershed. As forests regenerate, water yields generally decrease to pretreatment levels within two to three decades (Hicks *et al.* 1991).

Increases in water yield and peak flows can influence the amount of sediment entering a stream. This occurs as upslope surface erosion enters a stream channel or as the stream bed or banks erode at a higher rate due to either a decrease in stability or an increase in force. Episodic landslides and slumps usually associated with intense winter storms, hillslope erosion, stream bank erosion and roads are primary sediment sources in the planning area. Instream sediment from the stream channel bed and banks is to some extent part of the natural geomorphic process of a stream.

All watersheds are subject to changes in peak flow enhancement under certain conditions (e.g., excessive canopy openings, excessive road-ditch networks, changes in soil infiltration rates, large precipitation events). Where large, open conditions result in peak flow enhancement, increases in sedimentation often occurs from subsequent surface erosion, mass wasting, or channel scour.

Based on a compilation of watershed studies in the Pacific Northwest (Grant *et al.* 2008), peak flow response in a rain-dominated hydro-region is only detected when at least 29 percent of the catchment area is in the equivalent clearcut area (ECA). Equivalent clearcut area describes a second-growth forest stand in terms of its hydrological equivalent as a clearcut. If ECA remains below the 29 percent threshold, increased peak flow is unlikely and undetectable (Grant *et al.* 2008). The amount of ECA after the Rabbit Mountain Fire was extensive enough to contribute to peak flow enhancement or accelerated stream sedimentation in two of the five drainages located within the project area (Table 3-14; Appendix A, Figure A- 10).

Table 3-14. Equivalent clearcut area by alternative

Drainage Name	Drainage Size (acres)	ECA Threshold (%)	Post-fire Alternative One (%)	Alternative Two (%)
Cow Creek	3052	29	61[1]	63[1]
Darby Creek	2563	29	19	20
Dutchman Creek	1311	29	9	9
Hare Creek	2975	29	41[1]	42[1]
Stanchion Creek	2771	29	26	28

[1] ECA above the 29% threshold

Where a large wildfire has altered the forest environment, burned forest stands are unable to intercept rainfall, and are not capable of transpiring runoff. Generally, a stand is considered hydrologically recovered after 10-20 years of re-growth, but is dependent upon site-specific conditions. Additionally, wildfire consumes vegetation, thereby reducing evapotranspiration and interception of precipitation, increasing the total water yield and potentially adding to flow enhancements (Harr 1986, Jones 2000). Compaction from roads reduces infiltration capacity, increases subsurface water interception, and increases the rate of delivery of water and sediment to stream channels through ditchlines. Additionally, timber harvest and fire removes vegetation, thereby reducing evapotranspiration and interception of precipitation, increasing the total water yield and potentially adding to flow enhancements (Harr 1986, Jones 2000).

Increases in peak flows within smaller drainages may result in localized stream bed and bank erosion, subsequent increases in sedimentation, changes in channel morphology, and a loss of channel substrate and woody debris. Larger tributary and mainstem streams are generally high gradient, constrained bedrock channels, with large boulders and woody material providing a majority of the channel structure. These channels are generally resistant to major morphological changes as a result of low to moderate flow increases. Smaller headwater channels would be expected to be the least resistant to increased flows due to the fine silt and clay substrate that generally dominates these streams. Stream surveys indicate that many of the streams in this planning area are deficient of large woody debris, with the exception of in some moderate to high intensity burn areas where the root or soil structure was compromised causing fire killed trees to fall within and near streams. Where large woody debris is present within and near stream channels, the ability of the stream to dissipate energy would be increased. Energy dissipation would reduce the potential and magnitude of any channel degradation that could occur as a result of any increases in peak flow

3.7.3. Environmental Consequences

3.7.3.1. Fish Species and Aquatic Habitat Methodology

The project area (acres) is within the Union Creek-Cow Creek, Middle Creek, Bear Creek-West Fork Cow Creek, and Riffle Creek-Cow Creek sub-watersheds. The analysis described herein stems from sources of information that include field surveys (Clark, pers. obs. 2014), GIS analyses, Oregon Department of Fish and Wildlife (ODFW) Aquatic Inventory surveys, and the Lower Cow Creek Watershed Assessment (Geyer 2003).

3.7.3.2. Alternative One – No Action

Fish Species

Under Alternative One, no roadside, railroad right-of-way, or quarry safety treatments would occur. Individual hazard trees would be evaluated and treated in compliance with OSHA standards (Toupin *et al*. 2008). There would not be an emphasis to directionally fell individual hazard trees within riparian areas into adjacent streams, nor would an opportunity exist to utilize felled hazard trees for stream restoration projects outside localized roadside safety treatment areas. Individual imminent hazard trees would be felled on an as needed basis to provide resource protection, accommodate reciprocal users, and protect government infrastructure investments.

Areas not planted would become brushy and have an increased risk of burning in the future. While wildfire is a natural disturbance that fish are adapted to, additional fires could step up the level of disturbance beyond that of typical disturbance regimes. Before natural regeneration of shrubs occurs and because tree planting would not occur under Alternative One, road cuts and adjacent slopes would be at higher risk of failure and as such, road-derived fine sediment could be routed to streams during times of heavy precipitation. This sediment could be deposited into fish bearing streams which could affect fish.

Aquatic Habitat

The effect of no action would preclude a large volume of habitat-forming instream large wood from being directionally felled into streams (Figure 3-12). Lacking directional felling, a smaller portion (than if directionally felled as described in Chapter 2.3.5, #5) of dead or dying trees would be recruited into streams, which would make a large volume of substrate unavailable for high-quality fish habitat (cover, spawning, resting areas).

Because no planting would occur, road cuts and adjacent slopes would be at higher risk of failure that could contribute road-derived fine sediment to streams during times of heavy precipitation. This sediment could be deposited into fish bearing streams which could affect aquatic habitat

Water Resources

Under Alternative One, the project area would experience no hydrology-related effects to shade, sedimentation (turbidity), peakflow, or road sedimentation. There would be no effects to water quantity or water quality as associated with yarding corridors, skid trails, landings, or burning of activity fuels. Sites with inadequate ground cover would continue to be subject to surface erosion in the short term, and where hydrologically connected would result in an increase in stream sedimentation. In a majority of the units, sedimentation would likely dissipate to pre-fire conditions within a few years as vegetation reestablishes on the site.

3.7.3.3. Alternative Two – Proposed Action

Fish Species

Effects to fish species from hazard tree felling and log hauling can result from the addition of fine sediment to streams resulting in a temporary increase in turbidity. Fine sediment can impair respiration by clogging gill membranes, and increase overall stress levels (Waters 1995). Fine sediment that becomes embedded in spawning substrates can affect fish by reducing survival of eggs and alevins still buried in the gravel. In addition, removal of riparian trees can reduce streamside shading and preclude future recruitment of instream wood.

The majority of roadside safety treatments would have no detectable direct effects to fish in streams adjacent to or downstream of proposed activity areas because there would be no direct effects to the aquatic habitat. The majority of the proposed activities are located along ridges, well-removed from fish-bearing streams. Nearer to fish bearing reaches, felled hazard trees would not be removed within 100 feet of listed fish habitat (LFH) or 50 feet from perennial and intermittent streams within 1 mile of LFH (Chapter 2.3.5, #5). This action would increase the volume of instream large wood along Cow Creek and Middle Creek, which could increase habitat complexity and overwinter habitat for rearing salmonids. Project design features (Chapter 2.3.5) would prevent sediment from reaching streams because hazard tree removal would be restricted to the dry season on unsurfaced roads, use of ground equipment would not be allowed beyond skid trails or existing roads, and equipment would avoid perennially wet areas. Additionally, after log skidding operations along Cow Creek and Middle Creek road, newly created and reused old skid trails would be rehabilitated, if needed. Rehabilitation may include tilling, hand piling brush, hand construction of waterbars, and placement of topsoil over the treated trail areas.

Hazard tree removal would be limited to trees that represent an immediate danger to road users, as well as those that pose a threat in the near term. A small amount of shade provided by these potential hazard trees along Middle Creek and Cow Creek could be lost if these trees were felled. Subsequent detectable warming of these streams would not likely occur however, because trees that could potentially be felled are already limited in shading ability following the fire. Hazard tree removal would occur along less than one mile of these streams over the course of at least eight miles of stream. Within the hazard tree no-removal area adjacent to Middle Creek, approximately 20 trees with imminent likelihood of death within three to five years would be felled and left.

Davis *et al.* (2014) found that streams have a propensity to cool rapidly upon reaching downstream shaded stream reaches after passing through unshaded reaches. Overall, small increases of light and the increased amount of downed and decaying wood resulting from the directional felling would increase invertebrate species richness and abundance which could increase growth and survival of fish within the burned area (Heck 2007, Clark, pers. obs. 2009).

Where haul routes are paved there is no mechanism to disturb the road surface or transmit sediment to the stream channel. Gravel surfacing on roads effectively reduces sediment production from roads (Burroughs 1990). Road maintenance and application of best management practices (USDI BLM 2014) and project design features (Chapter 2.3.3, #5) would reduce potential sediment production from forest roads. Within the project area, portions of the haul route that are gravel surfaced and parallel or cross streams have the potential to deliver negligible amounts of sediment. There is one graveled haul route crossing over Cattle Creek, a fish-bearing stream within the project area—Oregon Coast coho salmon are present at this crossing. Approximately 0.75 miles of the proposed gravel-surfaced haul route runs parallel to Cattle Creek. Elevated stream turbidity associated with road use would not be expected because of the minimal opportunity for impacts, as well as the condition of these features (ditchlines, road surface, and road at stream crossing); therefore no effects from road-derived sediment to fish would be expected as a result of the proposed activities.

Road decommissioning and habitat restoration (tree planting) would occur upslope of perennial streams, so no effect to fish or aquatic habitat would be expected from these actions.

The summed effects anticipated from Alternative Two would include an increase in complex stream habitat (summer and winter) and increased forage availability for fish due to hazard tree safety treatments. The indirect effects to fish would roughly parallel the effects discussed for small functional wood, large wood, and pool habitat discussed in the following sections. Actions that have an impact on these three attributes, whether positive or negative, are likely to result in similar effects to aquatic habitat, and ultimately, fish.

Federally Threatened Fish Species

The actions proposed under Alternative Two would have no effect to Oregon Coast coho salmon. Hazard trees would not be removed in close proximity (Chapter 2.3.5, #5) to LFH and accordingly ground disturbance would not occur in close proximity to Oregon Coast coho salmon or Critical Habitat because mechanized equipment would not be used in these “no removal” areas. For circumstances in which hazard trees exist outside of these “no removal” areas, fuel loading may create a need to yard logs downhill to Middle Creek or Cow Creek road. Where downhill yarding is required sediment controlling methods such as waterbarring furrowed areas (possible during log yarding) to distribute any concentrated flow, strategic hand piling of brush to filter out suspended sediment during heavy precipitation, or the use of straw wattles in yarding corridors could be used to eliminate sediment from reaching the stream network (Middle and Cow Creeks). A limited amount of moderate-high burn severity occurred in Oregon Coast coho salmon Critical Habitat portions of the project area (Appendix A, Figure A- 4 and Figure A- 9), and as such, there is a small potential for negative impacts (i.e. warmer stream temperatures) from the fire to Oregon Coast coho salmon or Critical Habitat, and less yet from the proposed safety treatment actions in these more intensely burned areas.

Bureau Sensitive Fish Species

Oregon Coast coho salmon and steelhead, as well as Umpqua chub, are present in the Middle Cow Creek HUC 10 Watershed (Appendix A, Figure A- 2). There are two roadside safety treatment areas along the Cow Creek road and one along the Middle Creek road where coho, steelhead, and Umpqua chub are present. Effects to Oregon Coast coho salmon are discussed above under “Federally-Threatened Species”, and the effects to steelhead are roughly parallel to that of Oregon Coast coho salmon due to relatively similar habitat requirements and life history strategies.

Umpqua chub are found in mainstem Cow Creek and may be present in downstream reaches of Middle Creek—although they are not formally documented in Middle Creek to date. No changes to Umpqua chub would be expected to occur because no measurable effects (sediment or stream temperature) resulting from Alternative Two would influence Cow Creek or Middle Creek. See Critical Habitat discussion in the next section for a detailed effects discussion.

No discernable changes in sedimentation would be expected as a result of the proposed activities described in this EA because best management practices (USDI BLM 2014) and project design features (Chapter 2.3.5, #3 and #5) would be applied.

Aquatic Habitat

Sediment and Substrate

Because relatively few areas within the Rabbit Mountain Fire exhibited moderate to high burn severity in close proximity to riparian areas, Alternative Two have limited opportunity to influence fish and aquatic habitat. With application of best management practices (USDI BLM 2014) and project design features (Chapter 2.3.5, #3 and #5), no detectable level of sediment generated from Alternative Two would be transported to stream networks. Proposed road decommissioning would occur on or near ridge tops and would occur during the dry season; there would be no mechanism for sediment transport to occur from roads to streams during road decommissioning.

If sediment did become suspended in the water column, the newly recruited instream wood, including directional felled hazard trees in “no removal” areas, would form into jams that would cause large volumes of entrained sediment/substrate to fall out of the water column. Additionally, small functional wood and organic debris captured by these jams would increase the sediment filtration capacity of the streams in the project area beyond that existing prior to Alternative Two. The increased instream wood volume would allow sediment suitable for spawning fish to aggrade due to influxes of substrate from landslides as a result of the Rabbit Mountain Fire.

Pool quality

Pool quality would not be directly affected by proposed hazard tree felling and removal, and road-related activities. A direct effect could occur due to an increase in the amount of instream large wood expected as a result of directionally felling of hazard trees within the “no removal” areas. Large woody debris plays an important role in stream morphology (Gregory *et al.* 2003). In headwater streams it can capture and store sediment, control channel morphology, form deep scour pools and retain gravel substrate (Bilby and Ward 1989), which can all be beneficial for fish.

Large Wood and Instream Functional Wood

Following hazard tree felling, the volume of newly recruited large wood in Middle and Cow Creek would increase substantially in localized areas. Small functional wood would be routed through the stream network during high flows following the felling, but given the lack of existing large wood (mainly in Cow Creek), a limited amount of small functional wood would be retained in the project area. In instances where hazard trees are directionally felled into streams (see Chapter 2.3.5 #5 for details), large accumulations of small functional wood would be expected to build up.

Habitat Access

Habitat access would remain unaltered under Alternative Two. Fish passage culverts or bridges are not proposed to be replaced or upgraded under this project.

Coho Critical Habitat

As described in the Aquatic Habitat, Oregon Coast coho salmon Critical Habitat, and Essential Fish Habitat section and Fish Species section specific to Alternative Two, there would be no adverse effects anticipated to Critical Habitat for coho salmon. Felled hazard trees would not be removed within 100 feet of LFH or 50 feet from perennial and intermittent streams within 1 mile of LFH. Project design features (Chapter 2.3.5, #5) and best management practices (USDI BLM 2014) would be employed to effectively eliminate delivery of road derived sediment as well as any produced from yarding operations to nearby stream channels. Ditchlines would be left vegetated, where practical, and sediment traps such as hay bales or straw wattles could be deployed to minimize runoff before reaching it reaches ditchlines as well as to trap sediment that may be running in ditches. Beyond these measures, road decommissioning, hazard tree removal, and yarding to and hauling off of unsurfaced roads would be restricted to the dry season eliminate any sediment specific effects to Critical Habitat. Where sediment could reach streams designated as Critical Habitat, the amount is expected to be negligible and the effect short-term in nature. In theory, shade could be affected by hazard tree removal; however, a majority of felled trees would be dead or likely to die in the next three to five years.

Field surveys (Clark, pers. obs. 2014) and post-fire imagery indicate that the majority of the streamside trees in these areas (along Middle Creek and Cow Creek) are providing little or no stream shade due to their sparse or absent canopy. Cow Creek would be less likely than Middle Creek to be influenced by felling of streamside trees because stream temperature of larger order streams is minimally affected by streamside shading (Vannote *et al.* 1980). Within the hazard tree no-removal area adjacent to Middle Creek, approximately 20 trees with imminent likelihood of death within 3-5 years would be felled along Middle Creek. Of these trees, even fewer would have the features (i.e., proximity to stream, aspect, density of foliage, size of canopy) needed to provide shade to Middle Creek. Accordingly, if these dying trees were felled, no change to stream temperature would be expected. However, if localized stream temperature increases did occur, Davis *et al.* (2014) found that smaller order streams have a propensity to cool rapidly upon reaching downstream shaded stream reaches after passing through unshaded reaches. This combined information suggests that a subsequent warming of Middle Creek and Cow Creek would not be likely to occur as a result of hazard tree felling.

Essential Fish Habitat

As described previously for coho salmon Critical Habitat, there would be no adverse effects anticipated to EFH. The following components were analyzed to assess potential effects of the proposed treatments on EFH, with citations to appropriate sections of this assessment.

Water Quality/Water Quantity – There would be no measureable effect to water quality or quantity as a result of the proposed hazard tree treatments and associated log yarding or hauling. “No-removal” areas as well as the use of BMPS (USDI BLM 2014) and project design features (Chapter 2.3.5, #3 and #5) along streams would reduce delivery of sediment to streams and preserve streamside shading essential to the maintenance of water temperature (Chapter 3.7.2.2 and Chapter 3.7.2.3).

Substrate Characteristics – Where haul routes cross and hazard tree removal areas are adjacent to Essential Fish Habitat application of project design features would arrest any mechanism for sediment entering stream channels (Chapter 3.7.2.2).

Channel Geometry – Stream channel stability would not be affected beyond influences that may have occurred as a result of the Rabbit Mountain Fire. Following wildfire, stream channels typically go through a period of geomorphic change (e.g., substrate aggradation, woody debris jam formation), however, beyond increases of habitat forming large wood (Figure 3-12) due to directional felling of hazard trees, no changes to channel geometry form would be expected as a result of activities from the proposed action. Minor fluctuations in stream peak flow would not be expected to affect channel geometry.

Large woody debris within the channel and large woody debris source areas – The volume of newly recruited large wood in Middle Creek and Cow Creek would increase substantially in localized areas. Small functional wood would be routed through the stream network during high flows following felling, but given the lack of existing large wood (mainly in Cow Creek), a limited amount of small functional wood would be retained in the project area, outside of headwater streams. In instances where hazard trees are directionally felled into streams, accumulations of small functional wood would be expected (Chapter 3.7.3.3).

Fish passage – There would be no effect to fish passage because proposed activities would not alter any fish passage culverts or naturally formed geomorphic barriers (Chapter 3.7.3.3).

Forage species (aquatic and terrestrial invertebrates) – Forage for Oregon Coast coho salmon and Oregon Coast Chinook salmon would be expected to increase. Terrestrial invertebrate species may benefit from some increases in light as well as the increased volume of decaying wood in riparian areas.

Streamside vegetation in “no-treatment” areas would continue to provide sources of terrestrial invertebrates. Aquatic invertebrate populations would be unaffected by discountable and negligible increases in sediment, and may indirectly benefit from retention of hardwoods as stand components because hardwood litter represents a major nutrient input to streams.

Water Resources

Introduction

A wide array of components factor into changes in hydrologic behavior; some of the watershed interactions that control these changes are well understood scientifically, some are not (Grant *et al.* 2008). This analysis will focus on changes in shade, sedimentation/turbidity, road sedimentation, and peak flow enhancement as a result of open watershed conditions and roads.

Shade

The proposed activities within the riparian areas would be felling imminent and likely imminent hazardous trees only. There would be limited, localized impacts to existing stream shade; the impacts to stream shade would be insufficient to cause marked changes in stream temperature.

Sedimentation/Turbidity

With application of BMPs (USDI BLM 2014) and PDFs (Chapter 2.3.5, #3 and #5), no detectable level of sediment generated from the proposed actions would be transported to stream networks (see Sediment and Substrate section above).

Roads Sedimentation

There are approximately 14 perennial and 196 intermittent stream crossings or ditchline connections along native-surfaced and graveled haul routes in the project area. Following incorporation of the BMPs (USDI BLM 2014) and PDFs (Chapter 2.3.5, #3 and #5), erosion from haul routes in this project would be negligible. During the dry condition hazard tree felling, removal, and haul (Chapter 2.3.5, #3), there would be no water flowing on the road surface or in ditchlines, so sediment delivery to streams would be minimal.

All other road use, including skid trail construction and decommissioning, landing construction and rehabilitation, and yarding operations proposed under Alternative Two, would result in localized increases of erosion that would be minimized with PDFs (Chapter 2.3.5).

The amount of fine sediment introduced to streams during haul activities on hydrologically connected portions of the existing roads would be indiscernible beyond natural erosion processes occurring during winter rains, and would have negligible impacts to downstream resources. Deposition of fine sediments could result at capture points within 25 feet downstream of stream crossings within smaller tributaries. The extent of these deposits would not be of a magnitude to alter macroinvertebrate populations and would be indiscernible following the first few rains. Changes in embeddedness, interstitial spaces, and pool depth would not occur. Effects to water quality from hauling and road maintenance would not be discernible from background levels within the larger tributary or mainstem streams within this project area. An overall reduction in chronic sediment entering streams would occur on some sections of haul road following road maintenance because these road activities would improve currently impaired road drainage. As such, these actions would not exceed water quality standards for turbidity and would not result in any measurable effects on aquatic habitat.

