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Westside Fire Recovery Project
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Happy Camp Oak Knoll and Salmon/Scott River Ranger Districts,
Klamath National Forest
Siskiyou County, California

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Westside Fire Recovery Project

Final Environmental Impact Statement

Siskiyou County, California

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Abstract:

The Westside Fire Recovery Project was developed in response to the 2014 wildfires on the Happy Camp/Oak Knoll and Salmon/Scott River Ranger Districts of the Klamath National Forest (Forest). The project will address the needs for 1) worker and public safety and access; 2) safe conditions for firefighters performing fire suppression for community protection; 3) an economically viable project, meeting project objectives and benefiting our local communities; and 4) restored and fire-resilient forested ecosystems.

Alternatives considered in detail are: 1) Alternative 1, no action; 2) Alternative 2, the refined proposed action; 3) Alternative 3, an alternative that emphasizes the development of future late successional forest habitat, habitat connectivity, northern spotted owl habitat and legacy components within the post fire landscape; 4) Alternative 4, an alternative that is designed to reduce watershed disturbance and impacts to water quality and fisheries, relative to the proposed action; 5) Alternative 5, that adds fuels treatments adjacent to private timber lands and removes treatment of salvage logging and site preparation from late successional reserves, riparian reserves, and inventoried roadless areas; 6) Alternative 2 Modified, developed during consultation with the U.S. Fish and Wildlife Service to further minimize impacts on northern spotted owl habitat; and 7) Alternative 3 Modified (the preferred alternative)which combined elements from all alternatives considered in detail (Alternatives 2, 3, 4, 5 and Alternative 2 modified) in addition to the alternative developed by the Karuk Tribe. Alternative 3 Modified is the preferred alternative. Eleven other alternatives were considered but eliminated from detailed study.

Comments received on the draft EIS were considered in developing this final EIS, which is available at: http://www.fs.fed.us/nepa/nepa_project_exp.php?project=45579. The final EIS is available for a 30-day review period in accordance with 1506.10(2). There is no formal comment period on this final EIS prior to decision. An Emergency Situation Determination pursuant to 36 CFR 218.21 was granted for this project on May 13, 2015; therefore, under 36 CFR 218.21(d), a proposed action is not subject to the pre-decisional objection process as the Chief of the Forest Service determined that an emergency situation exists with respect to all or part of the proposed action or activity.

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Summary

The Forest Service prepared this final environmental impact statement (EIS) in compliance with the National Environmental Policy Act (NEPA) and other relevant federal and state laws and regulations. In response to issues raised by the public during scoping and consultation efforts with tribes and regulatory agencies, the Forest Service refined the proposed action and developed three additional action alternatives analyzed in detail. Comments received on the draft EIS were considered in developing this final EIS. After the draft EIS comment period the Forest Service developed two additional alternatives analyzed in detail by combining elements from all alternatives analyzed in detail in the draft EIS, including the Karuk Alternative. Consultation efforts with the Karuk Tribe, U.S. Fish and Wildlife Service, National Oceanic and Atmospheric Administration Fisheries, and public comments drove the development of these modified alternatives. This final EIS discloses the environmental impacts that would result from the Westside Fire Recovery project proposed action or its alternatives.

The final EIS is available for a 30-day review period in accordance with 1506.10(2). There is no formal comment period on this final EIS prior to decision. An Emergency Situation Determination pursuant to 36 CFR 218.21 was granted for this project on May 13, 2015; therefore, under 36 CFR 218.21(d), a proposed action is not subject to the pre-decisional objection process as the Chief of the Forest Service determined that an emergency situation exists with respect to all or part of the proposed action or activity.

Background

Severe drought and exceptionally dry fuel conditions made the 2014 fire season one of the most impacting in the history of the Klamath National Forest. Fires within the Happy Camp Complex were ignited by lightning near the town of Happy Camp, located on the middle portion of the Klamath River. Hot, dry and windy conditions caused three of the original 19 fires to escape containment, burn actively for several weeks, and eventually grow together spreading south along the Scott River and into the Marble Mountain Wilderness. The Beaver Fire located about 30 miles east of Happy Camp on the north side of the Klamath River, consumed approximately 32,400 acres. The July Complex was comprised of the Log and Whites Fires, which burned approximately 37,000 acres southeast of Fort Jones. The July Complex burned both private and National Forest land, ultimately spreading into the Marble Mountain Wilderness and into the drainage of the North Fork of the Salmon River. The 2014 fire season ultimately burned about 215,000 acres on the Forest, of which the Beaver Fire, the Happy Camp Complex, and the Whites Fire of the July Complex are a subset[1]. The Beaver Fire, Happy Camp Complex, and Whites Fire burned a total of about 183,500 acres, including 162,580 acres of National Forest System lands and 20,910 acres of private land (Table S- 1 below).

[1] The Beaver Fire, Happy Camp Complex, and Whites Fire were identified as requiring critical treatments due to post-fire conditions. Some other fires were also entirely within wilderness, preventing treatment. On the Goosenest Ranger District on the east side of the Klamath National Forest, the Forest is currently implementing the Little Deer project, which has much different conditions and no significant effects; the Environmental Assessment was finalized on February23, 2015 without an Emergency Situation Determination request and a decision notice/finding of no significance was signed on April 17, 2015. See project website for more information or documents about the Little Deer project: http://www.fs.usda.gov/project/?project=45313

Table S- 1: General Fire Information

Fire	Fire Start Date	Containment Date	Acres Burned: Forest Service	Acres Burned: Private	Total Acres Burned
Beaver Fire	July 30, 2014	August 30, 2014	14,630	17,870	32,500
Happy Camp Complex	August 12, 2014	October 29, 2014	115,050	2,150	117,200
Whites Fire	July 31, 2014	September 25, 2014	32,900	890	33,790
	Total of All Fires (acres)		162,580	20,910	183,500

Burned Area Emergency Response

Burned Area Emergency Response (BAER) actions, currently underway, aim to identify and manage imminent and unacceptable threats to human life, safety, property, and critical natural and cultural resources on National Forest System lands. BAER actions include repairing road drainages (grading, culvert cleaning, installation of rolling drainage dips, etc.), felling only imminent hazard trees along 650 miles of roads, and posting closure signs along roads and trails. Hazard trees felled during fire suppression and BAER activities were very limited in scope compared to the fire event and consisted of the most high-priority danger tree hazards[2] along only the most frequented of roadways. Due to the objectives of BAER activities and the scale of the event, the many recently fire-killed trees were considered to be structurally sound at the time and were left standing. As snags along the roadways in burned areas are exposed to winter rains, snow, and winds and subsequently deteriorate and decay, threats to human health and safety substantially increase. While BAER activities mitigate many of the immediate hazards, additional emergency actions are needed to address the remaining safety concerns and to move the affected areas towards recovery.