Peak Stream Flow

The extent of the hazard tree removal and soil compaction from Alternative Two would determine the degree of the risk and the magnitude of the impacts. Hazard tree safety treatments located in very low to low severity (less than 50 percent canopy cover mortality) could potentially increase ECA by up to two percent in drainages within the project area (Table 3-14; Appendix A, Figure A- 10). Canopy cover would not be reduced below 50 percent in 52 percent of the safety treatment areas burned under very low to low severity. Felling of hazard trees in areas burned under moderate to high severity (greater than 50 percent canopy cover mortality) would not add additional canopy openings, since the canopy was already opened during the fire. Proposed treatment areas matching these criteria are limited, and would not contribute to peak flow enhancement or accelerated stream sedimentation at the drainage or planning area scale.

Proposed actions may result in compacted soils, which would reduce infiltration, allowing for more rapid surface runoff, or by intercepting subsurface and surface runoff, and channeling it more directly into streams (Ziemer 1981). PDFs would limit the compaction of soils (Chapter

2.3.5, #3). If areas of compacted soils occur during proposed treatments, rehabilitation may include tilling, hand piling brush, and hand construction of waterbars (Chapter 2.3.5, #3).

No road construction will occur as part of the proposed action; therefore, roads would not cause peak flow enhancement under Alternative Two because the current roaded area is not extensive enough to cause peak flow enhancement at the drainage or planning area scale.

Cumulative Effects

This section considers proposed and future foreseeable activities that could affect stream temperature, sediment and substrate, in-stream functional wood, shade, road sedimentation, and peak flow enhancement. Actions that could influence these indicators in riparian areas primarily include timber harvest and associated log haul, roadside safety treatments, road maintenance and renovation, and stream restoration projects.

Private Land Management

Increased logging activity on private lands as a result of the Rabbit Mountain Fire has the potential to cause increases in fine sediment deposited in fish-bearing streams. However, this impact is unlikely because soils in the project area are rocky containing larger particles (Chapter 3.6) that would not be easily transported through the stream network. If these coarser particles were transported to fish-bearing stream reaches, these particles would most likely create micro-habitat in the form of interstitial spaces between particles for juvenile fish or macroinvertebrate prey to take refuge.

The combined actions of standard logging practices in the recent past and increased rate of logging and hazard tree removal on private timberland (salvage of fire-killed trees) could have resulted in increased stream temperatures. However, streamside herbaceous vegetation has responded rapidly, providing shade to streams where the Rabbit Mountain Fire burned at moderate to high intensity. Additionally, field surveys indicate that a large amount of large and small functional wood has been recruited into streams within the fire area. In a short time, this wood has trapped a large amount of substrate (in some cases several vertical feet) which will increase stream flows, cooling water temperatures (Clark, pers. obs. 2014). This increased flow combined with a rapid response in streamside vegetation following fire may have the ability to counteract (or even decrease) any increases in stream temperature that may result from increased logging and hazard tree removal on private timberland. Bureau of Land Management hydrologists have deployed stream temperature loggers in strategic locations to monitor any changes to stream temperature over time.

Sedimentation from routine harvest activities across all ownerships within subwatersheds would be expected to remain consistent with current levels over the long-term, but would vary from year-to-year.

Roseburg District BLM Actions

No timber sales are planned in the project area in the foreseeable future.

There are no formally planned stream restoration projects in the project area, however, the “no removal” areas would effectively restore habitat for fish and other aquatic organisms. As part of the Cow Creek Scenic Byway Rehabilitation Project (led by Federal Highways), two culverts along Cow Creek road (Crawford Creek and Calf Creek), which previously limited or hindered fish passage, are being proposed to be redesigned to allow fish and other aquatic organisms to pass easily through. These projects could allow or improve access to at least 1.5 miles of stream habitat. "No removal" areas within the project area would increase instream wood volume following felling of hazard trees. As discussed previously, large wood jams can trap an extensive volume of sediment, which in turn often retains or stores backwater that aids in the cooling of stream temperatures. In essence, the cumulative effects that may influence fish in the project area include increased habitat complexity following recruitment of a large volume of large wood and subsequent trapping of suitable substrate for spawning and cover. The newly recruited wood would set up in periodic jams that would be responsible for sediment build up and increased flow, which is known to cool water temperature. Additionally, proposed renovation of two culverts in a different project would improve access to 1.5 or more miles of stream for aquatic organisms.

Medford District BLM Douglas Fire Complex Recovery Project

The Medford District BLM (upstream in the Cow Creek Basin) is proposing to salvage timber resources following the Rabbit Mountain Fire; however, effects to fish are not expected due to site-specific PDFs and BMPs (See Medford BLM District's Douglas Fire Complex Recovery Project EA 2014, Fish Section, pp. 172-181).

The Riffle Creek-Cow Creek subwatershed is within the Rabbit Mountain Fire LSR Recovery project area, as well as the Douglas Fire Complex Recovery Project. ECA analysis (Table 3-14) found that there would be no impact to peak flow enhancement within the Rabbit Mountain project area if Alternative Two were to occur. The Medford District's Douglas Fire Complex Recovery Environmental Assessment found that there would be no impact to peak flows, low flows, water yield, or temperature as a result of the project. The only instance of sedimentation that would occur as a result of Alternative Two would be where hydrologically connected road maintenance and hauling activities on rocked and natural surface roads would result in localized instances of offsite erosion at stream crossings and where roads are adjacent to, and in close proximity to streams (See Medford BLM District's Douglas Fire Complex Recovery Project EA 2014, Hydrology Section, p. 168). Cumulatively, these projects would not contribute to peak flow enhancement or sedimentation.

Sedimentation from harvest actions and road construction on non-federal lands within this project area would be consistent with the Oregon Forest Practices Act, the Clean Water Act and the Endangered Species Act. These acts provide a threshold for water quality and aquatic impact that would suggest that actions affecting water quality and aquatic habitat on non-federal lands would maintain current conditions.

Reciprocal Rights-of-Way Road Safety Actions

Although difficult to quantify, private landowners not operating under BMPs or PDFs similar to those discussed in this EA could affect fish, aquatic habitat, and water resources through felling and removal of roadside hazard trees in locations adjacent to perennial streams. Where soils may be less rocky, these actions could input small quantities of road-derived fine sediment to streams. In some instances, hazard trees near streams could be felled and removed, reducing the amount of large wood and functional-sized wood that could have been naturally recruited to streams in the future.

3.8. Visual Resource Management

3.8.1. Introduction

Visual resources are the land, water, vegetation, structures, and other natural features or cultural modifications that make up the scenery of BLM-administered lands. In order to consider visual resource (scenic) values when planning management activities, BLM-administered lands have been inventoried, evaluated and assigned inventory classes according to their relative value from a Visual Resource Management (VRM) point of view values in the Resource Management Planning process.

The ROD/RMP identifies areas within the Rabbit Mountain Fire as having Visual Resource Management classes of II, III and IV. The objectives of Class II lands are to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape. The objectives of Class III lands are to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant features of the characteristic landscape. The objectives of Class IV lands are to provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance and repeating the basic elements of form, line, color and texture.

3.8.2. Affected Environment

3.8.2.1. Existing Condition

BLM lands are to be managed as VRM Class II lands if they are adjacent to recreation sites, state and federal highways, scenic waterways and rivers designated as wild and scenic, and available forest lands where federal ownership consists of more than half the viewshed and areas of critical environmental concern/research natural areas (PRMP/EIS, p. 2-116). Some of the project area is within a designated BLM Back Country Byway. The Cow Creek Recreational Gold Panning Day-Use Area is also located within the project area (Chapter 2.5.4), both of which managed as VRM Class II lands.

Approximately 1,558 acres of VRM Class II lands, 21 acres of VRM Class III lands and 4,684 acres of VRM Class IV lands within the project area were subjected to varying degrees of burn severity. The effects of the fire on the visual characteristics of the landscape altered the basic elements of form, line, color and texture dependent upon the severity of the burn. Areas that burned under moderate to high severity had the most altered visual characteristics, where areas that burned under low or very low severity had lower levels of altered visual characteristics.

The area where the Rabbit Mountain Fire burned had been altered dramatically prior to 2013. Much of the land under private ownership within the project area has been recently clearcut, creating dramatically modified visual landscapes. Generally, viewsheds that are noticeably altered can be further modified with less adverse visual impact than viewsheds with little or no visible alteration (PRMP/EIS p. 4-68).

3.8.3. Environmental Consequences

3.8.3.1. Methodology

In accordance with the ROD/RMP, visual contrast rating analyses (located in the project record) were completed within the project area. Two Key Observation Points (KOPs) within VRM Class II lands were selected to identify potential effects to the visual resources where low levels of change to the characteristic landscape may be noticed by the casual observer (Appendix A, Figure A- 11). VRM Class III and IV lands were not analyzed because they are not within the viewshed of the Cow Creek Back Country Byway, forest lands where federal ownership consists of more than half the viewshed is not available or adjacent to any recreation site and moderate to major modifications to the landscape are allowed.

3.8.3.2. Alternative One – No Action

Under Alternative One, individual imminent hazard trees may be felled on an as-needed basis, therefore visual resources would not be affected.

3.8.3.3. Alternative Two – Proposed Action

KOP 1

This KOP was selected (Appendix A, Figure A- 11) as it is the first opportunity that BLM Back Country Byway travelers (traveling south from Riddle) have to see the effects of the fire. Due to the short term nature of the visual impacts and the short duration of exposure to the casual observer (in view for approximately 15 seconds traveling at 40 MPH), the proposed activity is determined to meet VRM Class II objectives from this location with implementation of PDFs during hazard tree felling to detract visual attention in the safety treatment areas along Cow Creek Back Country Byway (Chapter 2.3.5, #7). Growth of planted trees and unburned trees in the foreground will mitigate against the short term visual impacts.

KOP 2

This KOP was selected (Appendix A, Figure A- 11) because it is the only developed recreation site (Cow Creek Recreational Gold Panning Area) within the project area. Recreationists here will have the project area in view if looking east (away from the river) during their stay. However, due to the short term nature of the visual impacts, the proposed activity is determined to meet VRM Class II objectives with implementation of PDFs during hazard tree felling to detract visual attention in the safety treatment areas along Cow Creek Back Country Byway (Chapter 2.3.5, #7). Growth of planted trees and unburned trees in the foreground will mitigate against the short term visual impacts. Growth of planted trees and unburned trees in the foreground will mitigate against the short term visual impacts.

In situations such as these, visual impacts from management practices can be beneficial. The removal of dying or dead trees and the manipulation of contrasting cutting boundaries especially on ridgetops and along the road can create more pleasing views to most observers (PRMP/EIS, p. 4-69).

Cumulative Effects

Private Land Management

Intensive post-fire timber management on private land will create a dramatically modified landscape. Generally, viewsheds that are noticeably altered can be further modified with less adverse visual impact than viewsheds with little or no visible alteration (PRMP/EIS p. 4-68).

Roseburg BLM Actions

Ongoing Roseburg District BLM actions, described in the Cumulative Effects Introduction (Chapter 3.2), have been determined to have no cumulative effect when combined with activities proposed for Alternative Two, and would not add to cumulative effects on the visual resources analyzed in Alternative Two.

Medford District BLM Douglas Fire Complex Recovery Project

Actions proposed by the BLM's Medford District, including salvage, would not have a cumulative effect on the visual resources analyzed in Alternative Two.

Reciprocal Rights-of-Way Road Safety Actions

Reciprocal rights-of-way road safety actions on BLM-managed lands are ongoing, and are described in the Cumulative Effects Introduction (Chapter 3.2). These potential actions would cumulatively add to the proposed imminent hazard tree felling and removal acres. Such actions would not add to cumulative impacts on the visual resources, because VRM Class II lands are along the Cow Creek Back Country Byway and adjacent to Cow Creek Recreational Gold Panning Area.

3.9. Carbon Storage and Release

3.9.1. Introduction

Climate change and greenhouse gas emissions have been identified as a resource concern by the Secretary of the Interior (Secretarial Order No. 3226; January 16, 2009), and the OR/WA BLM State Director (Instruction Memorandum OR-2010-012, January 13, 2010).

Forster *et al.* 2007 (pp. 129-234), incorporated here by reference, reviewed scientific information on greenhouse gas emissions and climate change. Their conclusion was that human-caused increases in greenhouse gas emissions have likely exerted a substantial warming effect on global climate. Literature, however, has not yet defined any specifics on the nature or magnitude of any cause and effect relationship between greenhouse gases and climate change.

The U.S. Geological Survey, in a May 14, 2008 memorandum (USDI USGS 2008) to the U.S. Fish and Wildlife Service, summarized the latest science on greenhouse gas emissions concluding that 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. Given this uncertainty, this analysis is focused on calculating carbon emissions and storage in the context of release and sequestration.

The 2008 FEIS (pp. 488-490), incorporated by reference, described current information on predicted changes in regional climate, concluding that the regional climate has become warmer and wetter with reduced snowpack, and that continued change is likely. Changes in resource impacts as a result of climate change would be highly sensitive to specific changes in the amount and timing of precipitation, which are presently too uncertain to predict. Because of this uncertainty, it is not possible to predict changes in vegetation types and condition, wildfire frequency and intensity, streamflow, or wildlife habitat.

Forests fix and store carbon through photosynthesis, and release carbon through respiration and decay, affecting atmospheric concentrations of carbon dioxide which thereby affect global climate. Forest management can be a source of carbon emissions through land use conversion and deforestation, or store carbon through forest growth or afforestation (2008 FEIS, p. 220).

Even though a causal link between this project and specific climate change effects cannot be assigned, the amount of carbon released or stored under the alternatives analyzed can be estimated. Values in this analysis, of carbon stored and released, are expressed as tonnes, the most common unit of measure used in scientific literature on the subject. One tonne of carbon is equivalent to 3.67 tons of carbon dioxide (USEPA 2005).

3.9.2. Affected Environment

Total annual global emissions of carbon dioxide (CO_2) are estimated at 25 billion tonnes (Denman *et al.* 2007), with estimated U.S. emissions of 6.9 billion tonnes of CO_2 (USEPA 2010; Table 2-3). In 2008, fossil fuel combustion accounted for 94.1 percent of CO_2 emissions in the U.S. (USEPA 2010; Executive Summary p. 6).

Land use, land use change, and forestry nationally resulted in a net sequestration of 940 million tons of CO_2 in 2008 (USEPA 2010; Table 2-3). Forest management in the U.S., alone, resulted in net CO_2 sequestration of 792 million tonnes (USEPA 2010; Table 2-9), an offset of approximately 11 percent of total U.S. CO_2 emissions.

On lands managed by the BLM in western Oregon and on the Klamath Falls Resource Area of the Lakeview District there are 222 million tonnes of carbon stored in live trees (2008 FEIS, p. 221). The amount of carbon stored in other than live trees (includes shrubs, brush, snags, woody debris, and organic carbon in the soil) is calculated at 195 million tonnes (2008 FEIS, p. 222).

3.9.3. Environmental Consequences

3.9.3.1. Alternative One – No Action

Under Alternative One, hazard trees would be felled and left on site. The majority of felled hazard trees would be dead or likely to die in the next three to five years. Dead trees do not fix carbon, and the natural process of decay would release carbon into the atmosphere overtime. On the 524 acres of hazard trees that have been identified the process of felling would emit 0.006 tonnes of carbon per acre, as analyzed in previous EAs (Camas Valley Harvest Plan Environmental Assessment 2011, Myrtle Creek Harvest Plan Environmental Assessment 2012). A total of total of just over three (3) tonnes of carbon would be released under alternative one. This carbon release is equivalent to 0.0000002 percent of current annual United States emissions estimated to be 1.7 billion tonnes and 0.00000004 percent of projected annual global emissions of 6.8 billion tonnes.

3.9.3.2. Alternative Two – Proposed Action

Under the proposed action, the majority of felled hazard trees would be dead or likely to die in the next three to five years. Dead trees do not fix carbon, and the decay process would release carbon into the atmosphere overtime. If hazard trees are felled and removed, the equipment used would emit carbon into the atmosphere by burning fossil fuels. Carbon emissions from felling and removing hazard trees, as analyzed in previous EAs (Camas Valley Harvest Plan Environmental Assessment 2011, Myrtle Creek Harvest Plan Environmental Assessment 2012), would release approximately 0.5 tonnes per acre or about 262 tonnes of carbon over the 524 acres proposed for hazard tree removal. This carbon release is equivalent to 0.000004 percent of current annual United States emissions estimated to be 1.7 billion tonnes and 0.00002 percent of projected annual global emissions of 6.8 billion tonnes.

3.9.3.3. Cumulative Effects

There would be negligible effects to the carbon pool and no noteworthy difference in carbon storage between Alternative One and Alternative Two. There would also be no notable cumulative effects.

3.10. Monitoring

Monitoring will be conducted in accordance with provisions contained in the ROD/RMP, Appendix I (pp. 84-86, 190-199). Monitoring efforts will focus on consideration of the following resources: late-successional reserves, air quality, water and soil, wildlife habitat, fish habitat, and special status species.

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Chapter 4. Agencies and Individuals Contacted; Preparers; and Literature Cited

Initiation of the project was published in the Spring 2014 Quarterly Planning Update. Upon completion of the EA, an electronic Notice of Availability for public review and comment will be posted to individuals and organizations having expressed interest in these types of projects.

4.1. Agencies & Persons Contacted

Adjacent Landowners and Down-stream Water Users
Cow Creek Band of Umpqua Tribe of Indians
Confederated Tribes of Grand Ronde
Confederated Tribes of Siletz Indians
NOAA Fisheries
U.S. Fish and Wildlife Service

4.2. Agencies, Organizations and Individuals to be Notified of the Completion of the EA

American Forest Resources Council
Cascadia Wildlands Project
Douglas Timber Operators, Robert Ragon - Executive Director
Klamath Siskiyou Wildlands Center
National Marine Fisheries Service
Oregon Department of Environmental Quality
Oregon Department of Fish and Wildlife
Oregon Wild
Pacific Northwest 4-Wheel Drive Association
U.S. Fish and Wildlife Service
Umpqua Valley Audubon Society
Umpqua Watersheds, Inc.
Ronald S. Yockim, Attorney-at-Law

4.3. List of Preparers

Project Lead, Wildlife...Chris Foster
Management Representative..Steve Lydick
Botany/Noxious Weeds ....Aaron Roe
Cultural Resources..Molly Caperson
Engineering..Brandy Albin
Fisheries..Steve Clark
Fire & Fuels Management, Air Quality ....Krisann Kosel
Forest Vegetation, Carbon ....Brennan Garrelts
Forest Vegetation, Carbon ....Ryan Johnson
Forester ....Macrina Lesniak
Hydrology ....Sidney Post
NEPA, Writer/Editor..Erin Banwell
Recreation/VRM..Erik Taylor
Soils ....Ward Fong

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Appendix A – Maps for the Rabbit Mountain Fire Late-Successional Reserve Recovery Project