Purpose and Need

This project was developed in response to landscape-level changes to forested habitat resulting from the 2014 wildfires on the Klamath National Forest. Forest Service resource specialists began evaluating conditions in the project area immediately following the fires. The BAER analyses provided resource assessments on the fires' effects on soils, watersheds, vegetation, and wildlife. Post-fire inventories of the transportation system were conducted to obtain condition status. Field crews conducted surveys on forested stands to collect data on stand mortality and salvage viability. Soil burn severities and vegetation burn severities were mapped to determine the changed post-fire conditions. The initial post-fire assessments were completed by the fall of 2014. Resource specialists used this information to make recommendations to the Forest Supervisor, to develop the purpose and need. The purpose and need is described in detail in Chapter 1. Overall, the purpose and need of the project includes the following needs:

- A need for worker and public safety and access.
- A need for safe conditions for firefighters performing fire suppression for community protection.

[2] A high-priority danger tree hazard is defined as "a road or road segments where danger trees are determined to be highly likely to fail and where those failures would be highly likely to cause injuries" (FSH 7709.59 Section 40.5).

- A need for a project that is economically viable, meeting project objectives and benefiting our local communities.
- A need for restored and fire-resilient forested ecosystems.

Proposed Action

The project area comprises 218,600 total acres, including 187,100 acres of National Forest System land and 31,500 acres of private land. It is divided into three subparts: project area A (Beaver Fire), project area B (Happy Camp Complex), and project area C (Whites Fire of the July Complex). This project areas is larger than the fire foot print because the boundary was expanded beyond the fire perimeters. The project area was expanded near private property structures in order to incorporate hazardous fuel reduction treatments and fire breaks for community protection. See the vicinity map in Appendix A.

In order to accomplish these objectives, the Forest Service initially proposed:

- 11,700 acres of salvage harvest units[3] where fire-killed trees (snags) would be removed to reduce future fire risk and severity and to provide for public and forest worker safety;
- 650 miles of roadside hazard treatments (i.e., snag removal) along Forest system roads, state highways, and county roadways;
- 22,900 acres of hazardous fuels treatments (including strategic fuel breaks and treatments within ¼ mile of private property structures and other infrastructure); and
- 7,900 acres of reforestation (site preparation, planting, and release) to accelerate the restoration of forest habitat.

Public Engagement

See Chapter 1 for details. The Notice of Intent to prepare an EIS for the Westside Fire Recovery project was published in the Federal Register on October 15, 2014, beginning the 30-day public scoping period. The Forest used news releases, social media, and public open houses and presentations to inform broader audiences.

Results of Scoping

The Forest Service received 749 unique comments by means of 98 unique letters, and 1,556 form letters during the scoping period. In response to comments received, the Forest Service determined four issues to be relevant to alternative development. Other issues were also considered during the refinement of the proposed action (Chapter 2) or addressed in the disposition of scoping comments (Appendix B in the draft EIS).

Comment Period Notification

A Notice of Availability and legal notice were published in the Federal Register on March 13, 2015, beginning the 30-day comment period, as granted through alternative arrangements with the Council on Environmental Quality on March 6, 2015. On April 3, 2015 a notice of extension was published in the Federal Register and a legal notice was published in the Siskiyou Daily News, extending the comment period an additional 15 days in response to public requests for additional review and comment time. Comments

[3] Treatment in salvage harvest units is limited to moderate to high severity areas (greater than 50 percent mortality) outside of riparian reserves. An estimated 6,800 acres of fire-killed trees would actually be removed. See chapter 2 for a complete description of harvest units.

received by April 27, 2015, were considered timely for agency response. The Forest used news releases, and social media, and public open houses and presentations to inform broader audiences.

Results from Comment Period Comments

A total of 13,413 comment letters were received during the Westside Fire Recovery draft EIS comment period. The Forest received 265 unique letters, 21 master form letters, and 263 form plus letters (with slight modifications of the master form letters; the remainder of the letters were form letters identical to one of the 21 master form letters). A list of comments received and how the Forest responded are included in Appendix B.

Ongoing Consultation Efforts

The Forest has been actively consulting with regulatory agencies as well as local and national elected officials. The Forest Service has also remained engaged in government to government consultation with federally recognized local tribes and seeking input from non-federally recognized tribes. Pacific fisher is proposed for listing as "threatened" under the Endangered Species Act. The Forest Service would conference with the U.S. Fish and Wildlife Service if it is determined that the Westside Fire Recovery Project would threaten the continued existence of Pacific fisher. If Pacific fisher is listed under the Endangered Species Act, the Forest Service would initiate formal consultation under Section 7 of the Endangered Species Act.

Alternatives Considered in Detail

In response to relevant issues, the Forest Service developed three alternatives (Alternative 3, 4 and 5) to the proposed action and several alternatives considered but eliminated from detailed study. In response to comment period comments and consultation with local tribes and regulatory agencies, the Forest Service developed two additional alternatives (Alternative 2 Modified and Alternative 3 Modified). Alternatives are described in detail in Chapter 2.

- Alternative 1 (No Action) -There will be no treatment with this alternative. The no action alternative provides reviewers a baseline to compare the magnitude of environmental effects of the action alternatives. It also provides a picture of the results of allowing natural regeneration to take place across the project area.
- Alternative 2 (Refined Proposed Action) – This alternative is the proposed action as scoped, except refined in response to public scoping comments and the acquisition of field-verified information about the project area. The alternative was developed through interdisciplinary involvement and recommendations in order to meet the purpose and need of the project, while being consistent with the Forest Plan and other regulatory requirements. This was the preferred alternative for the draft EIS.
- Alternative 3 – This alternative was developed in response to relevant issues about the effects of the proposed action on spotted owl and fisher habitat, habitat connectivity, and legacy components (i.e. old growth trees) and concerns about treatments in late-successional reserves. Alternative 3 emphasizes the development of future late successional habitat, habitat connectivity, northern spotted owl habitat and legacy habitat components within the post fire landscape. Alternative 3 is designed to retain legacy components for future habitat development, reduce effects to northern spotted owl nests, and lessen the effects to connectivity while still meeting the purpose and need for action.