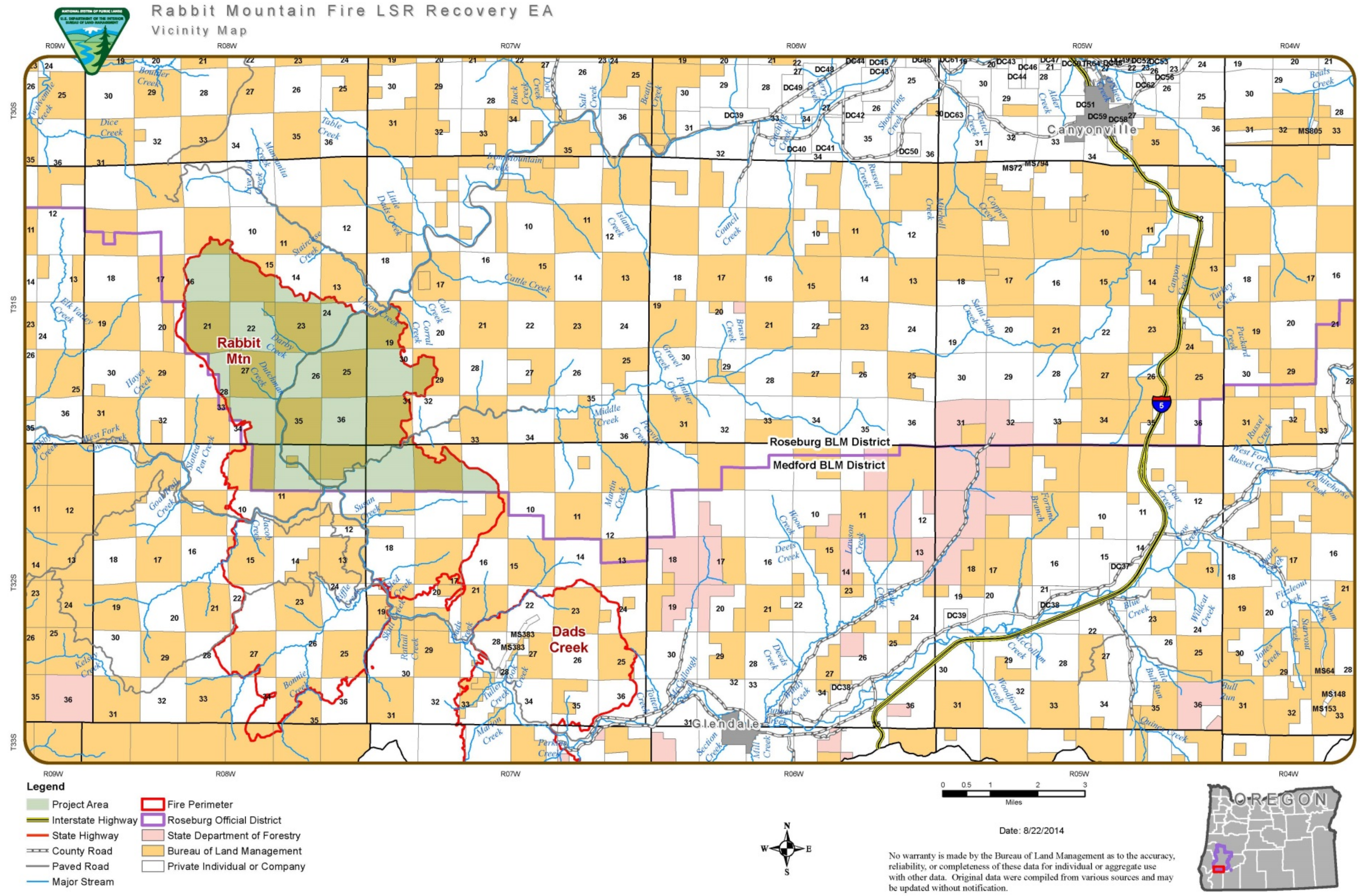

Figure A- 1. Rabbit Mountain Fire LSR Recovery vicinity map

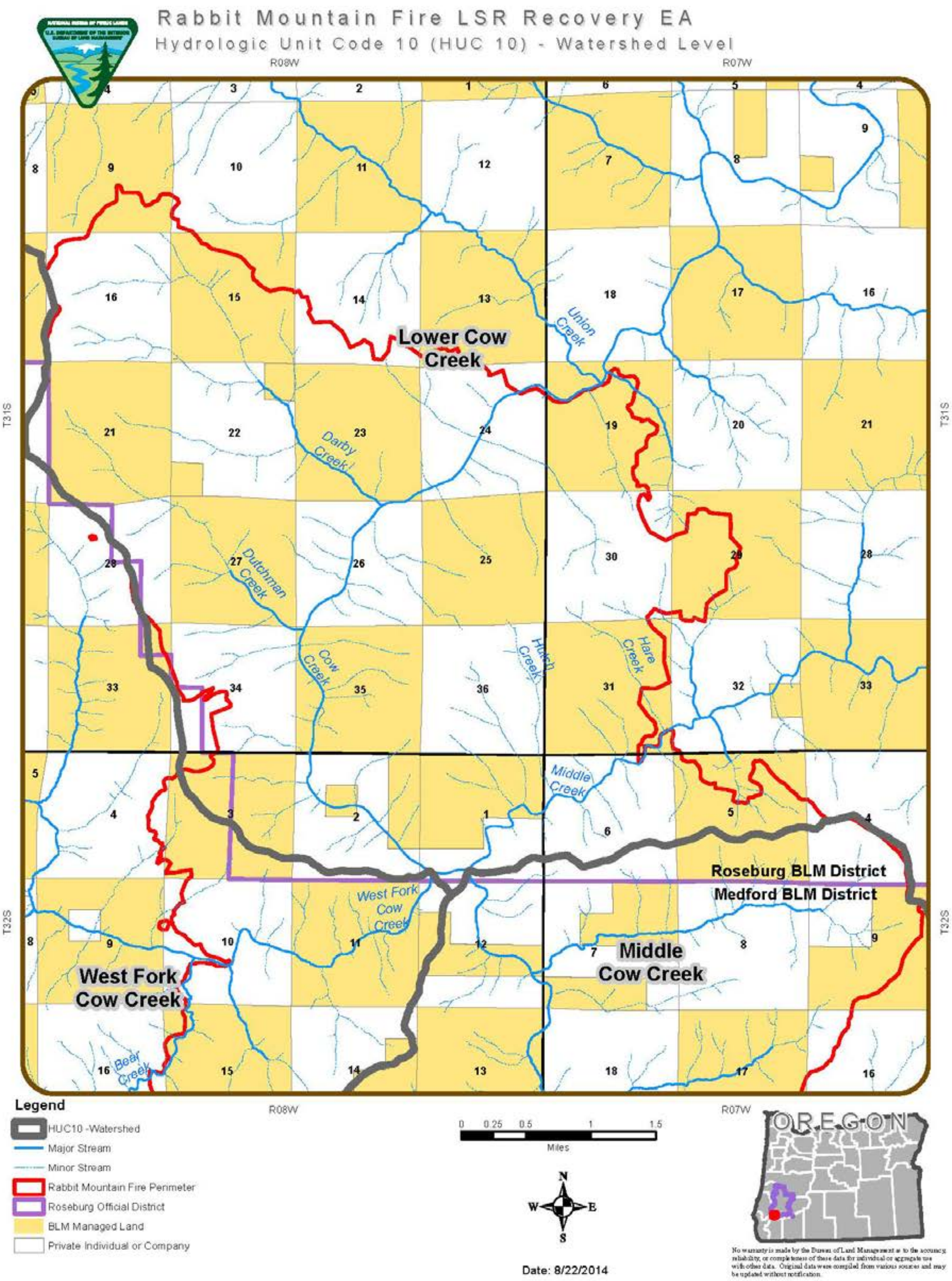

Figure A- 2. Hydrologic Unit Code 10 (HUC 10) – watershed level

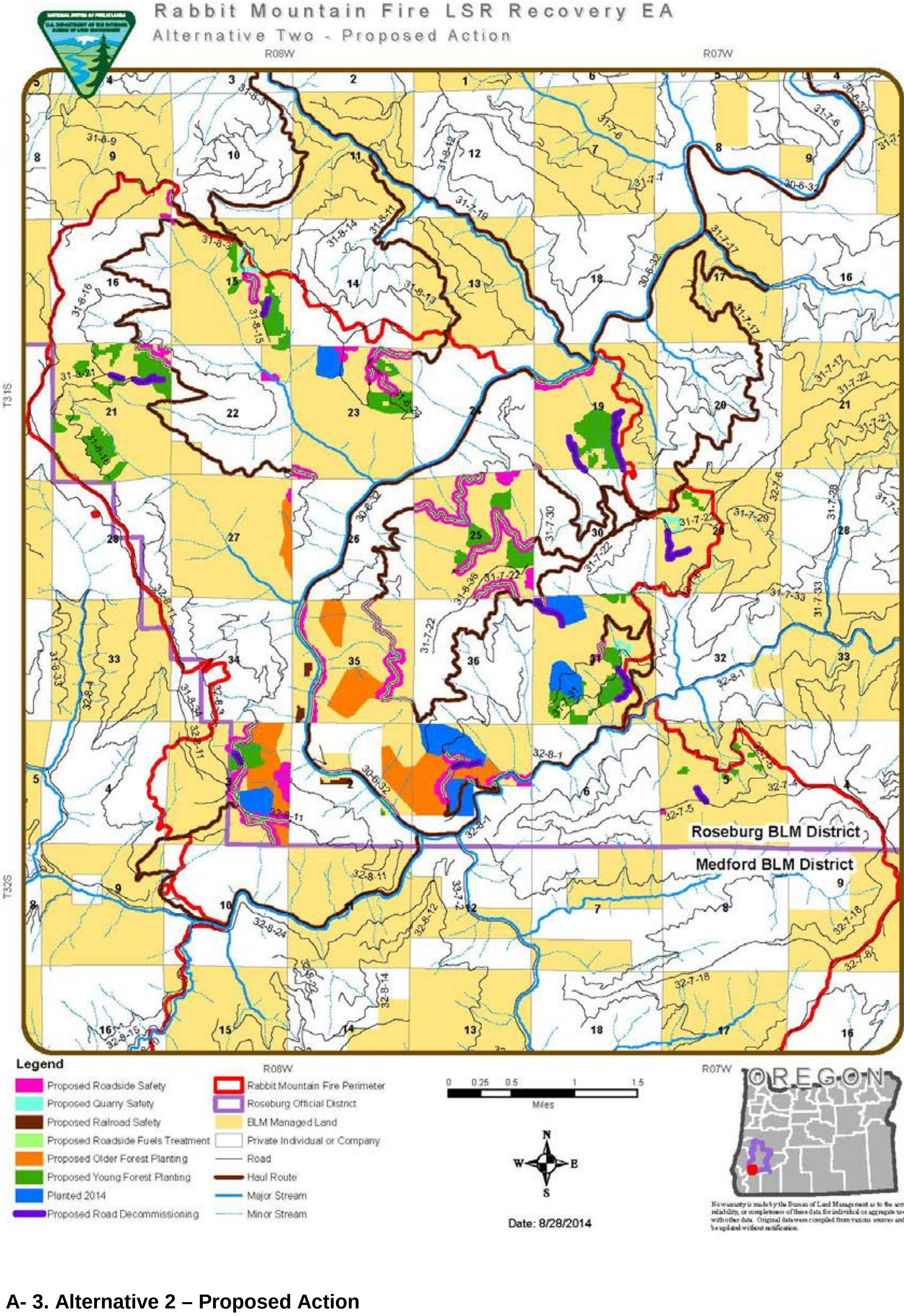

Figure A- 3. Alternative 2 – Proposed Action

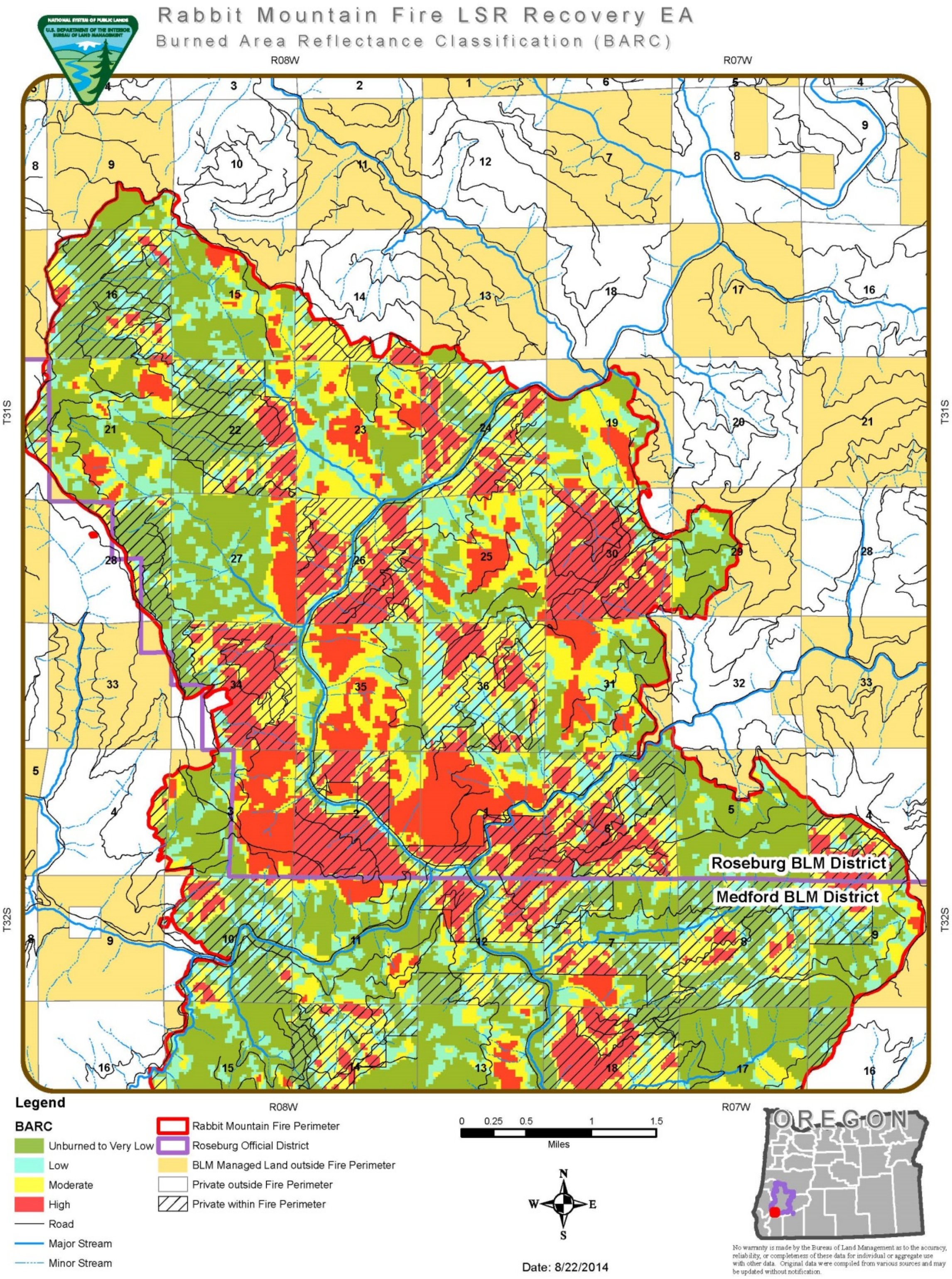

Figure A- 4. Burned Area Reflectance Classification (BARC)

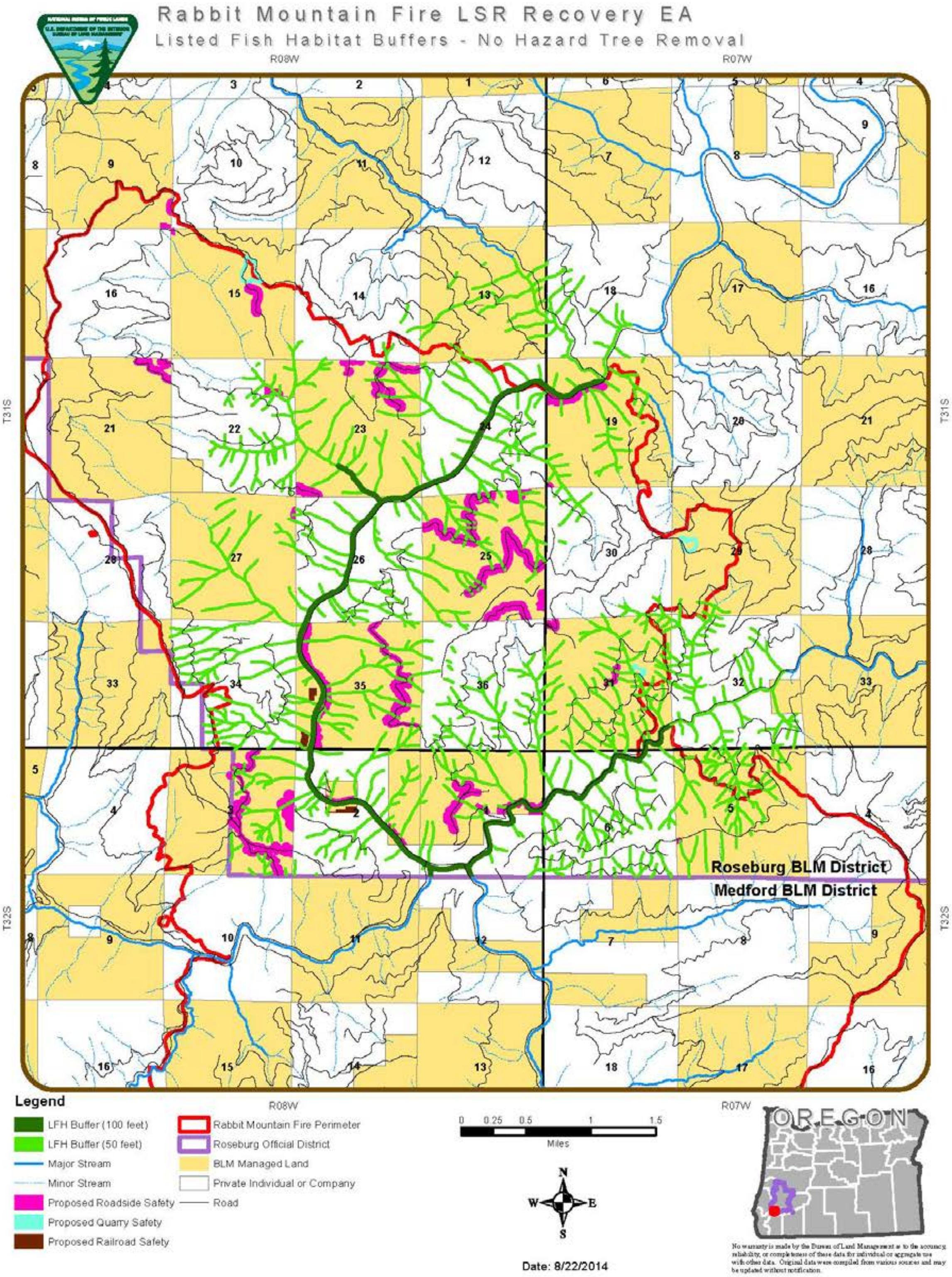

Figure A- 5. Listed fish habitat buffers – no hazard tree removal

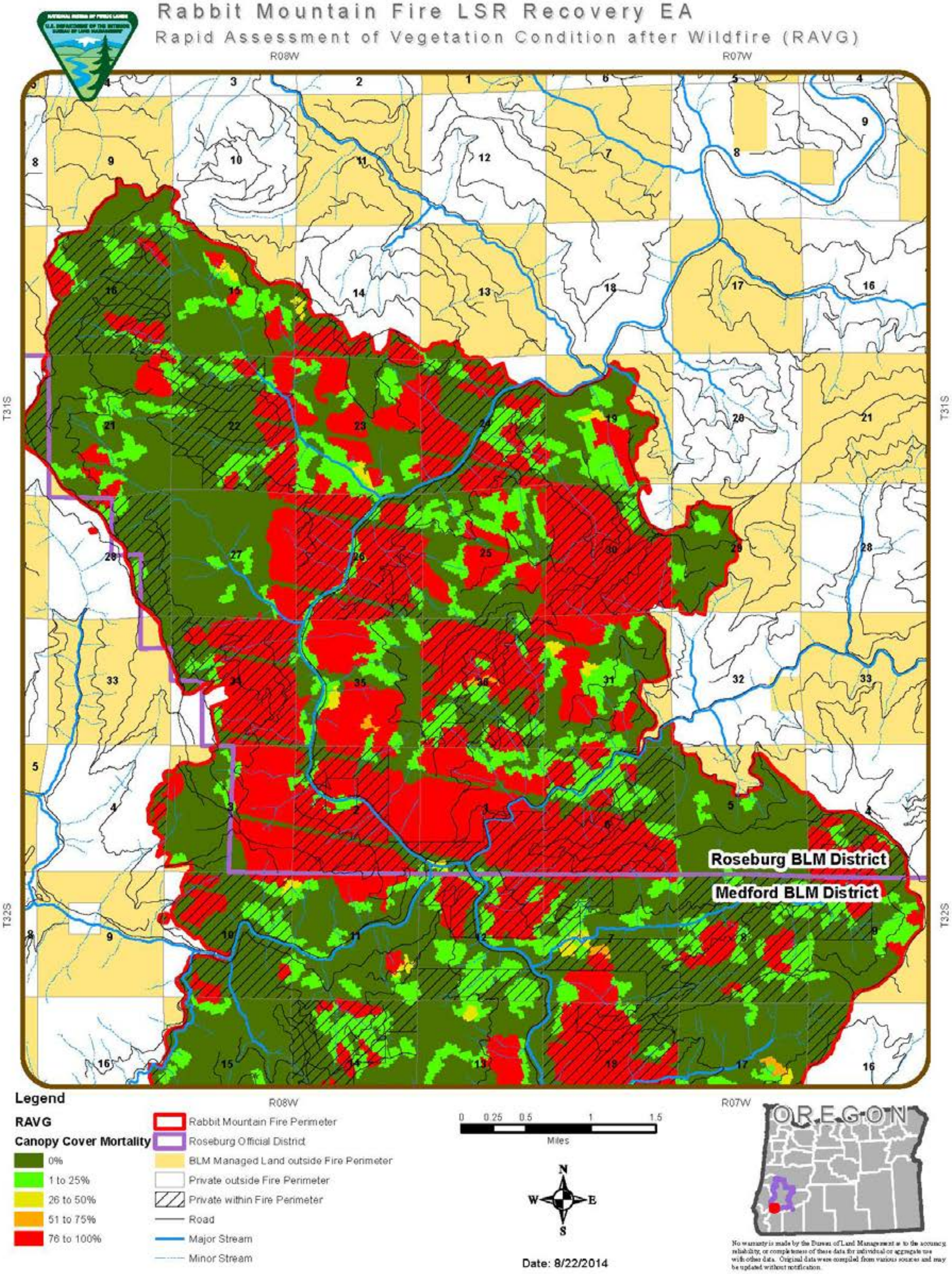

Figure A- 6. Rapid Assessment of Vegetation Condition after Wildfire (RAVG)