- Alternative 4 – This alternative was developed to reduced impacts to watershed, including to federally-listed Coho Salmon. This alternative was developed through consultation discussions between the Forest Service and the National Marine Fisheries Service (NMFS) and in response to relevant public issues about the effects of the proposed action on watershed conditions and recovery. Alternative 4 is designed to reduce watershed disturbance and impacts to water quality and fisheries, relative to the proposed action, while still meeting the purpose and need for action. This alternative reduces or eliminates temporary road actions, especially within key watersheds and sensitive watersheds, as identified by the interdisciplinary team.
- Alternative 5 – This alternative addresses disagreements about the effects of salvage logging and site preparation on late successional reserves, riparian reserves, and inventoried roadless areas. Alternative 5 also addresses disagreements about whether or not the proposed action sufficiently addresses the needs for fuels reduction adjacent to private timber lands in the Beaver Fire area. Salvage harvest, site preparation, planting, and release are only proposed within management areas considered as matrix lands. Additional hazardous fuels treatments are proposed adjoining private land treatments.
- Alternative 2 Modified –This alternative was developed as the agency continued further field verification efforts and early Endangered Species Act (ESA) consultation with U.S. Fish and Wildlife Service regarding the federally-listed northern spotted owl.
- Alternative 3 Modified (the preferred alternative for the final EIS) – This alternative was developed in response to comments received during the public comment period and continued consultation with local tribes and the U.S. Fish and Wildlife Service.

The agency considered a total of 18 alternatives for the final EIS. In addition to the 7 alternatives considered in detail and the 10 alternatives considered but eliminated from detailed study, the Forest Service received an alternative from the Karuk Tribe on March 5, 2015 at 4:30 p.m., the day before printing the draft EIS. This alternative was incorporated into Appendix G of the draft EIS and was made available for public review and comment. For the final EIS, the Forest Service developed Alternative 3 Modified and incorporated elements of the Karuk Alternative. Both Alternative 2 Modified and Alternative 3 Modified reflect ideas developed by the public during the comment period, collaborative efforts, and consultation. These additional alternatives are comprised of actions already proposed in the range of alternatives described in the draft EIS. Effects of these alternatives are within the scope of analysis already considered in the draft EIS and are disclosed in Chapter 3 of this document. For a full discussion of how the suggestions presented in the Karuk Alternative have been considered for this and future projects see Chapter 2 of the final EIS.

Emergency Situation Determination

In order to facilitate implementation of the project, the Forest requested and was granted an Emergency Situation Determination pursuant to 36 CFR 218.21 on May 13, 2015. Under 36 CFR 218.21(d), a proposed action is not subject to the pre-decisional objection process if the Chief or Associate Chief of the Forest Service determines that an emergency situation exists with respect to all or part of the proposed action or activity.

Alternative Arrangements

On March 6, 2015, the Council on Environmental Quality granted the Forest Service's request for Alternative Arrangements pursuant to 40 CFR 1506.11. As a result, he Forest Service shortened the comment period for the draft EIS from 45 to 30 days, shortening the 45-day comment period requirement for the draft EIS by 15 days, resulting in a 30-

day comment period (40 CFR 1506.10(c)). The Forest subsequently extended the comment period for 15 days in response to public requests for additional review and comment time.

The agency is not seeking any additional alternative arrangements for this project.

Decision Framework

As the Responsible Official, the Forest Supervisor may decide to: (1) select the proposed action; (2) select one of the alternatives; (3) select one of the alternatives after modifying the alternative with additional mitigating measures or a combination of activities from other alternatives; or, (4) select the no action alternative, choosing not to authorize the Westside Fire Recovery project.

In making this decision, the Forest Supervisor will consider:

- How well does the selected alternative meet the purpose and need described in this EIS?
- How well does the selected alternative move the project area toward the desired conditions established in the Forest Plan?
- Does the selected alternative mitigate potential adverse effects?

Chapter 1 Purpose of and Need for Action

Document Structure

The Forest has prepared this Environmental Impact Statement (EIS) in compliance with the National Environmental Policy Act (NEPA) and other relevant federal and state laws and regulations. This EIS discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into four chapters and appendices:

- ***Purpose of and Need for Action (Chapter 1):*** This chapter briefly describes the proposed action, the need for that action, and other purposes to be achieved by the proposal. This section also details how the Forest Service informed the public of the proposed action and how the public responded.
- ***Alternatives, Including the Refined Proposed Action (Chapter 2):*** This chapter provides a detailed description of the agency's proposed action as well as alternative actions that were developed in response to comments raised by the public during scoping. It describes the key management direction used in developing the project which comes from the Forest Plan's forest-wide standards and guidelines, and describes those specific to management areas found within the project area including Late Successional Reserves, which accounts for about 50 percent of the project area, and describes the role of salvage harvest for risk reduction in Late Successional Reserves. The end of the chapter includes summary tables comparing the proposed action and alternatives with respect to the activities proposed for each alternative, how each addresses the purpose and need of the project, how each addresses relevant issues, and their environmental impacts.
- ***Affected Environment and Environmental Consequences (Chapter 3):*** This chapter describes the affected environment and environmental impacts of the proposed action and alternatives on Forest resources and the overall response from the Forest to responsible opposing views.
- ***Consultation and Coordination (Chapter 4):*** This chapter provides a list of preparers and agencies consulted during the development of the EIS.
- ***Appendices:*** The appendices provide more detailed information to support the analyses presented in the EIS.

The EIS and supporting documents can be found at: http://www.fs.fed.us/nepa/nepa_project_exp.php?project=45579.

Additional information is located within the project record located at the Forest headquarters office in Yreka, CA.

Modifications or Clarifications between Draft and Final Document

Chapter 1

- The Public Involvement section was updated based on open houses, field trips, and public comments received during the comment period after the draft EIS was published on March 13, 2015. This includes updates to the collaborative efforts, tribal consultation and regulatory consultation that were ongoing during the time of publication
- A section was added to this chapter describing the use of salvage of fire killed trees in Late Successional Reserves, described in detail in Appendix E.
- Language was updated throughout the final EIS to reflect current status of the project.