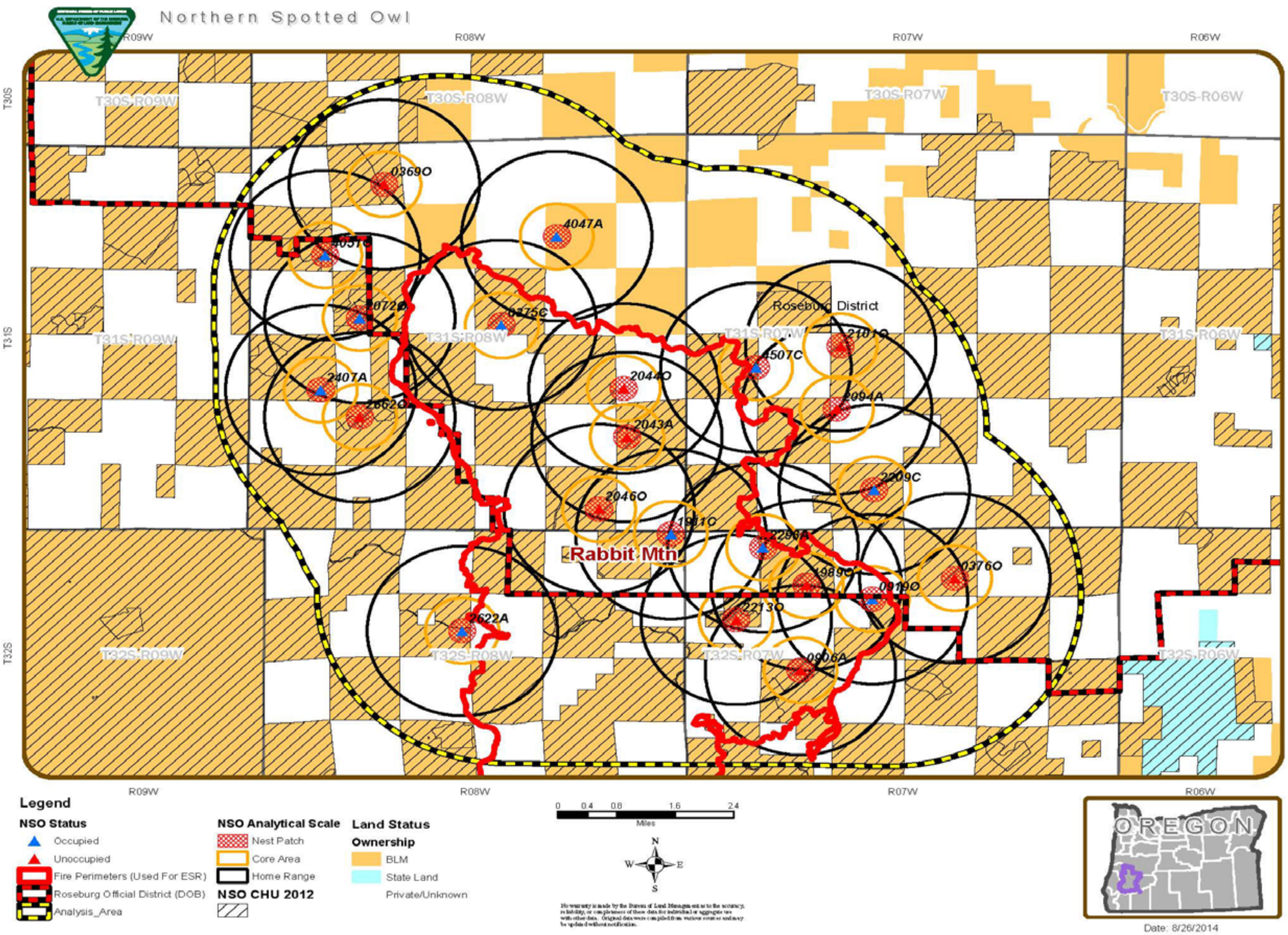

Figure A- 7. Northern spotted owl

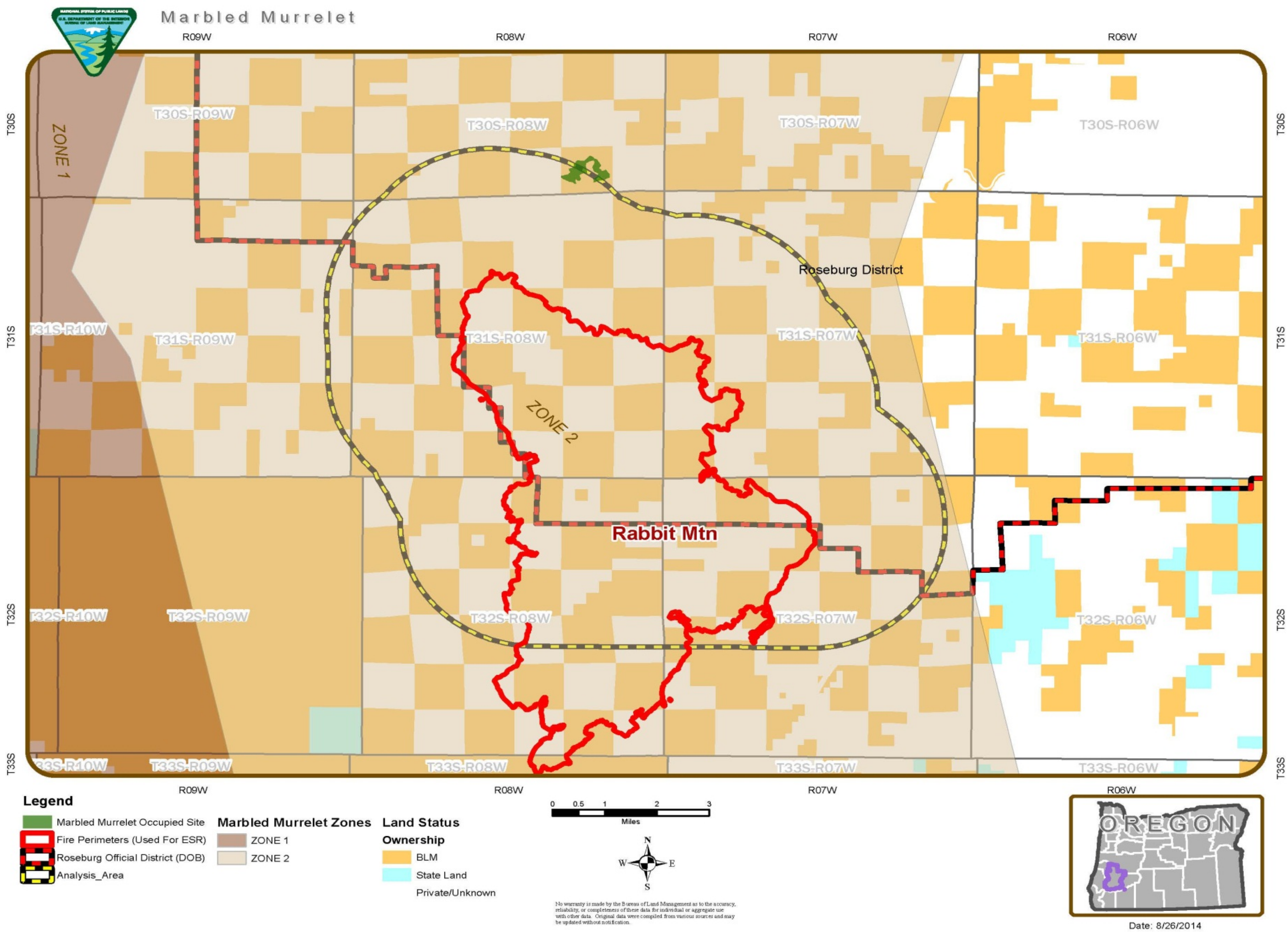

Figure A- 8. Marbled murrelet

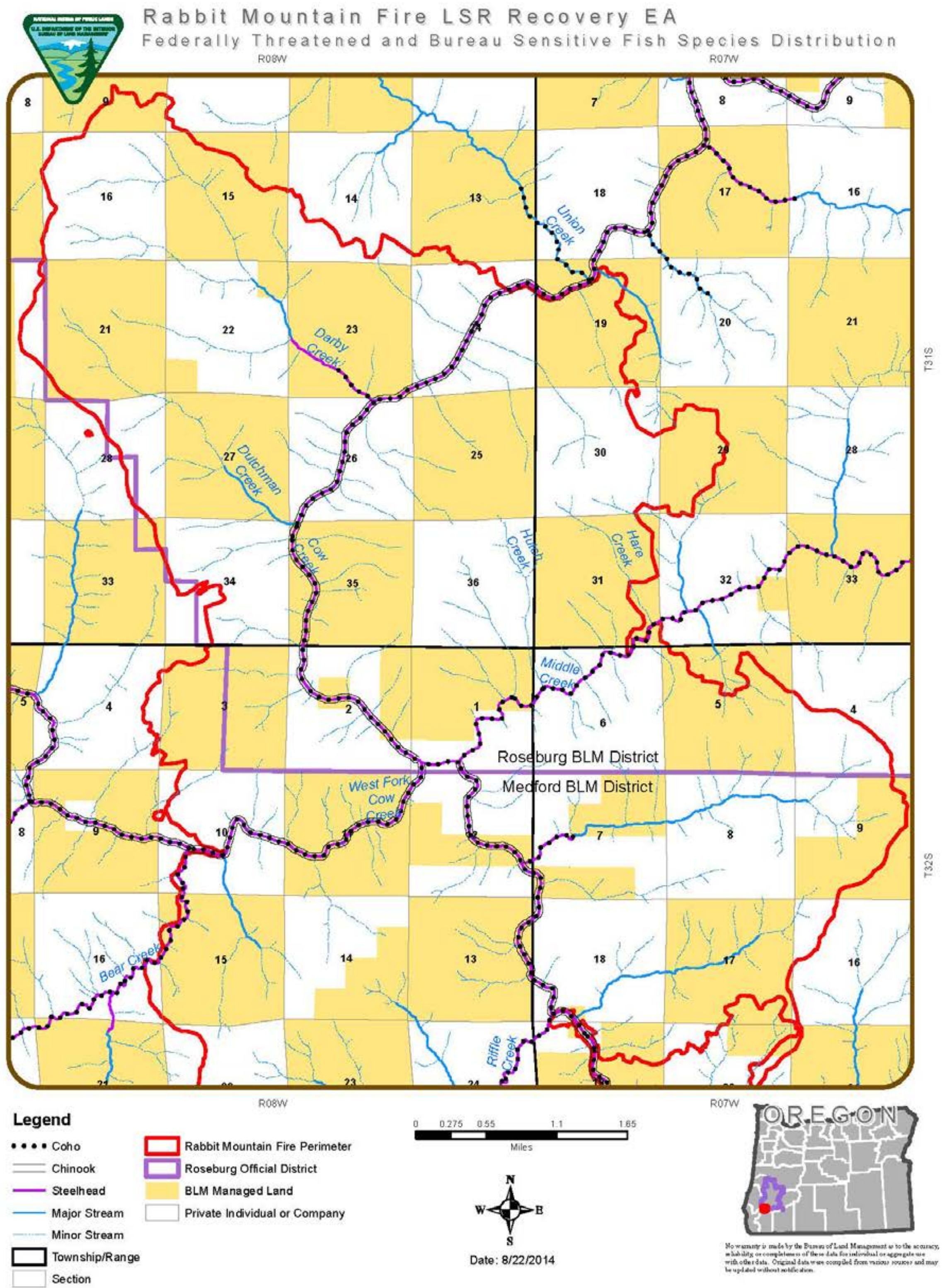

Figure A- 9. Federally threatened and Bureau sensitive fish species distribution

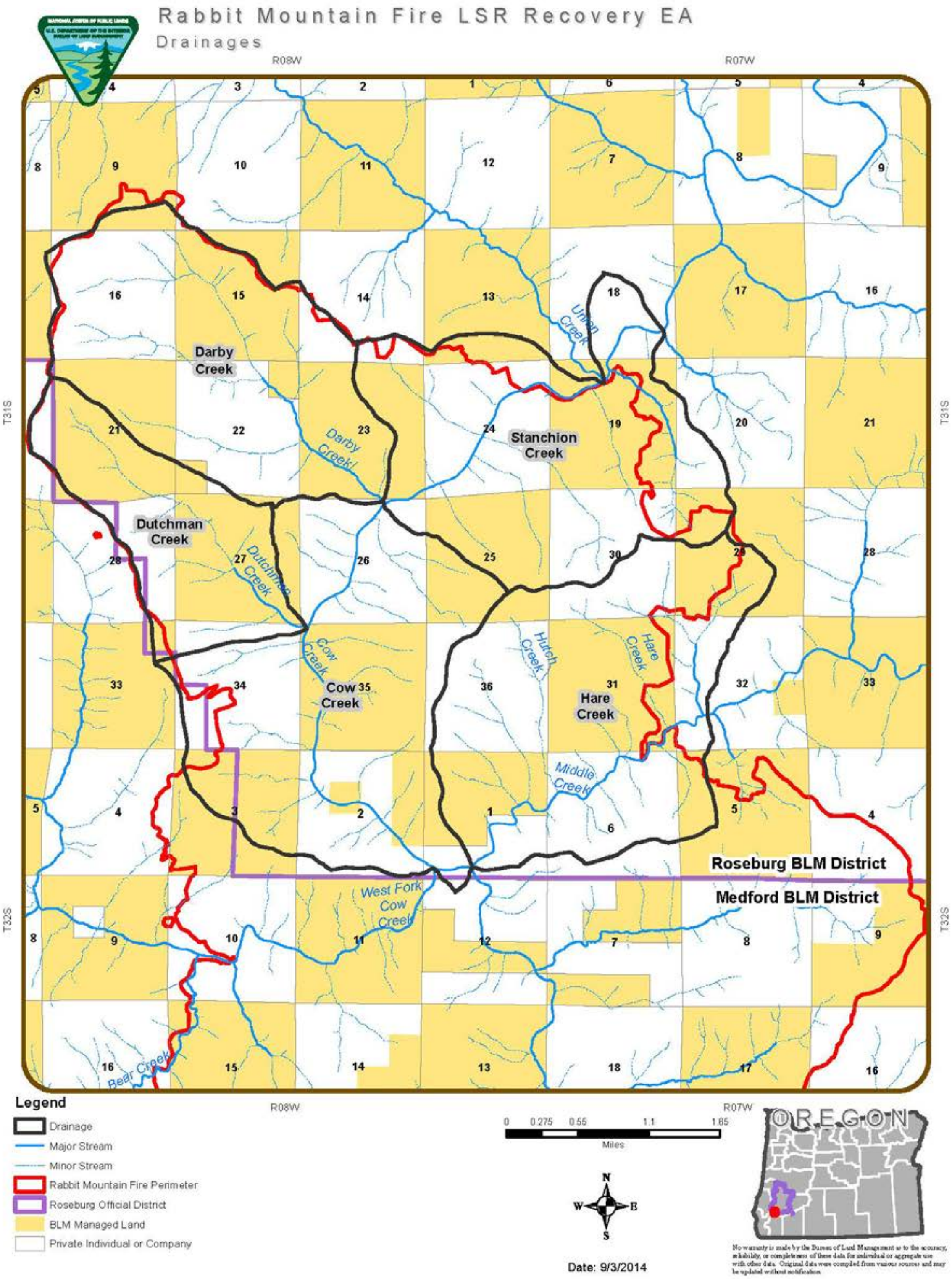

Figure A- 10. Drainages within the fire perimeter

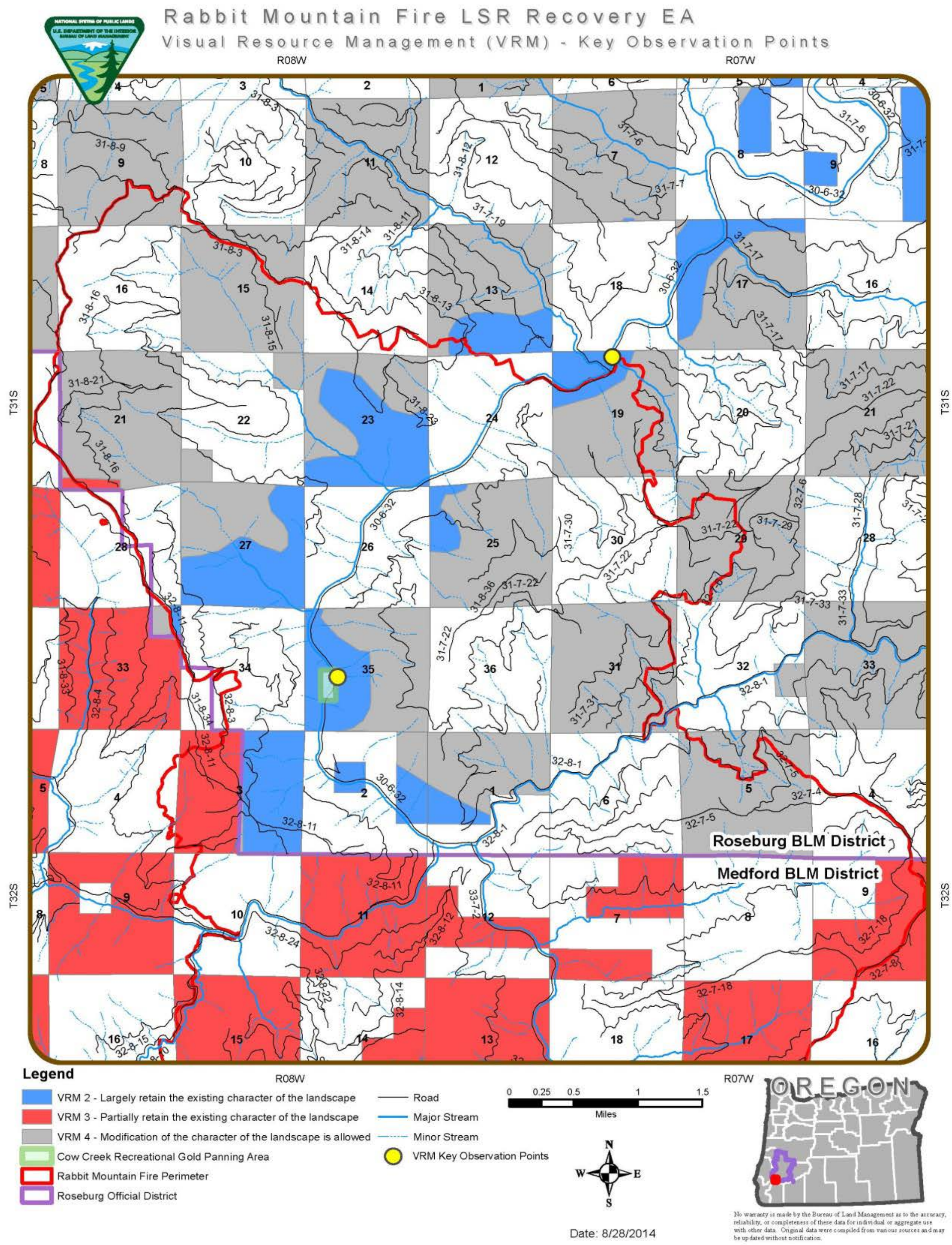

Figure A- 11. Visual Resource Management – key observation points

Appendix B – Southern Oregon Post-Fire Tree Survival Guidelines

Trees not immediately killed by fire may have damage to their crown, cambium and roots which can lead directly to death or predispose the tree to insect infestation and subsequent death within a few years of injury (Kimmey and Furniss 1943, Peterson and Arbaugh 1986, Ryan and Amman 1994). Survival potential depends on the time of year the fire occurred, degree of fire damage, i.e. crown scorch, cambial and root damage, but also pre-fire vigor of the damaged tree and site productivity. Young, fast-growing trees on good growing sites have better chances of survival than old, over-mature trees on poor sites. Even on good growing sites, old, slow-growing trees are poor risks for survival if fire damage is at all severe (Wagener 1961).

Estimates of post-fire survival are needed to determine which trees should be salvaged for commodity recovery, fuel reduction, wildlife habitat objectives and public safety. A number of models and guidelines to assess survival potential of major western conifers have been developed. Predicting exactly which trees will die and which ones will be infested by insects following a fire cannot be done with absolute precision with any existing rating system. There are too many variables involved to be correct in all cases. However, reasonable estimates of which trees have the greatest probability of dying are certainly possible (Don Goheen[1] personal communication).

Guidelines developed by entomologists at the Southwest Oregon Forest Insect and Disease Service Center were used for the Bland Mountain # 2 Fire Salvage. The Southwest Oregon Forest Insect and Disease Service Center guidelines (SWOFIDSC 2001) are based on literature and local experience of forest entomologists. They incorporate the two most important variables for prediction of mortality, crown scorch and cambial damage (Fowler and Seig 2004). Individual trees with a high probability of insect infestation are determined based on degree of fire damage. An infested tree is defined as one in which insects have been successful or are in the process of producing brood. Once infested, survival potential of the tree is negligible. The guidelines were initially developed in 1999 and tested that year in again in 2001 on fires on Rogue River National Forest.