Chapter 2

- Language was added to clarify how each alternative was developed or how each is responsive to public comments or issues. Changes to the descriptions of alternatives are summarized below and detailed in chapter 2.
- Acres were adjusted for all alternatives based on new field verified information and treatment adjustments as a result of consultation and further interdisciplinary input. These numbers are reflected in the description of the alternatives and in the summary tables in this chapter.
- Two additional action alternatives (Alternative 2 Modified and Alternative 3 Modified) were added to this chapter. Both alternatives were developed based on existing alternatives analyzed in detail before publishing the draft EIS. Alternative 2 Modified was developed through consultation with the U.S. Fish and Wildlife Service. Through continuing consultation additional modifications were needed and captured in Alternative 3 Modified.
- The tables displaying alternatives by management area were moved to the end of Chapter 2 to improve readability and illustrate the differences between alternatives by management area.
- After consultation with the Karuk Tribe, the Forest incorporated some of their suggestions in Alternative 3 Modified. Elements of the Karuk Alternative were used to develop this alternative. The Karuk Alternative is now included in Chapter 2 of the final EIS as a discussion about how the Karuk Alternative was considered, including what elements were incorporated into Alternative 3 Modified, what elements will be considered for future actions, and how the Karuk Alternative compares to the preferred alternative.
- The Forest Service received public comments regarding the readability of the draft EIS, errors such as table references, and needs to clarify language. Changes were incorporated throughout the final EIS to address these public comments. A list of editorial comments is included in Appendix B and is addressed in the body of the final EIS.
- A description of the evolution of the project from scoping to selected alternatives was added to this section of the final EIS. This description of the evolution was developed to describe how the project has changed from the initial proposed action as scoped to Alternative 3 Modified. The evolution of the project shows how each alternative was designed to respond to public comment, discussion with collaborative groups, and consultation with the Karuk Tribe and other local tribes and discussions with other tribal groups and regulatory agencies helped shape Alternative 3 Modified.
- Language was clarified or modified between draft and final EIS to describe the action alternatives and project design features. These changes are summarized below.

Changes to all Action Alternatives

- Language was added to clarify the description of roadside hazard based on how the Forest intends to use the Regional Hazard Tree Guidelines for Forest Service Facilities and Roads in the Pacific Southwest Region (Angwin et al. 2012). Along forest roads, dead and fire - damaged trees with a 60 percent or greater probability of mortality are proposed for removal. After publication of the draft EIS, these rules were modified so that trees over 45 inches in diameter were required to have a 95 percent probability of mortality. This was done to ensure that legacy trees along road systems were retained. Project design was modified after publication of the draft, in consultation with the U.S. Fish and Wildlife Service to eliminate marking of green hazard trees that are not fire-damaged. This was done to reduce potential impacts to northern spotted owl habitat. Within proposed roadside hazard areas, the Forest Service is using a 60 percent probability of mortality as a threshold. No alternatives in this project propose the removal of green trees, defined as trees with a less than a 60 percent probability of mortality. All green trees will be retained. The only exceptions are green trees that pose an immediate hazard to roadways.
- Hazardous fuels treatment acres were updated to account for about 670 acres that were incorrectly mapped in the published draft EIS. These acres overlapped the Marble Mountain

Wilderness in the draft EIS, but were never intended to be treated. The 670 acres now removed from the prescribed burn treatment areas in the Whites fire.

- Language was added to clarify when proposed fuels treatments are projected to be implemented (see Chapter 2). The target implementation timeline for fuels treatments is one to ten years following a project decision. Fuels treatments that overlap roadside hazard removal or salvage harvest treatments are proposed to be implemented following the implementation of roadside hazard removal or salvage harvest. If new information or changed circumstances relating to the environmental impacts of a proposed action come to the attention of the responsible official after a decision has been made and prior to completion of the approved program or project, the responsible official may review the information carefully to determine its importance. Consideration should be given to whether or not the new information or changed circumstances are within the scope and range of effects considered in the original analysis. New or supplemental analysis may be completed as needed to address changes in condition prior to continued implementation of proposed activities (FSH1909.15, Section 18.1).
- Language was clarified for treatments within site preparation and planting units (see Chapter 2). The language was clarified to state that any tree with any remaining green limbs will be considered live and retained within site preparation and planting units. Site preparation units outside of salvage harvest units will not use the mortality guidelines to determine trees for removal. The Forest Service recognized that trees with green limbs may still have the capability of producing seeds regardless of the likelihood of mortality as defined by the "*Mortality Guidelines for Fire Injured Trees in California*" (Smith and Cluck, 2011). The objective of site-preparation and planting units is to retain any potential seed source for natural reforestation. By retaining trees with green limbs, regardless of their likelihood of mortality, remaining trees will provide potential habitat for connectivity for northern spotted owl and fisher.

Changes to Project Design Features

- Heritage-9 was added during the development of a project-specific programmatic agreement with the State Historic Preservation Office for compliance with the National Historic Preservation Act (see Tribal Consultation section below).
- Range-3 was modified to add clarifying language that no planting is proposed within site preparation and planting or salvage units that overlap historic wet or dry meadows (as defined in Range-3); these are now just site preparation units that are site-prepared to improve growth of meadow vegetation.
- Recreation and Scenery-4 and -5 were modified to add clarifying language and identify where applicable. Recreation and Scenery-6 through -12 were also added for recreation and scenery; these project design features are described in the project design feature table in Chapter 2.
- Watershed-4 was modified to include equipment exclusion from all riparian reserves associated with stream channels, active landslides, inner gorges, and toe zones of dormant landslide deposits.
- Watershed-12 was modified to include leaving on site all hazard trees cut within 25 feet of a stream channel or spring. All hazard trees equal to or greater than 26 inches diameter at breast height within the first site tree (150-170 feet) distance from all streams (perennial and intermittent) will be left on site unless, after felling, leaving these trees continues to pose a threat to safety, infrastructure, forest road drainage system integrity or accessibility. Where hazard tree removal is proposed along roads that parallel fish-bearing streams, any hazard tree equal to or greater than 26 inches in diameter that is below the road, that would contact the stream channel if felled in that direction, will be retained on site.

- Watershed-34 was modified to add language responsive with continued ESA consultation with NMFS and public comments on the avoidance of drafting water in specific creeks and lower reaches of cold tributaries (Fish Biological Assessment, Appendix E).
- Language in all Wildlife project design features was modified based on clarification needed during consultation with the U.S. Fish and Wildlife Service.
- The original Wildlife-19 and Wildlife-20 were removed because the units described as part of these project design features were removed from treatment within the applicable alternative. Wildife-19 now clarifies that trees without fire damage will not be removed along roads unless they are an immediate hazard to maintain public and worker access. Wildife-20 clarifies that limited operating periods do not apply to roadside hazard treatments occurring along roads that are Maintenance Level 3, 4 or 5.