Fire injured trees that the Southwest Oregon Forest Insect and Disease Service Center would identify as having a high probability of insect infestation within four years following a fire includes:

Table B- 1. Ponderosa Pine

Percent Crown Scorch		Percent Circumference with Cambium Damaged		Other Factors
More than 70	and	0 to any		
More than 50	and	More than 25		
0 to any	and	More than 50	especially. if	Evidence of consumption of more than 4” deep duff/bark mound around tree if fire burned between April and July (will usually apply to older trees). or Evidence of consumption of large stump or log within 18” of the base of the tree.

[1] plant pathologist/entomologist, USDA Forest Service, Southwest Oregon Forest Insect and Disease Technical Center, Central Point, Oregon

Table B- 2. Sugar Pine

Percent Crown Scorch		Percent Circumference with Cambium Damaged
More than 65	and	0 to any
More than 40	and	More than 25
0 to any	and	More than 50

Table B- 3. Douglas-fir

Percent Crown Scorch		Percent Circumference with Cambium Damaged		Height of Charred, Spongy Bark
More than 70	and	0 to any	and	0 to any
More than 40	and	More than 40	and	Less than 5’
More than 40	and	More than 30	and	5’ or more

Table B- 4. White Fir

Percent Crown Scorch		Percent Circumference with Cambium Damaged
More than 40	and	0 to any
Less than 40	and	More than 25

At this time, the evidence suggests that the current guidelines are conservative in predicting fire-injured trees that will actually be infested by insects. The guidelines are not intended to be 100% precise about which individual trees will die after a fire, but are intended to show which trees have a high probability (75%+) of dying, either directly from fire-caused wounds or subsequently (within the 5 years after the burn) from insect infestation. Following the major fire summer of 2002, 200 plots containing about 1,500 trees were established in the Biscuit, Tiller Complex, and Apple fire areas for the purposes of monitoring insect-caused mortality for the 5 years from 2003 to 2007 and refining the guidelines. The final results of this evaluation will be available in 2007 (Don Goheen personal communication).

The SWOFIDSC guidelines generally provide predictions similar to those developed by Wagener (1961) from observations on thirty wildfire areas in northern California, but provide more detailed damage evaluation criteria. Wagener’s guidelines were recommended for use following wildfire in southwestern Oregon after the 1987/88 fires as: "still the best we have available for these species [Douglas-fir, white fir, incense-cedar] in California and Oregon." (Weatherspoon 1988).

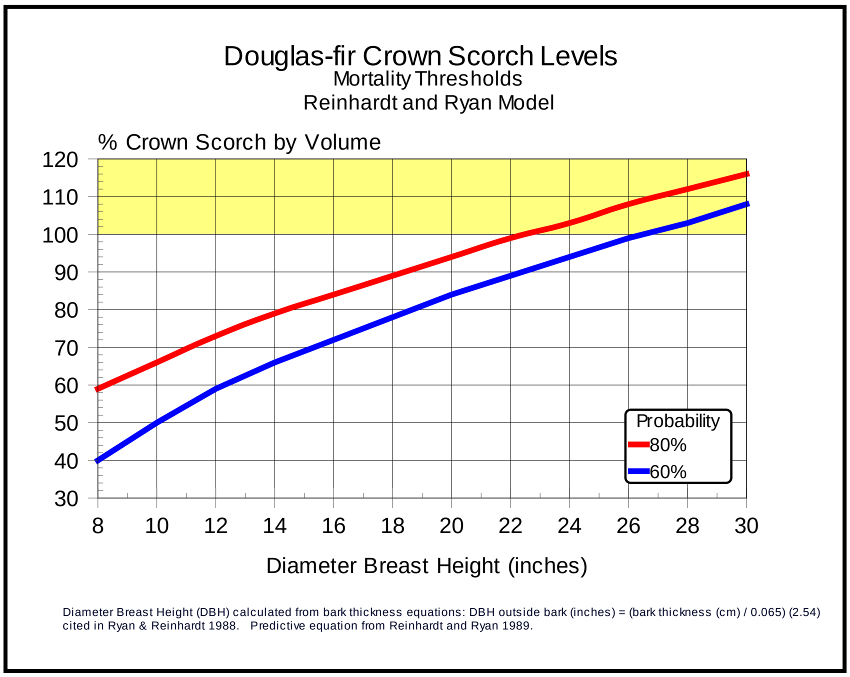

Figure B- 1. DF crown scorch levels, mortality thresholds (Reinhardt and Ryan 1989)

The Roseburg BLM, Rogue-Siskiyou National Forest and Umpqua National Forest recently used the SWOFIDSC guidelines on the Flea Flicker Fire Salvage (USDI 2004), Biscuit Fire (USDA and USDI 2003) and Baked Apple Fire Salvage (USDA 2004) respectively, for determining the risk potential of insect infestation and mortality of fire-damaged trees.

Another rating system (model) for western conifers developed by K.C. Ryan and E.D. Reinhardt has been used by Medford BLM (USDI 2003) and Umpqua National Forest (Davis 2003, USDA 2003) for recent fire salvage evaluations. The mortality model used by Medford BLM and the Umpqua National Forest are somewhat different in form, but are derived from the same data set from forty-three prescribed fires in Idaho, Montana, Washington and Oregon (Ryan and Reinhardt 1988; Reinhardt and Ryan 1989). Probability of mortality is based on bark thickness, calculated from diameter breast height (DBH) and published bark thickness equations, and percent of pre-fire live crown scorched by the fire. Medford BLM used the 1988 publication and Umpqua National Forest used the 1989 publication as the basis of their mortality estimates. Though based on the same data, the authors reformulated the model in their 1989 paper to better account for increasing bark thickness effects (Ryan and Amman 1994).

There are two principal factors which limit the utility of either of the Ryan and Reinhardt models for Bland Mountain mortality assessments.

First, the data set contains few trees over 24” DBH that had had extensive crown scorch (Ryan and Reinhardt 1988). This probably explains in part why the model predicts greater than 100% crown scorch needed to kill trees over 26” DBH at the 60% probability level using the reformulated 1989 model (Figure 1, blue line); 22” DBH if an 80% probability level (red line) is used. Sixty-five percent of the fire-damaged stands in the Bland Mountain area are older stands dominated by large trees poorly represented in the data base used to develop the model.

Second, in a validation test using data from the 1988 Yellowstone wildfires, the Reinhardt and Ryan (1989) model under predicted Douglas-fir mortality by a considerable amount. On an individual tree basis three years post-fire, the model accurately predicted the status of only 75% of fire damaged Douglas-fir. The authors concluded that in part this was probably due to differences in fire behavior experienced by trees between the two data sets. The data sets used in building the model came from prescribed burns with moderate intensity surface fires where duff moisture was generally too high to support sustained burning which causes basal girdling in thick-barked trees. In the wildfire situation, duff moisture content was low and consumption and sustained burning was at high levels (Ryan and Amman 1994). The latter situation would have been more typical within the Bland Mountain units at the time of the fire.

Other potential mortality models reviewed and rejected for this project were those developed by Peterson and Arbaugh (1986, 1989) and Stephens and Finney (2002). These models were developed from Autumn wildfires in the northern Rocky Mountains, Spring wildfires in the Cascades of Oregon and a late Autumn prescribed burn in the southern Sierra Nevada. Their models appear to suffer from the same shortcoming as Reinhardt and Ryan, being based on predominantly smaller vigorous trees. In addition, Peterson and Arbaugh recommend that their models not be used as strict guidelines for estimating post-fire survival in the field. They state that constraints of the logistic model function could lead to inaccurate predictions at very high or very low damage levels. It should be noted that the Reinhardt and Ryan model also employs logistic functions.

Besides reviewing the individual models described above, a recent literature review on methods to predict post-fire mortality of Douglas-fir and Ponderosa pine was consulted. The authors, Fowler and Seig (2004) found that:

1. There is no consensus in the literature on which methods are most accurate or practical in predicting short-term post-fire mortality.
2. However, crown scorch volume and determinations of basal scorch/cambium damage appear to be the best predictors of Douglas-fir post-fire mortality.
3. Foliage damage along with stem damage is clearly the easiest, most pragmatic, and most important measurement in practically all the studies reviewed.
4. If crown damage is the only damage assessment used, as some have recommended for hazard tree marking, then percent crown scorch volume above 70-95% for Douglas-fir and 80-95% for Ponderosa pine would indicate probable tree death ($p>0.80$) within two to three years. These figures would need to be reduced when combined with high insect attacks or obvious damage to stems and roots, or with drought conditions.
5. Insects can be an important factor affecting subsequent tree mortality following fire

The SWOFIDSC guidelines (2001) used for Bland Mountain # 2 Fire Salvage are consistent with these findings. The SWOFIDSC criteria are based on the literature and local experience. They are easy to apply in the field and incorporate the two most important variables for Douglas-fir mortality predictions, crown scorch and cambial damage. They account for the probability of insect infestation due to fire–damage causing delayed mortality several years following the initial injury.

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Appendix C – Late-Successional Reserve Update for the Rabbit Mountain Fire LSR Recovery Project (Appendix H only)

Appendix H. 2013 Rabbit Mountain Fire Update

Appendix H1. Changes to baseline

The Douglas Complex (Figure C- 1) was ignited by dry lightning in the early morning hours Friday, July 26th, 2013. That morning, 54 fires were ignited by lightning on lands in southern Douglas and northern Josephine Counties. The majority of the fire growth occurred in the 72 hours following ignition (Figure C- 2). Between ignition and August 3rd, the fires in the complex, Rabbit Mountain, Dad's Creek and Farmer Gulch had cumulatively burned over 36,000 acres. On August 26th, the fire was transferred to a Type 3 organization to continue mop-up and suppression rehabilitation actions. The Douglas Complex, which burned a total of 48,679 acres of Bureau of Land Management and private lands, was contained on September 3rd, 2013. The Douglas Complex occurred in the vicinity of Glendale and Riddle, Oregon (Figure C- 1). The Rabbit Mountain Fire burned 23,984 acres of which, 12,476 acres were BLM administered lands (Table c- 1). Six thousand two hundred forty-eight (6,248) acres of late-successional reserves (LSR) (RO-259) were contained within the fire perimeter. Fire severity varied across the landscape. Rapid Assessment of Vegetation Condition (RAVG) data measure severity as a percentage of canopy loss. Approximately 26 percent of the fire area burned under moderate and high severity conditions (canopy cover loss more than 50 percent). Throughout this analysis, all fire severity data (Table C- 1) comes from the RAVG data.

Table C- 1. The 2013 Rabbit Mountain Fire by ownership and fire severity

Ownership	Canopy Cover Loss[1] [acres (%)]										
	0%		0-25%		25-50%		50-75%		75+%		Total
Federal	8,441	(68)	1,782	(14)	63	(1)	14	(0)	2,176	(17)	12,476
Private	5,703	(50)	1,655	(14)	28	(0)	13	(0)	4,109	(36)	11,508
Total	**14,144**	**(59)**	**3,437**	**(14)**	**91**	**(0)**	**27**	**(0)**	**6,285**	**(26)**	**23,984**

[1]Canopy cover loss derived from Rapid Assessment of Vegetation Condition after Wildfire (RAVG)

Late-successional reserve 259 encompasses 39,382 acres of large block LSR, as well as 2,260 acres of Marbled Murrelet reserve located approximately 6 miles west of the fire area (Figure C- 4). Only the large block LSR will be discussed, as the fire did not affect the Marbled Murrelet reserve. A majority (75%) of the moderate and high severity impacts occurred during the first three days (Figure C- 2). Low severity areas were mainly underburned with canopy loss of less than 50 percent. Overall, late-seral forests (greater than 80 years) decreased 1,929 acres (8%); correspondingly early seral condition (less than 40 years) increased 2,006 acres (23%; Table C- 2).

Table C- 2. Pre- and post-fire forest conditions of LSR 259 (large block only)

Age Class	Pre-fire Area		Canopy Cover Loss[1] (ac)					Post-fire Area	
	(ac)	(%)	0%	0-25%	25-50%	50-75%	>75%	(ac)	(%)
Non-forest	1286	3	1,253	19	0	0	16	1286	3
200+ years	19,412	49	17,766	685	34	5	923	18,845	47
80-200 years	4692	12	4,332	79	6	2	272	4,417	11
40-79 years	5310	14	5,234	32	0	0	42	5,267	13
0-39 years	8681	22	8,096	136	0	0	449	9,925	25
Total	**39,382**		**36,682**	**951**	**40**	**7**	**1707**	**39,382**	

[1]Based upon Rapid Assessment of Vegetation after Wildfire (RAVG) data.

Northern spotted owl history is extensive in and around the fire area. Annual northern spotted owl surveys have been conducted since the mid- to late-1980s. The home ranges of 22 known sites were impacted by fire effects to LSR 259. The fire perimeter contains 5,016 acres of northern spotted owl nesting, roosting, and foraging habitat (NRF). The wildfire resulted in the loss of 1,430 acres of NRF (28%). Due to proximity of unburned NRF and core areas, approximately 435 acres continue to provide short term foraging opportunities, although these areas no longer provide nesting and roosting habitat. Moderate and high amounts of canopy loss compromised vertical and horizontal cover requirements of protection from predation and thermal regulatory needs. Fontaine (2007) found that small mammal species diversity tended to simplify after a wildfire, however, deer mice populations increased rapidly after fire. Overall abundance of small mammals remained similar (Fontaine 2007). This maintenance of the prey base, along with available roosts and flight space, permits stands affected by moderate and high severity fire to remain important foraging habitat; especially within 300 feet of NRF that was unburned or burned under low severity.

Based on habitat thresholds (USDI FWS, USDI BLM, USDA FS 2008), four northern spotted owl sites may have been altered below habitat thresholds necessary to provide for effective reproduction (Table C-3). Post-fire foraging habitat (PFF) may continue to provide foraging support at sites for at least the next 5 to 10 years, depending upon snag fall rates and the recovery of conifer canopy cover in the regenerating forests.

Table C- 3. Summary of available NRF habitat within the analytical scales of the northern spotted owls associated with the areas of LSR 259 contained within the 2013 Rabbit Mountain Fire

IDNO	Nest Patch (ac)		Core Area (ac)		Home Range (ac)	
	Pre	Post	Pre	Post	Pre	Post
0369O	24	24	79	79	606	606
0375C	65	65	277	248	1231	988
0376O	25	25	30	30	608	566
0906A	26	7	74	32	714	657
0919O	44	26	186	70	1145	552
1911C	67	67	215	213	891	817
1989O	65	41	295	170	1423	635
2043A	11	9	200	152	1482	903
2044O	68	12	369	124	1397	439
2046O	55	55	289	289	1084	1071
2072O	16	16	125	125	977	967
2094A	30	30	179	179	954	954
2101O	53	53	262	262	658	657
2209C	58	57	205	168	739	594
2213O	46	46	177	175	1092	943
2298A	63	63	145	145	953	949
2407A	40	40	174	174	964	839
2622A	45	45	209	209	921	899
2662O	31	31	132	132	602	555
4047A	51	51	226	226	965	965
4051O	24	24	134	118	1131	1014
4507C	24	24	79	79	606	606
Highlighted cells indicate Core Area or Home Ranges below threshold identified as critical for owl site functionality (USDI FWS, USDI BLM, & USDA FS, 2008)						

Appendix H2. Coarse Wood Analysis

Post-fire recovery activities in the LSR portion of the Rabbit Mountain Fire will include the felling of hazard trees. A hazard tree is identified as having an "imminent risk" of failure that poses a risk to individuals conducting land management or recreational activities within the potential failure zone of that tree (USDA and USDI, Field Guide for Danger Tree Indentification and Response, 2008). Potential failure zones of hazard trees extend one and one-half times the individual tree height on either side of a road, at a minimum. There are, at a minimum, 66 miles of BLM roads within the perimeter of the fire area. Complete hazard tree surveys have not been conducted, but there is a potential for hundreds of hazard trees to be identified and removed.

Hazard trees are treated in one of two ways: remove the hazard (fell the tree), or eliminate the opportunity to enter the potential failure zone (close the road/area). Road closure is of limited use because of the road agreements in-place to facilitate access to the intermingled landowners. Therefore, hazard trees will need to be managed through felling.

Background

Dead wood occurs with a high variability across the landscape, a result of the many biotic and abiotic factors that influence its creation and retention (Rose et al. 2001). Dead wood, standing and downed, plays many roles in the diversity and distribution of wildlife, nutrient cycling, soil fertility, moisture retention, mycorrhizae, prevention of mass wasting and surface erosion, and stream and riparian function (Rose et al. 2001; Ohmann and Waddell 2002). Snags and downed wood develop from a number of ecological processes: forest succession, insect and pathogens, mass wasting, flooding, windstorms, and fire (Rose et al. 2001). These causes can occur as single tree events or large scale occurrences. Rose and others (2001) summarized habitat relationship data for wildlife in the Pacific Northwest and found that 96 wildlife species are associated with snags; 86 species with downed wood. Wildlife species utilize all stages of dead wood—hard snags, soft snags, stubs, and downed wood. Many species depend upon large scale events to create habitat necessary for their survival. Downed wood can positively influence the presence and abundance of small mammals (Chappell and Kagan 2001; Fontaine 2007).

Snags provide opportunities for cavity nesting, perches for hunting, and are often associated with herbaceous and shrub habitats, and edges which are important habitat components for a number of early seral bird species (Rose et al. 2001). Large diameter snags may last for decades and provide nesting and foraging opportunities in later successional stages (Neitro et al. 1985).

Direction for Salvage in Late-Successional Reserve in the Roseburg District Management Plan (RMP) states (p. 30, BLM, 1995):

- Retain adequate coarse woody debris quantities in a new stand so that in the future it will still contain amounts similar to naturally regenerated stands.
- In the Oregon Klamath Province, if essential to reduce future risk of fire or insect damage, conduct salvage that does not meet the preceding management actions/direction. Focus on those areas where there is high risk of large scale disturbance.
- Remove snags and logs to reduce hazards to humans along roads and trails…Leave some material where coarse woody debris is inadequate.
- Retain logs present on the forest floor before a disturbance event.

- Deviate from these management actions/directions only to provide reasonable access to salvage sites and feasible logging operations. Limit deviation to as small an area as possible.

Further direction in the LSRA, regarding salvage states (USDI and USDA 1998):

- (p. 72) Individual or groups of trees along roads, trails…may be salvaged if it is determined that they pose a hazard to people or are blocking or obstructing the use of the area.
- (p 73)…reduce the probability that large-scale late-successional habitat loss will occur.
- (p 74) In LSRs 259…there is presently a moderate to high fire hazard…(p. 75) Some salvage that does not meet the preceding salvage guidelines would be allowed if it is essential to reduce future risk of fire or insect damage to late-successional forest conditions…the value of reducing the risk of future loss of late-successional habitat, or perpetuating a fuel condition that would put neighboring forests at risk, should be weighed against the value of snags or downed trees as habitat structures.

The loss of downed wood, as a result of salvage, would impact long term dynamics of downed wood potential. Downed wood levels will be compared to large-scale inventory data summarized in DecAID (Mellen-McLean et al. 2012)

Proposal

The Bureau assessed the burned area, road use plans and history, slope, and fire severity, and identified approximately 524 acres of forests, adjacent to 12.6 miles of roads, a railroad right-of-way, and quarries, that will be surveyed for hazard trees. Moderate and high severity wildfire occurred in approximately 124 acres of forests greater than 80 years of age. Trees identified as a hazard, and trees likely to become a hazard in the next 3-5 years, would be felled and potentially removed from the site.

High percentages of hazard trees would be felled close to the roads identified as a high priority. The number of remaining snags would likely gradually increase with distance from the road. Individual snags may be removed up to 300 to 500 feet from the road, depending upon tree height and slope. Outside of riparian areas, non-merchantable materials would be retained; to a maximum of 19 tons/acre (3.4% ground cover).

Within riparian buffers felled hazard trees would not be removed within the following distances:

(1) 100 feet from listed fish habitat (LFH[2]); and
(2) 50 feet from perennial and intermittent streams within 1 mile of LFH.

Downslope from Cow Creek and Middle Creek roads, all hazard trees greater than 30 inch DBH[3] would be felled into Cow Creek and Middle Creek, where possible. Upslope from Cow Creek road, felled hazard trees within the LFH no-removal buffer would be moved to the downhill side of Cow Creek road and left onsite. To address hazardous fuel build-up upslope from Cow Creek road, felled hazard trees within the perennial and intermittent stream no-removal buffers may be moved to the downhill side of Cow Creek road and left onsite.