Chapter 3

- A section was added to this chapter to respond to comments that were submitted during the comment period on the draft EIS. This section directly responds to repeated themes in comments the agency received during comment periods on the original proposed action (scoping) and on the draft EIS. A list of Scoping comments is in Appendix B of the draft EIS; a list of comments submitted on the draft EIS is in Appendix B of the final EIS.
- Analysis of the effects of two additional alternatives (Alternative 2 Modified and Alternative 3 Modified) was completed since the draft EIS was published and is included in Chapter 3 of the final EIS. Any clarification or changes of methods is described for each resource, and analysis was also broken apart by fire area (Beaver, Happy Camp, and Whites) in Chapter 3. The history and description of all alternatives are found in Chapter 2.

Appendices

- Additional maps were added to Appendix A. These maps include a cumulative effects map, a map showing the evolution of salvage units, a map showing how Late Successional Reserve (LSR), Inventoried Roadless Area (IRA), matrix, and non-matrix lands overlap the project areas, and updated treatment maps for all alternatives (including maps for Alternative 2 Modified and Alternative 3 Modified).
- Appendix E contains the full text of the “Risk Reduction Salvage in Late Successional Reserves” document that was sent to the Regional Ecological Office as part of project review and the letter of concurrence from the Regional Ecological Office concluding that this Project is consistent with the Northwest Forest Plan.
- Appendix B: Response to Comments replaces Appendix B: Public Scoping Comments Disposition and Open House Record that was published in the draft EIS. This new Appendix B lists each comment the Forest received during the comment period on the draft EIS and how the Forest responded to each comment.
- Appendix H and I were added to the final EIS. Appendix H is the Wildlife Biological Assessment and Appendix I is the Fisheries Biological Assessment.

Background

On the west side of the Forest, the terrain is extremely rugged with total relief in excess of 7,500 feet and hillslopes commonly steeper than 65 percent. The Klamath Mountains, of which the west side of the Forest is a part, are also characterized by steep ecological gradients, high vegetation, wildlife, and fish diversity, with numerous species including the federally-listed northern spotted owl and Coho Salmon (under the Endangered Species Act (ESA)) and the Pacific fisher which is proposed for federal listing under ESA. Annual precipitation ranges from approximately ten inches in eastern valleys to

over 70 inches in the highest elevations. Climate is essentially Mediterranean, and watershed hydrology is characterized by dry summer and fall months followed by substantial winter precipitation. Morphology and function of the steep stream channels is influenced by large floods and associated landslides and debris flows.

Prior to the 2014 fires, vegetation types within the project area generally consisted of oak, brush, grass, and mixed conifers. Oaks, brush, and grasses are typically found on low-elevation sites on shallow, rocky soils located on the southerly and westerly aspects. These southerly and westerly aspects exhibit harsher conditions than the northerly and easterly aspects. As elevations increase, conifer species become more prevalent, primarily as a function of higher precipitation amounts at higher elevations. Deeper, more developed soils than those at low elevations support mixed conifer stands of Douglas-fir, ponderosa pine, incense cedar, and sugar pine. Higher elevation sites within the project area provide favorable conditions for red fir and white fir survival and growth, with white fir becoming a substantial component of the mixed conifer type. Hardwood species, including Pacific madrone, California black oak, canyon live oak, Oregon white oak, tanoak, and bigleaf maple are generally a minor component of mixed conifer stands.

Few forested regions have historically experienced fires as frequently and with such high variability in fire severity as the Klamath Mountains Bioregion (Skinner 2006). The fire regime of the forests of the Klamath Mountains differs from the more mesic old-growth Douglas-fir dominated forests of Oregon and Washington (described in Franklin et al. 1981) in fire frequency, fire severity and structural attributes such as the amount and persistence of snags and coarse woody debris (Taylor and Skinner 1997). The characteristic fire regime of the Klamath Mountains, before the current era of fire exclusion, was one of frequent low to moderate intensity fire with low to moderate severity effects (Skinner et al. 2006), not the “stand-replacement or mixed” regime that is typical in the Coast Range and western Oregon and Washington Cascades (Taylor and Skinner 1998, Wills and Stuart 1994, Fry and Stephens 2006). In a fire regime dominated by low to moderate severity effects, tree mortality with wildfire is generally low. In the Klamath Mountains, patches of moderate to high severity fire were more likely on upper slope positions and on south and west-facing aspects (Skinner 2006). Patches of high severity would produce a pulse of snags and, eventually, down logs until these were consumed by subsequent fires. Because frequent low to moderate severity fires consume wood, it is unlikely that coarse woody debris accumulated to levels seen in Oregon and Washington (Taylor and Skinner 1997); snags and logs were likely clustered in time and space with long intervals and large areas where dead wood was sparse (Skinner 2002). Under historical conditions an event with large patch size and geographic extent of high severity fire that occurred within the project area would have been highly unlikely to occur because there would have been substantially less surface fuel, less fuel continuity and lower stand density than existed in 2014. Fires were more likely to burn on the ground rather than in the tree canopy and a patchy stand structure would have been shaped by frequent low to moderate intensity fires that consumed most of the dead and down wood on upper slopes.

Even though fire exclusion has since altered the fire regime and produced an unnatural accumulation of surface fuels in many areas, fire in the Klamath Mountains still generally burns with predominately low to moderate severity effects today (Odion et al. 2004, Miller et al 2012). The current elevated fuels conditions sometimes lead to fires of higher

intensity and severity; combined with severe drought, wind and lighting strikes, these conditions led to about 31 percent of the 2014 wildfires burning with moderate to high severity effects in the project area.

Within the Klamath Mountains bioregion, lightning accounts for 74 percent of ignitions and 82 percent of burned areas, and median fire return intervals range from eight to 38 years (Taylor, Skinner, and Agee 2006). A great portion of the project area remained unburned from 20 to 100 years prior to the 2014 fires.