[2] The Magnuson-Stevens Fishery Conservation and Management Act of 1996 (Federal Register 2002) designated essential fish habitat (EFH) for fish species of commercial importance. Essential fish habitat consists of streams and habitat currently or historically accessible to Oregon Coast Chinook and Oregon Coast coho salmon, and is coincident with Critical Habitat designated for Oregon Coast coho salmon in the Union Creek-Cow Creek, Middle Creek, Bear Creek-West Fork Cow Creek, and Riffle Creek-Cow Creek sub-watersheds. Essential fish habitat is also coincident for listed fish habitat (LFH) in the project area.
[3] DBH - Diameter at Breast Height, 4.5 feet above ground

Within riparian areas, outside of the no-removal buffers listed above, felled hazard trees may be removed, with the exception of trees felled into stream channels. Some felled hazard trees (greater than or equal to 9 inch diameter at the large end) would be left onsite for habitat (up to 10 tons/acre (i.e. 10 logs/acre, 16 feet in length). No felling of hazard trees into stream channels would occur within a distance of 100 feet upstream of a culvert.

Analysis

The 2013 Rabbit Mountain Fire occurred in the Southwest Oregon Mixed Conifer-Hardwood Forest type (Chappell and Kagan, 2001; Mellen-McLean, et al., 2012). Inventory data utilized in DecAID is derived from a system of plots (Continuous Vegetation Survey, Forest Inventory and Analysis, and Natural Resources Inventory) developed to assess the vegetative state at a landscape scale, which is the recommended scale of analysis (greater than 12,800 acres) (USDA 2012). On the advice of the Regional Ecosystem Office – LSR Advisory Group, the analysis area will be equal to those sixth field watersheds that encompass LSR 259; an area of approximately 93,000 acres of federal lands (Table C- 4, Figure C-5).

Table C- 4. Modeled forest conditions in the LSR 259 analysis area for coarse woody debris (forest size classification according to the DecAid[1] model)

Size Class[2]	Pre-fire Conditions		Canopy Loss[3] (ac)					Post-fire Conditions	
	(ac)	(%)	0 %	0-25%	25-50%	50-75%	>75%	(ac)	(%)
Non-forest	2,245	2	2,131	81	0	0	33	2,245	2
Open Canopy	11,858	13	10,857	175	12	8	807	14,018	15
Small-Medium Trees	22,432	24	21,700	391	12	2	327	22,103	24
Large Trees	56,605	61	53,049	1,642	83	20	1,811	54,773	59
Total	**93,140**		**87,736**	**2,290**	**107**	**30**	**2,977**	**93,140**	

[1]DecAID—Decayed wood advisory model; Mellen-McLean, et al. 2012.
Open Canopy – <10% canopy cover, or if canopy cover is greater than 10%, Quadratic Mean Diameter (QMD) ≤ 9 inches
Small-Medium Trees – stand QMD 10-19 inches
Large Trees – stand QMD >20 inches (Mellen-McLean, et al., 2012).
[3]Canopy loss derived from the RAVG data.

Inventory data was derived from plots less than 2.47 acres in size (one hectare). Therefore, it is unknown whether high densities of snags (i.e. above the 80 % tolerance levels[4]) were part of a small- or large-scale event(s). The data from unharvested plots will be used to establish the range of natural variation in an untreated system. Natural fire events may be represented by those dead wood levels in excess of the 80 percent tolerance level. The proportion of the analysis area that contain snag and downed wood densities in excess of the 80 percent tolerance level ranges from 13 to 18 percent of the landscape. This 13 to 18 percent would then be a desired landscape target (Table C- 5).

[4] Tolerance Levels --tolerance intervals are estimates of the percent of all *individuals* in the population that are within some specified range of values (Mellen-McLean, et al., 2012).

Table C- 5. Eighty (80) percent tolerance levels in the Southwest Oregon Mixed Conifer-Hardwood vegetation class, unharvested forests

Stand Size Class	80% Tolerance Level			% of Landscape that Exceed 80% Tolerance Level		
	Snags (snags/acre)		Downed Wood (% cover)	Snag Size Class		Down Wood Size Class
	> 10 in.	> 20 in	> 5 in	> 10 in	> 20 in	> 5 in
Open Canopy	26.2	7.9	7.9	13	18	13
Small/Medium Trees	36.1	13.1	4.1	15	14	14
Large Trees	41.1	19.3	6.3	14	13	13

Approximately 12,500 acres of federal lands were within the perimeter of the 2013 Rabbit Mountain and the adjacent Farmer Gulch fires. Approximately 3,007acres were subjected to moderate and high severity wildfire (loss of greater than 50 percent canopy cover) and therefore underwent stand replacing events (Table 1). Approximately 2,160 acres of open canopy forest were created from small/medium and larger forests; an 18% increase (Table 4).

Very few acres of Open Canopy forest on federal lands are unmanaged. These managed Open Canopy forests contain less than two residual, large diameter snags/acre (greater than 20 inch DBH), as per prescription, given the current and past land use plans; below the 20 percent tolerance level of 4.4 snags/acre (greater than 20 inch DBH) found in unmanaged Open Canopy forests (Mellen-McLean, et al., 2012). In an unmanaged landscape, approximately 19 percent of the landscape is below this 20 percent tolerance level (Mellen-McLean, et al., 2012). Open Canopy forests created in the 2013 fires will have greater than 20 inch DBH snag densities in excess of the 80% tolerance levels (8 snags/acre) (Table C- 6). The 80 percent tolerance levels for snags greater than 10 inch DBH is approximately 26 snags/acre, in Open Canopy forests (Table 5). The fire created early seral habitat that could easily exceed this standard, as modeled (Table C- 6).

Table C- 6. Estimated number of snags created by a stand-replacing fire event for one representative stand in each DecAID size class

Stand Size Class	[1] Hard Snags (snags/acre), by size class	
	>10 inch DBH	>20 inch DBH
Open Canopy	66.5	9.7
Small/Medium Trees	40.9	14.0
Large Trees	76.9	38.6
[1]Snags modeled using the FVS-FEE model, southwest Oregon variant, for a representative stand in each size class.		

The 80 percent tolerance level for downed wood cover (greater than 5 inch diameter) is 13 percent (Table C- 5). Based upon snag fall modeling, Open Canopy stands originating from wildfire would meet, or exceed, the 80 percent tolerance levels for downed wood (greater than 5 inch diameter) within seven to ten years (Figure 5). Without considering ingrowth from regenerating stands, downed wood levels would exceed the 7.9 percent threshold for the next 50 years (Figure 6).

Fire initiated Open Canopy forests would account for 2% of the analytical landscape (Table C- 7); well under the 13% that could be expected in a natural landscape condition. Even at the LSR scale, Open Canopy stands with snag levels in excess of the 80% tolerance level (greater than 10 inch DBH) would only account for approximately 3% of the landscape; again well under 13% in a natural landscape (Table C- 5).

Table C- 7. Summary of Open Canopy forests, all and fire created, in the analysis area and LSR 259

	Area (acres)	Open Canopy Condition (acres)			
		All		Fire Created	
Analysis Area	93,139	14,018	15%	2160	2%
Late-Successional Reserve	39,380	9,925	25%	1244	3%

Open Canopy and Small/Medium Tree stands on federal lands in this landscape have been heavily managed. In addition to the Open Canopy (non-fire created) stands being deficient in retained dead wood, approximately 2,400 acres (10%) of the Small/Medium Tree stands has been either commercially thinned or had some sort of density management conducted in them—typically this means a loss of snags and downed wood, and a delay in the development of natural dead wood through competitive mortality.

Additional impacts to snags within the fire perimeter are ongoing. In the Matrix portion of the 2013 Rabbit Mountain, Dad's Creek, and Farmer Gulch fires with the analysis area, the Medford District is planning to salvage up to 1,669 acres of Matrix forest. Road safety concerns are ongoing; approximately 75 hazard trees have been requested to be felled on Roseburg District lands, under reciprocal rights-of-way agreements, some within the proposed project areas. The Medford District has currently identified 73 hazard trees on Matrix lands to remove.

Dead wood conditions on federal lands in the Roseburg District are lacking due to an intensive land management history. This fire begins a process of recovering the natural dead wood, but it currently does not meet landscape needs (Tables 3 and 5). The felling of snags not only removes the habitat component from the developing habitat now, and into the future, but it truncates the downed wood trajectory. Wood put on the ground now would create a deficit of snags in the future. The felling of hazard trees is unavoidable; the safety needs of land managers (private and federal) and the public are mandated by OSHA (USDA and USDI 2008) and permissible in the Roseburg RMP (BLM 1995) and Late-Successional Reserve Assessment (USDI and USDA 1998).

BLM is proposing to retain approximately 58 percent of the Open Canopy forest created through wildfire in LRS 259; a beginning to recreating the natural dead wood community and high quality Open Canopy forests on federal lands. Retaining all snags and downed wood in these untreated, Open Canopy forests should transition into natural dead wood communities in the resulting Small/Medium and Large Tree forests of the future.

Appendix H3. Fuels Management

As previously described, the Rabbit Mountain Fire burned with varying degrees of severity (Table 1; Figure 3), and therefore retains varying levels of surface fuels. The recovery activities proposed in the Rabbit Mountain Fire Recovery project area would potentially fell hundreds of hazard trees along roadways, railroad right-of-ways, and quarries for hazard tree abatement.

Background

Fires are influenced by three environmental factors; fuels, weather, and topography. Of those, fuels are the only factor that can be manipulated by land management and fire suppression activities. Firefighting is usually focused on breaking up the horizontal continuity of the fuels, creating a fire break that will stop fire spread. Hazardous fuels treatments focus on disrupting fuel continuity and increasing the ease of line building related to fuel loading and fuel size classes.

Fuel Conditions: The contribution of fuels to fire risk is determined by seven characteristics; vertical arrangement, horizontal continuity, size and shape, loading, compactness, moisture content, and chemical content. Of those seven, five can be reasonably influenced by management; vertical arrangement, horizontal continuity, size and shape, loading, and compactness.

Fine fuels, those less than three inches in diameter, are generally the primary carrier of a fire and the most easily ignited. Large fuels, those greater than three inches in diameter, generally do not contribute to fire ignition or spread, but can greatly influence potential fire severity. Continuous fuels, whether surface litter, shrubs, or tree crowns; means a fire can burn continuously, and is only influenced by weather and terrain.

Heavy fuel loading makes building of fire line during initial attack very difficult. Different size classes of downed wood have different influences on fire line construction. Fine fuels provide little difficulty to fire fighters building line as it is easily moved, disrupting the horizontal continuity to bare soil. Dense mid-sized fuels, between three to nine inches in diameter, can considerably slow fire line construction. A thick layer of these fuels are difficult to separate and can be impossible to clear with just hand tools. Larger fuels, greater than nine inches in diameter, which are dispersed (i.e. not continuous) throughout an area, can be avoided by firefighters building line. The denser and more continuous the larger fuels, the more difficult these ‘pockets’ can be to avoid during line construction. Sandberg and Ward (1981) quantified line building rates in different fuel types using a Resistance to Control (RC) rating (on a scale from 1 to 40). The RC rating can be translated to an estimate of the amount of line construction (chains/hour) one person can build. Therefore, the more fuels greater than nine inches in diameter present, the higher the RC rating, and the slower the line construction rate.

Fuel loading also influences predicted fire behavior. This influence is directly related to the proportions of each size class, as well as the total fuel load. Small fuels (less than three inches diameter) can increase the predicted rate of spread, mid-sized fuels (three to nine inches in diameter) can increase predicted flame lengths, while fuels larger than nine inches in diameter contribute to fire effects, but not fire behavior. It is generally accepted that initial attack firefighters with hand tools cannot direct attack fires with flame lengths greater than four feet (Andrews and Rothermel, 1982).

Table C- 8 demonstrates this dichotomy. Example 1 has a lower total fuel loading, but 90 percent of the material is less than nine inches in diameter, therefore the estimated fire behavior includes flame lengths beyond the capabilities of firefighters with hand tools. Example 2 has almost twice as much total fuel loading, but only 45 percent of the material is less than nine inches in diameter, resulting in a lower predicted flame length. Conversely, the line building rate in Example two is 61 percent slower than Example 1.

Table C- 8. Examples of fuel loading and resulting predicted fire behavior, Resistance to Control ratings, and fire line construction rates

Example number	Photo series number*	Total Fuel Loading (tons./ac)	Flame length (ft)†	Rate of spread (ch/hr)†	Resistance to Control Rating‡	Fire line construction (ch/hr/person)‡
1	4-DF-4-PC	27.9	6.4	6.4	9	1.3
		<3” material = 33%, 3”-9” material = 57%, >9” material = 10%				
2	7-DF-4-PC	61.8	3.4	5.4	15	0.8
		<3” material = 21%, 3”-9” material = 24%, >9” material = 55%				

*Photo series from Maxwell and Ward, 1976
†Estimates of fire behavior modeled using BehavePlus 5.0.5 under moderate conditions
‡Resistance to control rating and fire line construction rate estimates from Sandberg and Ward, 1981

The current LSRA (Appendix F.) cites not only the risk of wildfire in the LSR, but also the risk of wildfire causing damage to existing stands. “Controlling the fuel bed with proper fuel treatment of natural stands, and after forest management activities, is the key to managing the survivability of the LSRs from fire. Heavy ground fuels are also a threat to the survivability of a stand. Course Woody Debris (CWD) should be distributed throughout an area to avoid creating ‘jackpots’, which would produce areas of intense heat, thereby producing lethal temperatures to the stand” (Appendix F., pp. 3 & 4).

Ignition Risk – Natural: While lightning is impossible to predict with any accuracy, chances of lightning storms, like the one that started the Douglas Complex, can be inferred from historic data. In the South Douglas District, Douglas Forest Protective Association area, approximately 369 fires occurred from 2004 to 2013, which is an average of 41 fires per year. Of those, lightning caused 39% while the rest were human-caused (Oregon Department of Forestry, 2013). While the height of a tree (live or dead) does not guarantee it will attract lightning, tall objects such as trees, ridges, and skyscrapers are the most common targets (National Weather Service, 2011). However, lightning can strike anywhere, including open ground, if conditions align (National Weather Service, 2011). Compared to the rest of the lower 48 states, Oregon does not experience many thunderstorms per year. However, many of the thunderstorms created in Oregon produce positive lightning strikes, which have a higher probability of starting a wildfire (National Weather Service, 2011; National Interagency Fire Center, 2013).

If a lightning strike hits, the target will likely determine what type of fire, if any, will be started. Strikes that hit live trees will generally spiral down the tree to the base and could cause a fire start at the base of the tree. Strikes that hit snags, however, could start a fire in the top of the snag and not reach the ground. If the snag is burning in the top, the combustion could cause flaking of the cured wood, which in turn could cause burning embers to scatter with the wind in any direction. Embers produced from dead trees could start one or more fires if they land on a receptive fuel bed.

Excluding the areas designated for hazard tree treatment (roads, railroad right-of-way, and quarries), there are large blocks of fire-killed trees that do not pose a direct threat to human safety. However, when thunderstorms pass over areas where trees are contiguous, tall, and located at or near the top of ridgelines, they could become the most likely target of lightning.

Ignition Risk – Human: Of the 369 fires started in South Douglas District, DFPA from 2004 to 2013 (see *Ignition Risk – Natural* section), 61 percent were human-caused. Of the fires determined to be caused by human equipment (i.e. automobiles), approximately 48 percent were roadside ignitions (Oregon Department of Forestry, 2013).

Proposal

Roadside: Since fine fuels are concerning for ignition potential, treating these fuels along the roadways would be important in reducing the chances of human-caused fire. Any area where fine fuels were not well consumed in the fire, or are generated when hazard trees are felled, may be treated 50 feet from the edge of the road surface. This small fuel, realistically 2-6 inch diameter (to be capable of gathering by workers), would be hand piled and burned, removed offsite, or chipped. Riparian areas, where felled trees are retained, would be problematic to hand pile as there could be sizable concentrations of fuel. The result would be that the riparian areas would be at a higher risk for roadside ignition. If a fire were to start at the roadside in a riparian buffer, the fire would likely carry through the contiguous fuels to the top of the ridge. In many areas this would not be a considerable concern due to the infrequency of the riparian buffers. However, some areas exist where the riparian buffers do or almost do meet which could lead to several hundred feet of roadside left untreated. To address hazardous fuel build-up upslope from Cow Creek road, felled hazard trees within the perennial and intermittent stream no-removal buffers may be moved to the downhill side of Cow Creek road and left onsite. Preferably fine fuels would be treated in the riparian buffers even if felled hazard trees are left onsite.

Fuel amount/arrangement roadside: Felling hazard trees would create an accumulation of fuels in various size classes. If there were no other treatments, felled hazard trees that are stable on the slope could be retained while the remainder would likely be removed completely as there is no shoulder or other buffer between the slope and the road surface. Removed material may be piled, covered and burned or sold as biomass or saw-logs. If a downed hazard tree is stable on the slope, it could be considered for retention or removal. Once a tree is confirmed as stable, a decision would be made on overall CWD density. Since hazard trees would only be treated along the roadways and the railroad right-of-way, and around quarries (20 percent of the LSR area that burned under moderate and high severity), there is no minimum retention of CWD required as there will be ample amounts of CWD in the remainder of the fire area. Retained CWD does not have to be evenly spaced, but should be spread enough to avoid overlapping of stems. The planned retention of CWD, material greater than or equal to nine inches in diameter from the large end, in the area should be no more than 10 logs/acre, 16 feet in length (or 10 tons/acre). This number was derived by considering the average diameter of trees in a representative stand. The predominant large diameter in this stand was 26 inches. Ten of these logs at 16 feet in length would equate to approximately 10 tons/acre. Logs of smaller diameter would still be limited to 10 logs/acre, 16 feet in length.

Fuel amount/arrangement habitat: The fire produced large expanses of fire-killed trees. Private land owners have chosen to salvage most of these fire-killed trees and replant the area. On BLM-managed lands, approximately 414 acres of fire-killed trees are far enough away from low severity seed source areas (greater than 650 feet; 200 meters) to make natural regeneration unlikely. A variety of conifers would be hand planted in scattered areas. Hand planting would allow for more tailored site selection to increase the survivability of seedlings and ensure a safe working environment. The trees would also be planted at varying stocking rates. Not all areas would be planted due to risk from fire-killed trees and other practical issues.

Reduce risk of potential re-burn to remaining habitat: There are areas of older stands that burned under low severity, but are surrounded by areas of high severity. Specific stands could be operationally feasible to underburn. Underburning would reduce the risk of wildfire to intact older stands by creating fire-adapted ecosystems. Ideally, these stands would be underburned five to eight years after the Rabbit

Mountain Fire occurred, (years 2018 to 2021) after enough fine fuel has accumulated but before large concentrations are generated. Burn units would be based upon current condition, location of roads, proximity to other benefitting resources (including protection of private timberlands), topography, and accessibility. Efforts would be made to avoid building of fire line, where possible, but could require burning inclusion of some areas that burned with moderate or high severity.

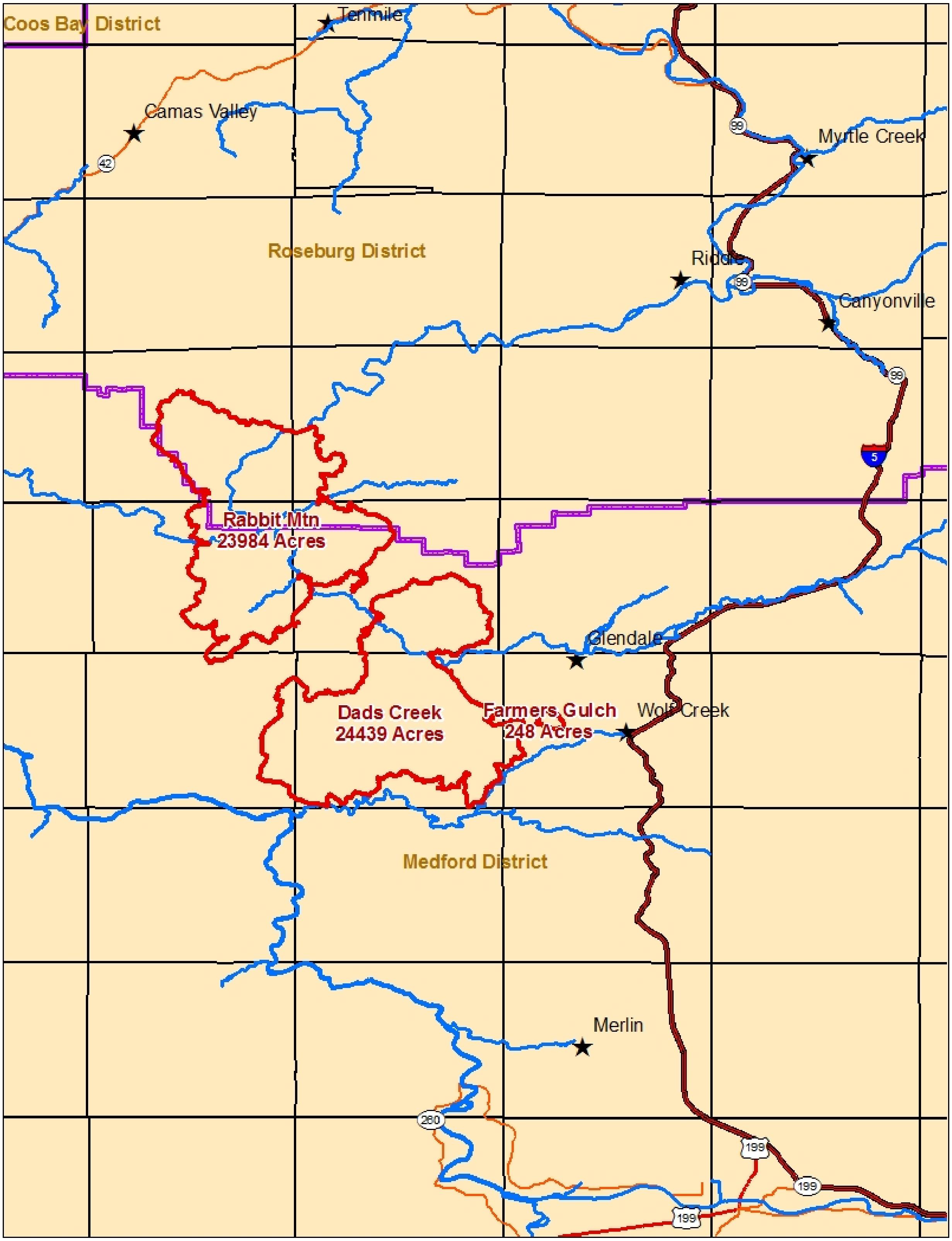

Figure C- 1. Location of the 2013 Douglas Complex fires

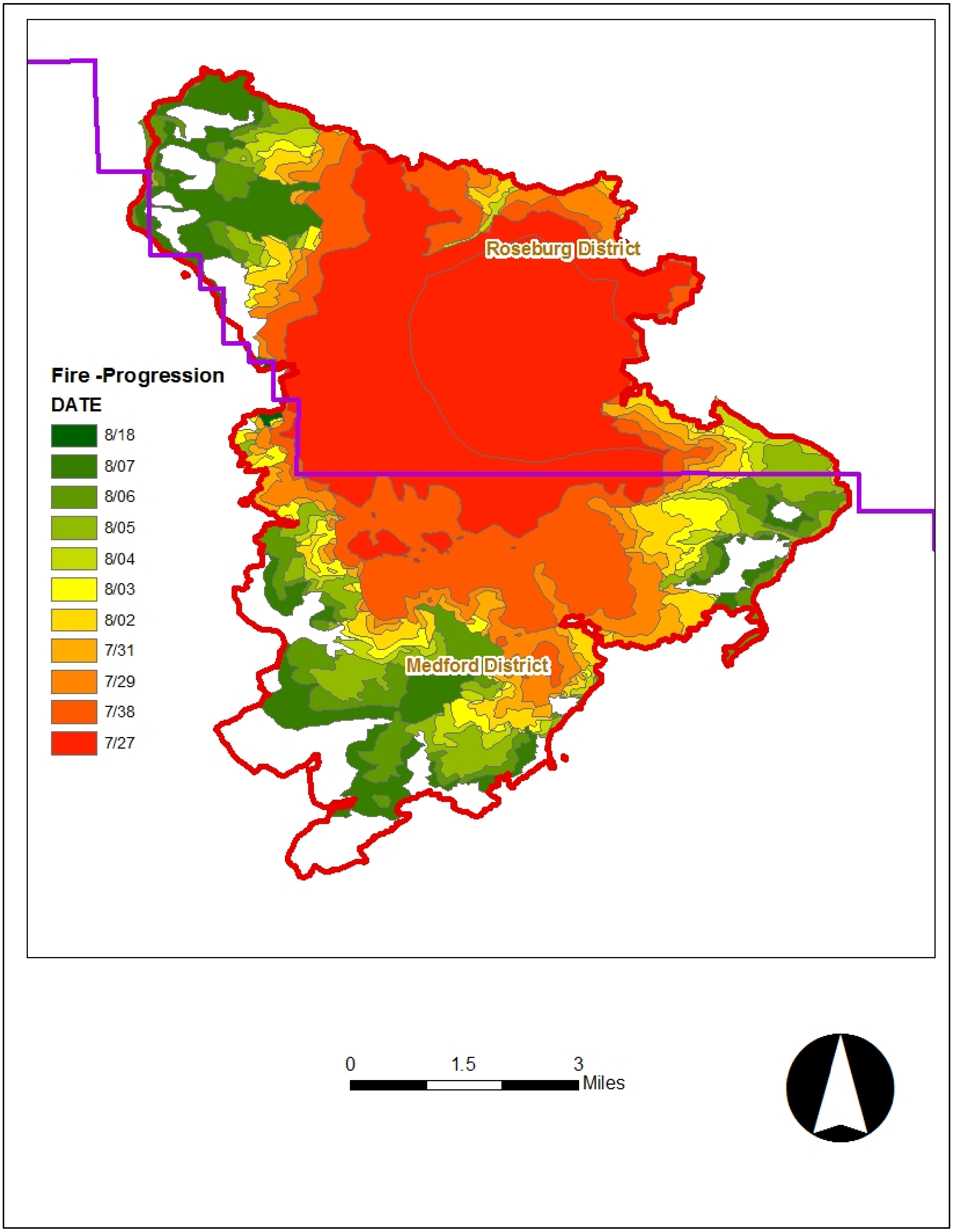

Figure C- 2. Fire progression of the 2013 Rabbit Mountain Fire

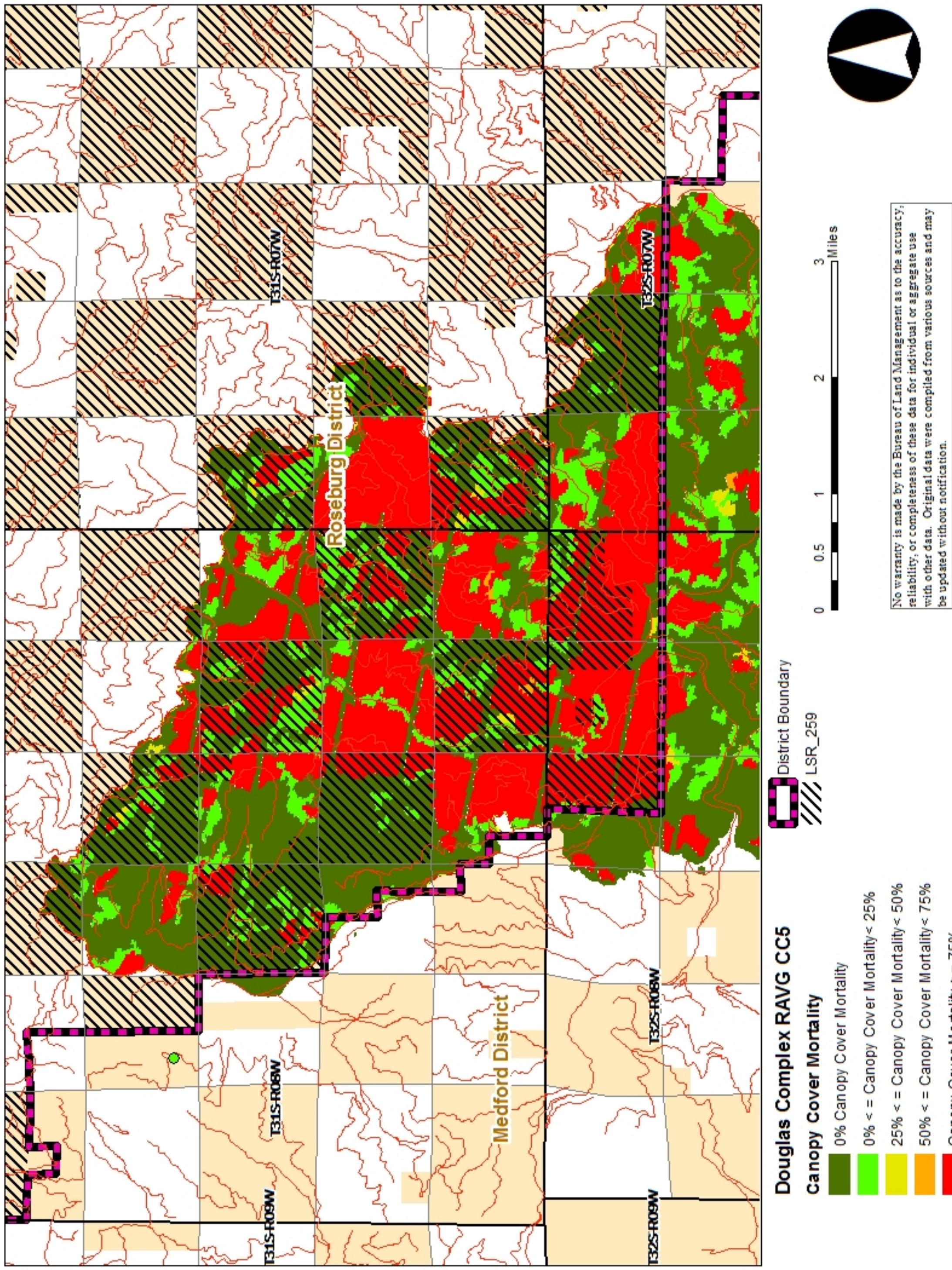

Figure C- 3. Fire severity of the 2013 Rabbit Mountain Fire in Late-Successional Reserve 259.

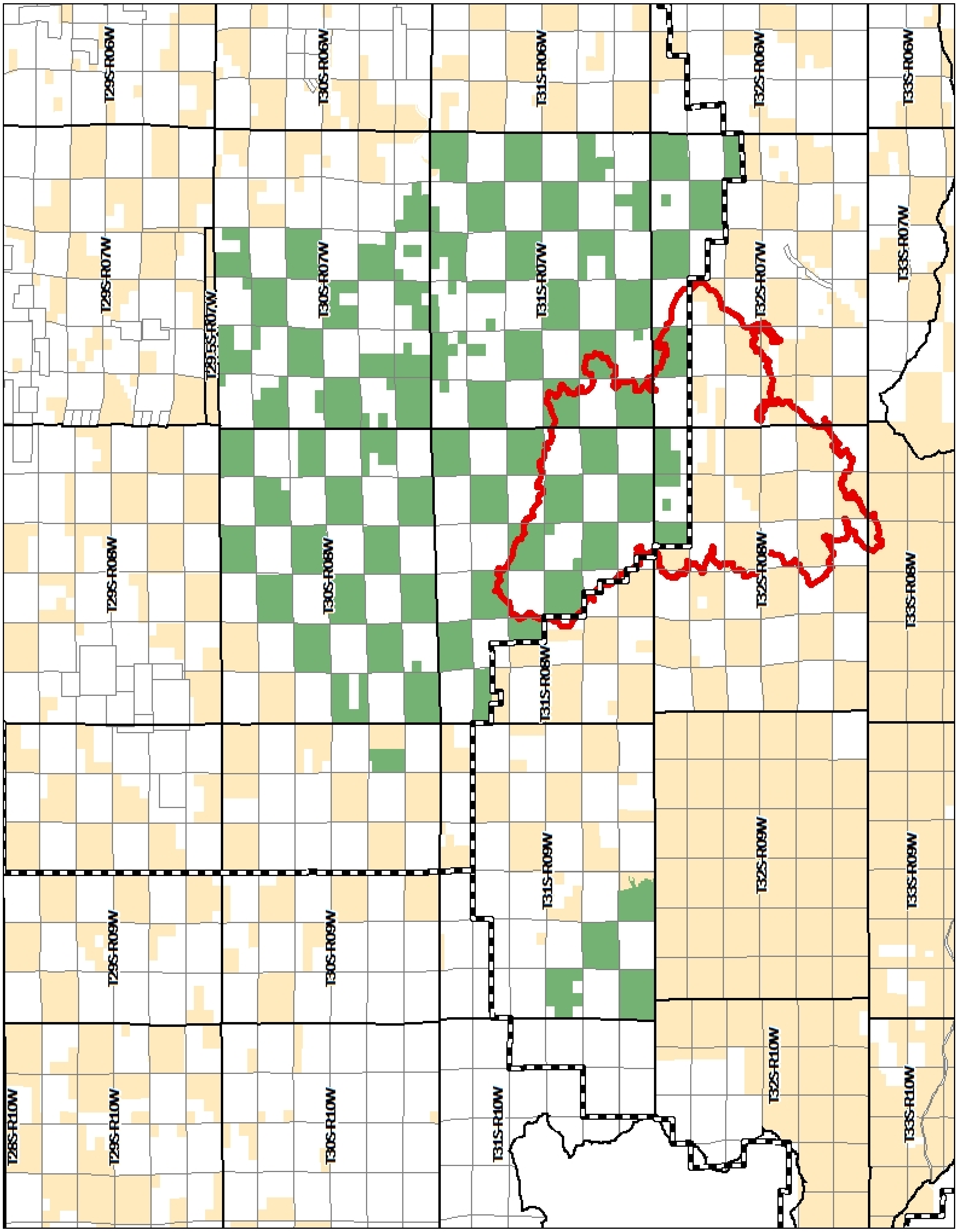

Figure C- 4. Late-Successional Reserve 259, in relation to the 2013 Rabbit Mountain Fire.

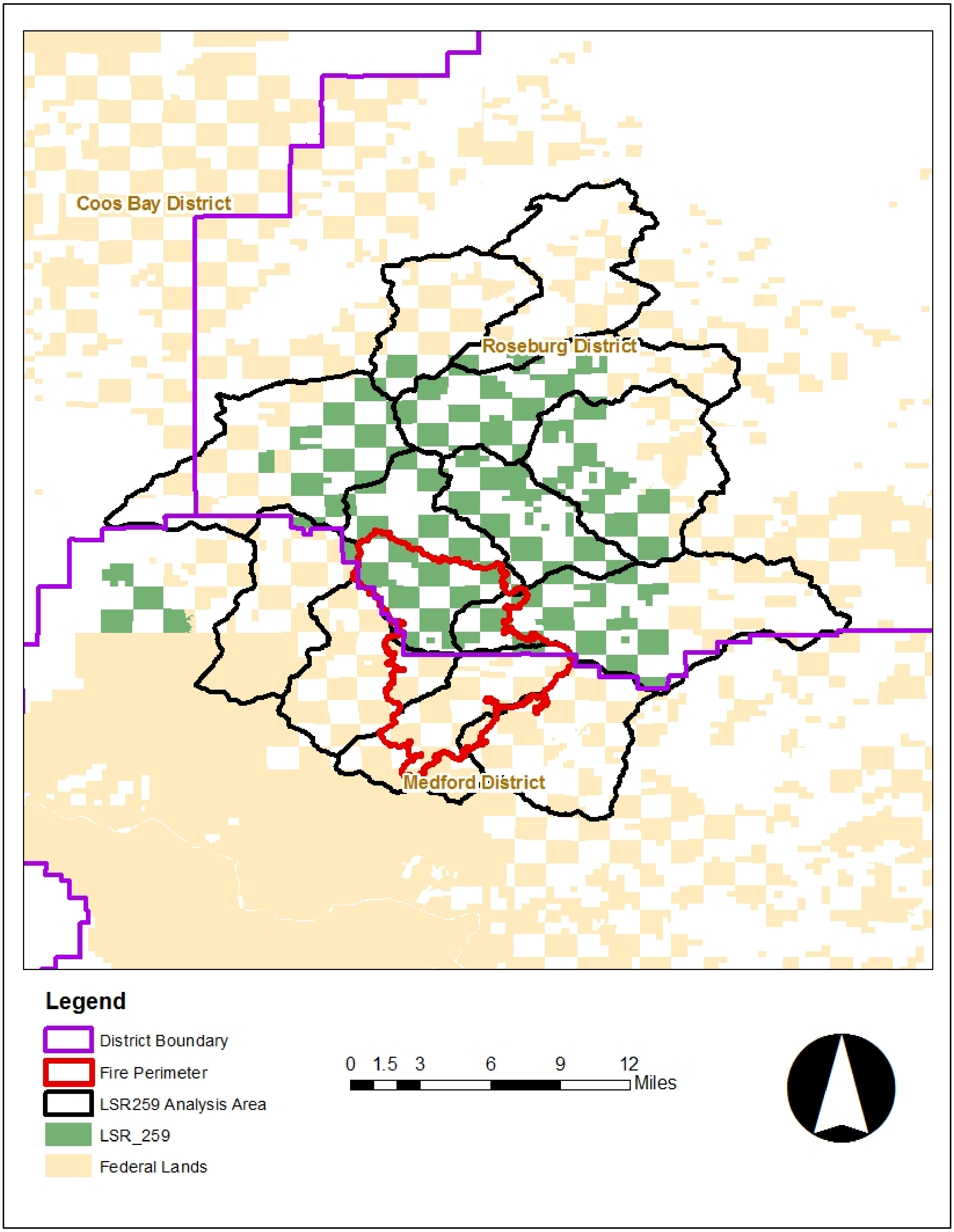

Figure C- 5. Analytical area for the coarse wood analysis associated with Late-Successional Reserve 259

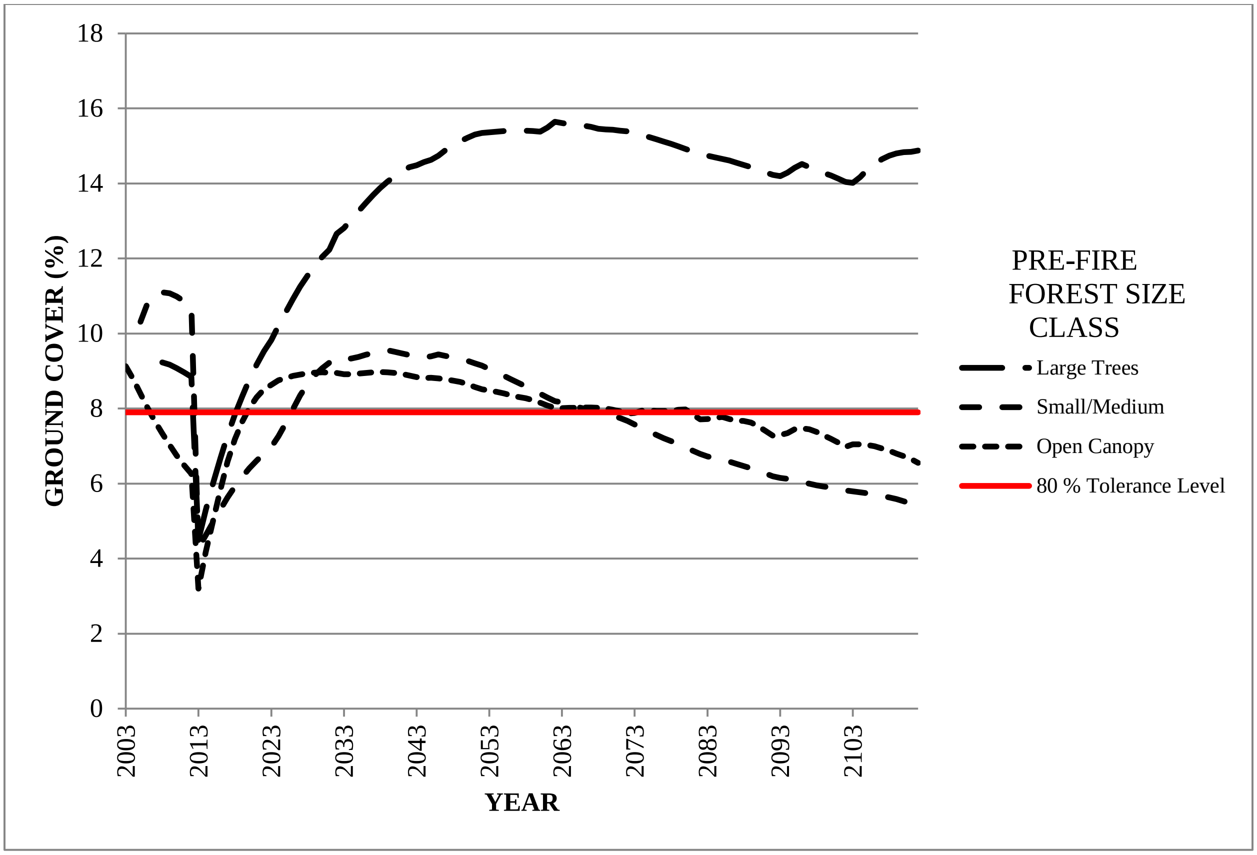

Figure C- 6. Downed wood trajectories (greater than 5 inches in diameter) for Open Canopy forest created as a result of the 2013 Rabbit Mountain Fire (80% tolerance line is for unharvested, open canopy forests).