Emergency Triggering Event

Severe drought and exceptionally dry fuel conditions made the 2014 fire season one of the most impacting in the history of the Forest. The following outlines some of the difficult conditions that characterized the season:

- Three consecutive years of drought resulted in record low snowpack, rainfall, and stream flows;
- Live and dead fuel moistures were at record historic lows with numerous days setting new records for severe wildfire burning conditions;
- Over the course of the summer, five separate waves of lightning storms affected the Forest, setting a total of 127 wildfires (an additional 12 wildfires were human-caused);
- Twenty severe fire weather warnings ("Red Flag Warnings") were issued by the National Weather Service between July 29 and August 18, 2014, due to lightning and abundant dry fuels, strong winds, and low relative humidity;
- As a result of threatening wildfire activity, a total of 14 Mandatory Evacuations and 15 Evacuation Advisories were ordered by the Siskiyou County Sheriff's Office. These evacuations affected an estimated 800 residents. Extensive Forest road and area closures were also in effect for most of the fire season;
- Simultaneous wildfires burning in Oregon, Washington, and other parts of California resulted in limited firefighting resources (crews and aircraft) being readily available to the Forest during initial suppression efforts; and
- Rugged mountainous topography, heavy fuel loadings (jackstraw fallen snags and trees) and limited access made fire suppression efforts extremely challenging.

Forest-wide, the 2014 fire season ultimately burned about 215,000 acres. Restoration needs for all affected acres were identified. Some fires, or portions of fires, burned within wilderness areas where natural processes drive restoration. Restoration needs of the 5,500-acre Little Deer fire (located on the east side of the Forest) have been identified and analyzed through a stand-alone environmental analysis. The Westside Fire Recovery project is composed of the other large fires (or portions of fires) that burned during 2014 - the Beaver fire, Happy Camp Complex, and the Whites fire of the July Complex.

The Beaver, Happy Camp Complex, and Whites fires burned a total of about 183,500 acres, including 162,580 acres of National Forest System lands and 20,910 acres of private land. See Table 1-1 below.

Table 1-1: General fire information

Fire	Fire Start Date	Containment Date	Acres Burned: Forest Service	Acres Burned: Private	Total Acres Burned
Beaver Fire	July 30, 2014	August 30, 2014	14,630	17,870	32,500

Fire	Fire Start Date	Containment Date	Acres Burned: Forest Service	Acres Burned: Private	Total Acres Burned
Happy Camp Complex Fire	August 12, 2014	October 29, 2014	115,050	2,150	117,200
Whites Fire	July 31, 2014	September 25, 2014	32,900	890	33,790
Total of All Fires (acres)			162,580	20,910	183,500

Fires within the Happy Camp Complex were ignited by lightning near the town of Happy Camp which is located on the middle portion of the Klamath River. Nineteen fires were ignited in this storm and comprised the complex. Due to hot, dry and windy conditions, three of the original 19 fires could not be readily contained and eventually grew together and spread east to the Scott River and south into the Marble Mountain Wilderness over the course of several weeks. This combined fire burned about 133,000 acres, not all of which are included in the Happy Camp Complex as analyzed by this project. The Beaver fire occurred on the north side of the Klamath River about 30 miles east of Happy Camp, and eventually consumed approximately 32,000 acres. The July Complex was comprised of the Log and Whites fires; the complex fire burned approximately 37,000 acres southeast of Fort Jones, 33,800 acres of which are part of the Whites fire as analyzed in this project. The July Complex burned both private and National Forest land, ultimately spreading into the Marble Mountain Wilderness and into the North Fork drainage of the Salmon River.

Resources Affected

The fires burned extensive portions of the Klamath River, Scott River, and Salmon River 5th field watersheds on the western half of the Forest. Dozens of tributary drainages in these watersheds were affected. Large portions of late successional reserves and habitat burned with high-severity fire. In the wildfires that occurred in the 2014 Westside Fire Recovery project area (Beaver, Whites, and Happy Camp fires) over 7,000 acres of functioning nesting-roosting habitat and 9,600 acres of foraging habitat were lost to stand-replacement (i.e. high severity) fire. All the large fires of the 2014 season burned with mixed severity, meaning there was a mosaic of light, moderate, and severely burned forests within each fire area.

Table 1-2 below describes the percentage of vegetative canopy killed (basal area). See the Rapid Assessment of Vegetation Condition maps in Appendix A.

Table 1-2: Percentage of vegetative canopy killed (basal area)

Fire Severity	Percentage (%) of Vegetative Canopy Killed (basal area)	Beaver %	Happy Camp %	Whites %	Total %
Very Low	0-25	43	62	63	**59**
Low	25-50	10	8	6	**8**
Moderate	50-75	7	6	5	**6**
High	75-100	40	23	26	**27**

Of the approximately 183,500 acres that burned within the Westside project area, approximately 27 percent exhibits very high vegetation burn severity effects. Within high-severity areas, full consumption of duff, conifer and hardwood litter, saplings, and small and large dead material occurred. Full consumption of canopy foliage and small branches within the crown stratum has left standing dead trees that are storing a

tremendous amount of biomass available for future surface fuel accumulation. Areas of high severity burns experienced 75 percent or greater vegetation mortality, loss of canopy and understory cover, and loss of duff layers and large woody debris. The stands that burned at high severity ranged in species composition and structure, and included shrub/oak stands, single layered conifer plantations, multi-layered mixed conifer stands, and higher elevation stands dominated by true fir. Most trees within high severity burn areas are dead or expected to die in the next three to five years.

About six percent of the fire areas burned with moderate severity. Areas characterized by moderate-severity burns experienced 50 to 75 percent vegetation mortality, substantial reduction in canopy, understory cover, duff layers and large woody debris. Moderate-severity fire areas generally experienced consumption of surface fuels, leaving the canopy structure primarily intact; however, the conifer and hardwood canopies are generally brown needle foliage. Dead fuels contribute to surface fuel loads and will decay slowly. Small shade-tolerant trees fill in the mid-story canopy connecting to the upper canopy fuel (ladder-effect) of the larger fire-resilient trees on the landscape resulting in high-severity effects in many forested lands. A substantial portion of the trees within moderate-severity areas have either been killed by fire or are expected to experience high mortality due to fire injury, insects, and the effects of prolonged drought. Continued overall low levels of rainfall and particularly low snowfall amounts this winter are not alleviating drought conditions in northern California. These continuing relatively dry conditions will further decrease the survivability of fire-damaged trees, even in areas that burned at lower severity.

Areas characterized by low or very low severity burns experienced zero to 50 percent vegetation mortality and a reduction in fuel loading. In low-severity burn areas, most of the stand mortality occurred in understory trees less than 10 inches in diameter at breast height. Over time, these small trees will fall to the forest floor and contribute to future fuel loading, but in much smaller quantities than in the moderate- to high-severity burn areas.