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Appendix D – Wildlife Species Considered in the Rabbit Mountain Fire LSR Recovery Environmental Assessment

Table D- 1. Wildlife species dropped from detailed study for the Rabbit Mountain Fire LSR Recovery Project

Status[1]	Common Name	Scientific Name	Key Habitat Features	Rationale for Exclusion from Detailed Study
Bureau Sensitive	Foothill Yellow-legged Frog	*Rana boylii*	Low-gradient streams with bedrock or gravel substrate (Corkran and Thoms 1996)	Project would not modify stream systems, ponds, or wetlands
Bureau Sensitive	Harlequin Duck	*Histrionicus histrionicus*	Nesting has not been documented in the Umpqua River Basin (Dowlan 2003, p. 116). In the western Cascades, breeding pairs are observed on low to moderate gradient (1-7%) third to fifth-order streams in the western hemlock zone (Dowlan 2003, p. 116).	These analysis units is over 20 miles from the nearest document harlequin duck siting in the North Umpqua River, near Rock Creek (GeoBOB 2013). Nesting has not been documented on the District.
Bureau Sensitive	Lewis' Woodpecker	*Melanerpes lewis*	Open woodland with ground cover and snags (Tobalske 1997)	Not impacting suitable habitat
Bureau Sensitive	Oregon Vesper Sparrow	*Pooecetes gramineus affinis*	Grassland, farmland, sage. Dry, open habitat with moderate herb and shrub cover (Jones and Cornely 2002)	Grassland and open habitat not present in project area.
Bureau Sensitive	Peregrine Falcon	*Falco peregrinus*	Cliffs and rocky outcrops with shear vertical structure often near water (White et al. 2002).	One known site adjacent to analysis area; >2 miles away. Possible beneficial effects as a result of treatment
Bureau Sensitive	White-tailed Kite	*Elanus leucurus*	Low-elevation grassland, farmland or savannah and nearby riparian areas (Dunk 1995)	Lack suitable habitat.
Bureau Sensitive	California Shield-backed bug	*Venduzeeina borealis californica*	A tall grass prairie specialist, this subspecies inhabits high elevation (e.g. 900 m) natural balds and meadows (Applegarth 1995).	Natural balds meadows or grasslands not present in the project area.
Bureau Sensitive	Franklin's Bumble Bee	*Bombus franklini*	Requires habitat with a sufficient supply of floral resources to provide continuous blooming throughout the colony season (Foltz et al. 2009).	Project within the historical range of the species. Undocumented in the Roseburg District. Not reasonably expected to occur in the analysis area due to lack of suitable habitat.
Bureau Sensitive	Western Bumble Bee	*Bombus occidentalis*	Western bumble bees forage on flowering shrubs and forbs usually found in open spaces including lupines and California poppy (Xerces Society 2008).	Limited data but project within the historical range of the species. Undocumented in the Roseburg District. Not reasonably expected to occur in the analysis area due to lack of suitable habitat.
Bureau Sensitive	Columbian White-tailed Deer	*Odocoileus virginianus leucurus*	Oak woodland habitats near and north of Roseburg, OR (USDI USFWS 1983)	Project area outside the currently accepted distribution range of the species.

Status[1]	Common Name	Scientific Name	Key Habitat Features	Rationale for Exclusion from Detailed Study
Bureau Sensitive	Fisher	*Martes pennanti*	Large contiguous blocks of mature forest with structural complexity (Verts and Carraway 1998)	Species range is outside the project area
Bureau Sensitive; S&M Cat: A	Crater Lake Tightcoil Snail	*Pristiloma articum crateris*	Above 2000 feet in elevation throughout the Oregon Cascades and associated with perennially wet situations in mature conifer forests, among rushes, mosses within 10 meters of open water in wetlands, springs, and riparian areas (Duncan et al. 2003, Duncan 2004).	Project area outside of species range
Bureau Sensitive	Green Sideband Snail	*Monadenia fidelis beryllica*	Deciduous trees and brush in wet forest, low elevation; strong riparian associate (USDA USDI 1994, Frest and Johannes 2000)	Species has not been documented in the Roseburg District.
Bureau Sensitive	Round Lanx Snail	*Lanx subrotunda*	Umpqua River and major tributaries (USDA/USDI 1994)	Analysis area includes major tributaries to the Umpqua River; no anticipated impacts to Cow Creek
Bureau Sensitive	Western Ridged Mussel	*Gonidea angulata*	Low to mid-elevation streams with cobble, gravel, or mud substrates (Nedeau et al. 2009)	Project would not modify stream habitat
Bureau Sensitive	Pacific Pond Turtle	*Actinemys marmorata*	Marshes, ponds, lakes, streams, and rivers with emergent structure (Csuti et al. 1997). Nesting habitat is in areas of high solar exposure and sparse vegetation consisting of grass, forbs, compact soil composed of clay, silt or sandy loam and sometimes a mix of soil and gravel/cobble (Rosenberg et al. 2009). There is one documented occurrence in the analysis area outside of proposed units.	Habitat components are present within analysis area, Habitat improvement when snags are felled into Cow Creek.
S&M Cat: C	Great Gray Owl	*Strix nebulosa*	Conifer forest in vicinity of natural meadows (USDA & USDI. 2004 Survey protocol for the great gray owl within the range of the Northwest Forest Plan, V3)	No large (>10 ac) grasslands/balds within action area
S&M Cat: C	Red Tree Vole	*Arborimus longicaudus*	Conifer stands in the Mesic Zone (Huff et al. 2012)	Snags felled for safety reason, exempt from surveys, Minor impact to "green" forests.
Bird of Conservation Concern	Purple Finch	*Haemorhous purpureus*	Open areas or edges of low to mid-elevation mixed coniferous/hardwood forests (Csuti et al. 1997). Primarily nest in Douglas-fir, pine or spruce but may use oak, maple, and fruit trees.	Known to occur in the analysis area. Nesting habitat will not be modified
Bird of Conservation Concern	Rufus Hummingbird	*Selasphorus rufus*	Nests in shrubs and small trees, and is highly dependent on nectar producing flowering plants (Patterson 2003).	Suitable habitat is found in project areas; but will not be affected

Status[1]	Common Name	Scientific Name	Key Habitat Features	Rationale for Exclusion from Detailed Study
Game Bird Below Desired Condition	Band-tailed Pigeon	*Patagioenas fasciata*	Conifer forest with high canopy cover and hardwood stands (Bottorff 2007). In Oregon, nest primarily in closed Douglas-fir stands with canopy cover above 70 percent (Leonard 1998). Presence is linked to mineral springs (Altman 1999, Sanders and Jarvis 2000). Used mineral sites appear to be scared in western Oregon, and are seemingly essential resources for this species (Sanders and Jarvis 2000). Sanders and Jarvis (2003) indicate availability of food sources may be directly related to the declining band-tailed pigeon population in Oregon.	There are no mineral springs associated with proposed actions and the stands offer little or no foraging opportunities due to high canopy closure. Action would create potential foraging habitat for the band-tailed pigeon.
Game Bird Below Desired Condition	Mourning Dove	*Zenaida macroura*	Forests, woodland edges, savannas, grasslands, deserts, suburban and urban areas, and agricultural lands. Frequently seen on the Roseburg District along roadsides and forest openings. Nesting may occur on the ground, on ledges, in bushes and in trees (Otis et al. 2008), in edge-habitats between woodlands/shrubs and open areas (Csuti et al. 1997). Generally avoid extensive forests and wetlands.	Habitat will not be modified by the proposed action
Landbird Strategy	Orange-crowned Warbler	*Vermivora celata*	Associated with brushy areas, particularly deciduous species; riparian thickets (Dillingham 2003)	Habitat will not be modified by the proposed action
Landbird Strategy	Rufus Hummingbird	*Selasphorus rufus*	Highly associated with nectar producing flowering plants in both open and forested habitats (Patterson 2003, Altman and Alexander 2012)	Habitat will not be modified by the proposed action
Landbird Strategy	Winter Wren	*Troglodytes troglodytes*	Associated with larger patches of older forests; utilizes dense ground vegetation/shrubs/down wood; forage on the forest floor and logs (Weikel 2003)	Habitat will not be modified by the proposed action
Bald Eagle Act	Golden Eagle	*Aquila chrysaetos*	Usually associated with open grassland, pasture, and shrub land conditions. In southwestern Oregon, golden eagles nest in a variety of trees including ponderosa pine, Douglas-fir, oak species, and madrone (Csuti et al. 1997; Kochert et al. 2002).	No known sites/wintering area in analysis area.

1-Cat - Category A, B, C, D and F are levels of pre-disturbance clearance or protection needs for these species during review of BLM projects (under BLM-IM-OR-2011-063 and associated 2001 ROD (USDA and USDI 2001).

Table D- 2. Wildlife species studied in detail for the Rabbit Mountain Fire LSR Recovery Project

Status[1]	Common Name	Scientific Name	Key Habitat Features	Rationale for Inclusion for Detailed Study
Federally Threatened	Marbled Murrelet	*Brachyramphus marmoratus*	Forests where trees have large diameter branches, mistletoe brooms or other nesting platforms within 50 miles of the Oregon Coast (Hamer and Nelson 1995, McShane et al. 2004).	Project area in MAMU zone 2; projects may occur in/adjacent to suitable nesting habitat
Federally Threatened	Northern Spotted Owl	*Strix occidentalis caurina*	Forests older than 80 years with habitat for nesting, roosting and foraging, and dispersal. Suitable habitat typically has multi-layered, multi-species canopy dominated by large overstory trees > 20" DBH. Canopy cover is typically 60-80 percent, with open spaces in and below the overstory canopy. Trees with large cavities and other deformities, large snags, and large down wood are typically abundant (Thomas et al. 1990; Forsman et al. 1984; Hershey 1997)	Analysis area is within multiple historical territories of this species. Proposed activities would modify or remove dispersal habitat or suitable habitat.
Bureau Sensitive	Bald Eagle	*Haliaeetus leucocephalus*	Large trees near large bodies of water (Buehler 2000, Anthony and Isaacs 1989)	Known to winter in analysis area; no known nest site
Bureau Sensitive	Purple Martin	*Progne subis*	Snags, woodpecker cavities; typically found in open areas near water (Brown 1997, Horvath 2003).	Within range of the species. Nesting and foraging habitat impacted by action alternative.
Bureau Sensitive	Fringed Myotis	*Myotis thysanodes*	Hibernacula and roost sites includes caves, mines, buildings and large snags (Weller and Zabel 2001)	Snags present in the analysis area. All units considered foraging habitat
Bureau Sensitive	Pacific Pallid Bat	*Anthrozous pallidus pacificus*	Hibernacula and roost sites in caves, mines, rock crevices, bridges, hollow trees and snags (Lewis 1994)	All units are considered foraging habitat. Snags present.
Bureau Sensitive	Townsend's Big-Earred Bat	*Corynorhinus townsendii*	Roost and hibernate in mines and caves and hollow trees (Fellers and Pierson 2002)	Snags present in project. All units considered foraging habitat
Bureau Sensitive; S&M Cat: B	Chace Sideband Snail	*Monadenia chaceana*	This snail requires refugia from desiccation during dry periods, which may include interstices in rock-on-rock habitat (talus), soil fissures or interior of large woody debris (Weasma 1998a, Weasma 1998b; Duncan et al. 2003, Frest and Johannes 2000).	Project area within range of species and habitat present. Proposed activities would impact species' habitat.
Bureau Sensitive	Oregon Shoulderband Snail	*Helminthoglypta hertleini*	These snails require refugia from desiccation, during dry periods, which may include interstices in rock-on-rock habitat, soil fissures, or the interior of large woody debris (Duncan et al. 2003)	Analysis area is within the range of the species. Proposed activities would impact species' habitat.

Status[1]	Common Name	Scientific Name	Key Habitat Features	Rationale for Inclusion for Detailed Study
Bird of Conservation Concern	Olive-sided Flycatcher	*Contopus borealis*	Forages in early-seral areas associated with natural or man-made openings with tall trees or snags available for perching and singing (Altman 1999). In the Oregon Coast Range, it is closely associated with edges of older stands with tall trees and snags greater than 21 inches diameter breast height and broken canopy (Carey et al. 1991).	Suitable habitat is present within the project units. Actions will impact snag/tall tree component.
Landbird Strategy	Lazuli Bunting	*Passerina amoena*	Associated with brushy fields, grassy savannahs, post-fire; key habitat features "reasonably" tall trees/snags (Dowlan 2003, Altman and Alexander 2012).	Loss of snags in treatment areas will have adverse effects to this species
Landbird Strategy	Northern Flicker	*Calaptes auratus*	Associated with open canopy forests/savannahs, forest edges associated with open habitat; key habitat features are large diameter snags and live trees exhibiting high levels of decay/broken tops (Simmons 2003)	Loss of snags in treatment areas will have adverse effects to this species
Landbird Strategy	Olive-sided Flycatcher	*Contopus borealis*	Breeds in conifer forests, particularly those associated with past burns, containing tall isolated green trees and snags; high contract forest edges; openings and harvest units with scattered tall, live and dead trees (Altman 2003)	Loss of snags in treatment areas will have adverse effects to this species
Landbird Strategy	Pileated Woodpecker	*Dryocops pileatus*	Associated with late-seral conifer forest; key habitat feature large diameter snags or trees exhibiting decay and large diameter down wood (Bull 2003b)	Loss of snags in treatment areas will have adverse effects to this species
Landbird Strategy	Vaux's Swift	*Chaetura vauxi*	Associated with late seral conifer forests; key habitat component is large diameter hollow trees/snags (Bull 2003a)	Loss of snags in treatment areas will have adverse effects to this species
Game Bird Below Desired Condition	Wood Duck	*Aix sponsa*	Nest in tree cavities (Lewis and Kraege 1999) in the vicinity of wooded swamps, flooded forest, marsh, or ponds (Ehrlich et al.1988), riparian areas of rivers and large streams. At least 10 acres of wetland or other aquatic habitat in a contiguous unit or in isolated parcels separated by no more than 100 feet of upland is needed in close proximity to nesting habitat is needed (http://www.abirdshome.com/wdwater.htm). Open water makes up 25% of brood-rearing area with the remainder a mixture of shrubs and herbaceous emergent plants and trees (Hepp and Bellrose 2013).	Suitable habitat is present in the harvest units. Management activities may remove snags and other potential nest trees.

[1] Category A, B, C, and F indicate levels of pre-disturbance clearance or protection requirements for Survey and Manage Species under BLM-IM-OR-2011-063 and associated 2001 ROD (USDA and USDI 2001).

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Appendix E - Aquatic Conservation Strategy Assessment

The Aquatic Conservation Strategy (ACS) was developed to restore and maintain the ecological health of watersheds and aquatic ecosystems on public lands. The ACS must strive to maintain and restore ecosystem health at watershed and landscape scales to protect habitat for fish and other riparian-dependent species and resources and restore currently degraded habitats. This approach seeks to prevent further degradation and restore habitat over broad landscapes as opposed to individual projects or small watersheds. (Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl, page B-9).

ACS Components

Key Watersheds: Middle Creek and West Fork Cow Creek are designated as Tier 1 Key watersheds (Roseburg District ROD/RMP, USDI 1995a). Occurring almost entirely within the Lower Cow Creek 5th field watershed (up to 500 acres of roadside safety treatments) and to a much lesser degree in the West Fork Cow Creek (up to 23 acres of roadside safety treatments) and Middle Cow Creek (up to 1 acre of roadside safety treatment) 5th field watersheds, this project consists of roadside, railroad right-of-way, and quarry safety treatments, roadside fuels treatments, habitat restoration (tree planting), and road decommissioning. Of these treatments, there is an analytical emphasis directed toward roadside safety treatments because these treatments have the highest likelihood to influence aquatic resources due to the nature and proximity of these treatments to streams.

Watershed Restoration: One of the primary purposes of this project is to allow for safe travel along roadways in the project area (through felling of hazard trees). Because this EA proposes to directionally fell hazard trees into stream channels, where possible, this action would significantly increase aquatic habitat quality (Chapter 3.7.3.3). Therefore, portions of the proposed actions (in particular roadside safety treatments) could also be considered as watershed restoration projects. *Watershed Restoration* is the only ACS component that is an action (the others are location-based or process-based).

Watershed Analysis: In developing the project, the Lower Cow Creek Watershed Analysis (USDI 2002) was used to evaluate existing conditions, establish desired future conditions, and assist in the formulation of appropriate alternatives. Existing watershed conditions and the short- and long-term effects to aquatic resources are described in the EA, Chapter 3.7.

Sources of Environmental Variability

As previously noted, aquatic habitat in the watershed is variable over time and sensitive to a range of disturbance events. Large scale disturbance events (e.g. fire, debris torrents, wind throw), can reduce the quality of aquatic habitat in the short-term (less than five years); however, disturbances are important to the long-term diversity of habitat components such as substrate, large woody debris, and pool complexity (Reeves *et al*. 1995).

Tributaries of Lower Cow Creek are located in often steep and confined valleys where large woody components would be recruited to the stream from adjacent hillslopes and upland stands (Reeves *et al*. 2003). Harvest of riparian and upland stands where debris flows would have occurred has reduced over time the amount of large wood entering the stream. Agricultural development of low lying floodplain areas has impacted stream channels by eliminating sources of large wood, reducing riparian vegetation and stream shade, and limiting access to tributaries through the installation of road crossings.

Summary

The ACS objectives were considered in detail throughout the analytical process for fish species, aquatic habitat, and water resources within the project area. As a result, the Environmental Consequences section for fish species, aquatic habitat, and water resources (Chapter 3.7.3) can be used to determine the level of consistency with the ACS objectives. The resulting summary from the effects discussion is that Alternative Two would meet the ACS objectives in all instances at the site and watershed scales. In the short-term, felling of hazard trees could reduce streamside shade (ACS objective # 4-water quality), however, the number of hazard trees still providing shade is low, and would not be expected to result in measureable changes to water quality or stream temperature. Due to rocky soils in the project area and PDFs (Chapter 2.3.5), an innumerable volume of sediment derived from Alternative Two would enter the stream network, and thus, ACS objective #5 (sediment regime) would be fully met.

Based on the restorative nature of many actions taken by the BLM, such as directionally felling hazard trees into stream channels, "no removal" riparian areas, and upslope habitat restoration in the form of tree planting, this project would support the attainment of the ACS objectives. Therefore, this action is consistent with the ACS, and its objectives at the site and watershed scales.

Table E-1. ACS objectives assessment

ACS Objective	5th Field Watershed Scale Assessment
	Scale Description: Treatments proposed in this EA are located in three separate 5th field catchments totaling roughly 271,699 acres in size. The BLM manages approximately 113,417 acres in these catchments (41.7 percent). Roadside safety treatments represent 0.19 percent of the total catchment area, and 0.46 percent of the BLM managed lands in the catchment.
1. Maintain and restore the distribution, diversity, and complexity of watershed and landscape-scale features to ensure protection of the aquatic systems to which species, populations, and communities are uniquely adapted.	Up to 500 acres of roadside safety treatments in the Lower Cow Creek 5th field watershed and up to 24 acres of roadside safety treatments in the West Fork Cow Creek and Middle Cow Creek 5th field watersheds (combined acreage) are proposed. Directionally felling hazard trees into stream channels, "no removal" riparian areas, and upslope habitat restoration, fit within the range of natural variability of riparian area wood recruitment following wildfire, and thus the ACS.
2. Maintain and restore spatial and temporal connectivity within and between watersheds	Within the catchments, the proposed actions would have no influence on aquatic connectivity because no reduction in stream flows would be expected. Therefore, the proposed actions would maintain the existing spatial connectivity of streams within the catchments.
3. Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations	The proposed treatments (particularly directionally felling hazard trees into stream channels and "no removal" riparian areas) would likely improve the integrity of the aquatic system due to the increased recruitment of large wood to streams and adjacent riparian areas.
4. Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that maintains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.	Water quality would not be at risk of impairment due to post-fire natural regeneration of native understory vegetation, as well as upslope habitat restoration. The vegetation would maintain its natural filtering function, maintaining the biological, physical, and chemical integrity within the riparian community.

5. Maintain and restore the sediment regime under which aquatic ecosystems evolved.	As previously stated, site specific characteristics (rocky soils) in addition to PDFs and BMPs would keep the effects of this project, if any, well within the sideboards to which the aquatic system evolved.
6. Maintain and restore in-stream flows sufficient to create and sustain riparian, aquatic, and wetland habitats and to retain patterns of sediment, nutrient, and wood routing.	The proposed treatments would maintain stream flows within the range of natural variability. The treatments would not reduce canopy closure to an extent that could potentially influence instream flows, because efforts would be made to directionally fell hazard trees into stream channels and no new roads would be constructed.
7. Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows and woodlands.	As discussed in #6 above, this project would maintain stream flows within the range of natural variability. Therefore, it would also maintain stream interactions with the floodplain and respective water tables.
8. Maintain and restore the species composition and structural diversity of plant communities in riparian areas and wetlands to provide adequate summer and winter thermal regulation, nutrient filtering, appropriate rates of surface erosion, bank erosion, and channel migration and to supply amounts and distributions of coarse woody debris sufficient to sustain physical complexity and stability.	Tree planting proposed in roadside safety treatment areas would restore and enhance species composition and structural diversity of plant communities in riparian areas.
9. Maintain and restore habitat to support well-distributed populations of native plant, invertebrate and vertebrate riparian-dependent species.	In order to restore populations of native plant, species, habitat restoration would occur in areas burned under moderate to high severity. Habitat burned under low severity would be left unaffected so that populations of native plant, invertebrate, and vertebrate species would remain well distributed.

Appendix E. Literature Cited

Reeves, G.H., K.M Burnett, and E.V. McGarry. 2003. Sources of large wood in the main stem of a fourth-order watershed in coastal Oregon. *Canadian Journal of Forest Research*, 33:1363-1370.

USDI Bureau of Land Management. 1995a. Roseburg District. Record of Decision and Resource Management Plan.

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