Debris Flows in Post-Fire Environment

Over 50,000 acres of the Westside Fires burned with moderate to high severity, killing most of the trees. Because of the extreme fire conditions, ground vegetation, down woody debris and tree crowns were completely consumed in large areas of the fire. Lack of ground cover and crown interception exposes soils to raindrop impacts, and increases the amount of precipitation that reaches the ground. Moderate to high severity fires can also cause a loss of soil hydrologic function by sealing pores and degrading soil structure. Under high severity fire conditions, soils become resistant to water infiltration because burned organic material soaks into empty pore spaces in the soils, making the soil surface impervious to water, or “hydrophobic”. Also, silica in the soil can fuse at high temperatures contributing to hydrophobicity. Once soils become hydrophobic, surface runoff and erosion can increase dramatically because rainfall cannot infiltrate the soil. During mid-July, 2015 high intensity rainfall events over severely burned portions of the West Side Fire area caused surface erosion that triggered a number of debris flows. As much as 1.5 inches of rain fell in less than an hour in many parts of the fire area during these storms. The high-intensity rainfall event on hydrophobic soils that had been denuded of vegetation in the 2014 Westside Fires caused rapid delivery of water and sediment to stream channels by rills and small gullies. This slurry of water and debris is

what formed the debris flows. Water, rocks, mud and trees were swept downslope in the Music Creek, Beaver Creek, Grider Creek, and Walker Creek drainages. Debris flows in a post-fire environment is a common natural phenomenon especially where there are large areas of high severity burn such as the 2014 Westside Fires. These debris flows were surface erosion events related primarily to loss of ground vegetation, loss of forest canopy and hydrophobic soil conditions rather than landslides caused by loss of root strength.

Burned Area Emergency Response

Ongoing Burned Area Emergency Response (BAER) actions aim to identify and manage imminent, unacceptable threats to human life, safety, property, and critical natural and cultural resources on National Forest System lands. BAER actions include repairing road drainages (grading, culvert cleaning, installation of rolling drainage dips, etc.), felling only imminent-hazard trees along roads, and posting closure signs along roads and trails. Hazard trees felled during fire suppression and BAER activities were very limited in number and consisted of older dead, decomposed, and structurally unsound trees along only the most-frequented of roadways. Due to the objectives of BAER activities and the scale of the fire-impacted area, most of recently fire-killed trees (snags) were considered to be structurally sound at the time of BAER and were left standing. As snags along the roadways in burned areas are exposed to winter rains, snow, and winds, and subsequently deteriorate and decay, threats to human health and safety substantially increase. While BAER activities mitigate many of the immediate hazards, additional emergency actions are needed to address the remaining safety concerns and to move the affected areas towards recovery.

Westside Fire Recovery Project

The Westside Fire Recovery project was developed in response to landscape-level changes to forested habitat resulting from the 2014 wildfires on the Forest. Resource specialists began evaluating conditions in the project area immediately following the fires. The BAER analyses provided resource assessments on the fires' effects on soils, watersheds, vegetation, and wildlife. Post-fire inventories of the transportation system were conducted to obtain condition status. Field crews conducted surveys on forested stands to collect data on stand mortality and timber salvage viability. Soil-burn severities and vegetation-burn severities were mapped to determine the changed post-fire conditions. The initial post-fire assessments were completed by the fall of 2014. Resource specialists used this information to make recommendations to the responsible official, Forest Supervisor Patricia Grantham, for developing the proposed action.

The Forest has prepared this EIS to analyze and disclose the effects of proposed treatments included in the Westside Fire Recovery project. An EIS is required due to the scope of the proposed treatments and the potential for significant impacts, especially to the federally-listed northern spotted owl and Coho Salmon and their critical habitats.

The boundary was extended beyond the fire perimeters (Table 1-1) to incorporate hazardous fuel reduction treatments and fire breaks within one-quarter mile of structures on private property. The project area comprises 218,600 total acres, including 187,100 acres of National Forest System land and 31,500 acres of private land. It is divided into three subparts: project area A (Beaver fire), project area B (Happy Camp Complex), and

project area C (Whites fire of the July Complex). See the vicinity map (Map A-1 in Appendix A).

Table 1-3: Acres within the project area on private and National Forest System lands by fire area

Project Area	Fire	Forest Service Project Area (acres)	Private Lands within Project Area (acres)	Total Acres within Project Area
A	Beaver Fire	19,000	24,800	43,800
B	Happy Camp Complex	127,000	5,400	132,400
C	Whites Fire	41,100	1,300	42,400
Total Project Area (acres)		187,100	31,500	218,600

Table 1-4: General location by fire area within the project area

Project Area	Fire	Legal Location Township (T), Range (R), and Section (S)	Elevation Range (Feet)	Watershed (5th Field)
A	Beaver Fire	Mt.Diablo: T46N R8W S 2-7, 9-11; T46N R9W S1-13,18; T46N R10W S1-3,10-15;T47N R8W S4-10,15-22, 27-35; T47N R9W S1, 9-17, 20-36; T47N R10W S 25, 34-36	1,700-6,300	Beaver Creek, Horse Creek-Klamath River, Humbug Creek-Klamath River
B	Happy Camp Complex	Humboldt: T14N R8E S 5, 8,17, 20; T15N R7E S 1, 2,12,13, 24;T15N R8E S3-10,15-22, 27-28, 34; T16N R7E S1, 2,10-15, 23-25, 35, 36; T16N R8E S6-10,15-22, 27-34 Mt. Diablo: T43N R12W S2-11,14-20; T44N R10W S6; T44N R11W S1-11, 15-22, 28-30;T44N R12W S1-35; T45N R10W S5-9,16-21, 28-32; T45N R11W S1-36; T45N R12W S1-36; T46N R10W S31-32; T46N R11W S 16-22, 26-36; T46N R12W S 10-11,13-16, 20-36	1,100-7,400	Elk Creek[4], Horse Creek-Klamath River, Indian Creek,Lower Scott River, Seiad Creek-Klamath River[5], Thompson Creek-Klamath River, Ukonom Creek-Klamath River
C	Whites Fire	Mt.Diablo: T39N R10W S 1-11,17-18; T39N R11W S 1-3,10-15; T40N R8W S 6-7,18-19,30; T40N R10W S 2-36; T40N R11W S 1-4, 9-16, 21-28, 33-36; T41N R10W S 8-22, 27-35; T41N R11W S 24-25,33-36	2,200-8,000	French Creek-Scott River, North Fork Salmon River[6], South Fork Salmon River[7]

Management Direction

Direction for this project comes from the Klamath National Forest Land and Resource Management Plan (Forest Plan) of 1995, as amended. The Forest Plan incorporates direction from the Record of Decision for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl (Northwest Forest Plan). Other statutes, regulations, plans and policies that provide

[4] Key Watershed from the Forest Plan
[5] The Grider Creek 6th field portion of this 5th field watershed is identified as part of a Key Watershed in the Forest Plan
[6] Key Watershed from the Forest Plan
[7] Key Watershed from the Forest Plan

management direction for this project include, but are not limited to, the Endangered Species Act, the National Historic Preservation Act, the Clean Water Act, the Clean Air Act, Recovery Plans for northern spotted owls and Coho salmon, as well as Forest Service directives. The project is designed to be consistent with all applicable laws, policies and plans, and to consider information in guidance documents such as watershed analyses, the National Fire Plan, and Forest Fire Management Plan.

Key direction for this project comes from the Forest Plan's forest-wide standards and guidelines, and those specific to management areas that are found within the project area, as described in Table 1-5. This project includes design features listed on Table 2-42 in Chapter 2 that were developed to reduce potential negative impacts to resources and to meet the standards and guidelines of the Forest Plan. For further information pertaining to meeting the requirements of the Forest Plan, please see the Forest Plan consistency checklist, available in the project record and on the project website.

Much of the project lies within the wildland urban interface (WUI) community threat zone as described in the Forest Fire Management Plan. Within the project area, there is U.S. Fish and Wildlife Service-designated critical habitat for northern spotted owl (U.S. Fish and Wildlife Service 2012), and National Marine Fisheries Service-designated critical habitat for Coho Salmon (May 5, 1999, 64 FR 24049). The project is located within the North and South Fork Salmon River, Elk Creek, and the Grider section of the Seiad Creek-Klamath River key watersheds; management direction for key watersheds in the Forest Plan (pages 4-25 through 4-26) applies to activities in the project.

The 1995 Forest Plan includes standards and guidelines from the Northwest Forest Plan. The Forest Plan provides forest-wide and management area direction for project-level projects. Management areas within the project area are described in Table 1-5.

Table 1-5: Notable Forest Plan management area goals for management areas found within the project boundary[8]

Management Areas (MA)	Pages in Forest Plan	Notable Forest Plan Goals, Standards and Guidelines
MA1- Research Natural Area[9]	4-67 to 4-69	Not applicable; no activities are planned for this management area.
MA2- Wilderness	4-70 to 4-75	Not applicable; no activities are planned for this management area.
MA3- Recommend and Designated Wild River[10]	4-78 to 4-79	Not applicable; no activities are planned for this management area.
MA12- Recommended and Designated Scenic River	4-117 to 4-119	A wide range of silvicultural treatments may be used to meet Scenic River objectives. Salvage of trees killed by wildland fire, pest infestations or other natural processes is permitted consistent with area resource management goals. Salvage and reforestation efforts are a moderate priority. Minimize the loss of timber value where possible (page 4-119).
MA13- Recommended and Designated Recreational River	4-120 to 4-122	Lands may be managed for a full range of silvicultural uses, to the extent currently practiced. Timber harvesting would be allowed under standard restrictions to protect the immediate river environment, water quality, scenic, fish and wildlife and other values. Schedule moderate timber yields, compatible with area goals (page 4-122)
MA 5- Special Habitat: Late Successional Reserves (LSRs) Falcon and Eagle	4-82 to 4-89; 4-92 to 4-93; 4-90 to 4-92	Conditions of late-successional forest ecosystems are enhanced to serve as habitat for late-successional species. Continuous areas of multi-layered forests with high quality habitat characteristics and attributes are common (page 4-83). Vegetation removal to eliminate public hazards and salvage are permitted if it benefits habitat (pages 41 and 4-93). See discussion of salvage in LSRs and Appendix E for a complete assessment of compliance with MA-5.
MA7-Special Interest Area	4-97 to 4-100	Salvage of burned or pest-killed trees may be allowed to promote the management goals and objectives of the SIA. Reforestation of these areas to meet SIA objectives shall be a high priority (page 4-99).
MA10-Riparian Reserves[11]	4-106 to 4-114	Riparian Reserves (RRs) are portions of watersheds where riparian-dependent resources receive primary emphasis and where special standards and guidelines apply. Standards and guidelines prohibit and regulate activities in RRs that retard or prevent attainment of the Aquatic Conservation Strategy (ACS) objectives. Standards and guidelines applicable to this management area include the following: Fall roadside safety hazard trees; allow the removal of these trees where woody debris requirements are met (page 4-113). Design fuel treatment practices and activities to meet ACS objectives, and to minimize disturbance of riparian ground cover and vegetation. Restore RRs to meet ACS. Design prescriptions to re-establish stands that provide the desired vegetation characteristics (for example, species composition and age class structure).
MA 11- Retention Visual Quality Objective (VQO)	4-115 to 4-116	Salvage of trees killed by wildland fire, pest infestation or other natural processes is permitted consistent with area goals (page 4-116)
MA 15- Partial Retention VQO	4-126 to 4-127	An attractive, forested landscape is provided and is maintained for a sustained yield of wood products in areas capable, available, and suitable for timber production. Forested stands are resilient to wildland fire, insect, disease, and other damage (page 4-126).
MA 17- General Forest	4-131 to 4-132	A programmed flow of timber is provided, which is sustainable through time. Conifer stocking levels and high growth rates are maintained commensurate with the capability of the site to produce wood fiber. Forested stands are resilient to wildland fire, insect, disease, and other damage (page 4-131).

[8] See the Forest Plan consistency checklist in the project record for detailed information about project consistency by applicable standard and guideline.
[9] All of MA1 overlaps MA2.
[10] All of MA3 overlaps with MA2 with exception of about 40 acres.
[11] Riparian reserves overlap with most other management areas. No treatment is proposed within hydrologic (water-related) riparian reserves, except roadside hazard treatment and fuels treatments within one-quarter mile of private property structures.

Risk Reduction Salvage in Late Successional Reserves

About 81, 200 acres or 50 percent of the 162,580 acres of National Forest lands burned in the Beaver, Happy Camp, and Whites fire perimeters are within Late Successional Reserves. The 2014 fires created large patches of fire-killed trees. As the dead trees break or fall, adding to the surface fuels, future stands will contain high fuel loadings. Areas of continuous, high fuel loading have a high probability of burning with high severity (Chapter 3, Fuels). This condition conflicts with the Forest-wide goal for Fire Management which is to "reduce unacceptable fuel buildups and potential acreage of future high intensity wildfires." (Forest Plan, page 4-8)

The primary reason that salvage harvest is proposed within Late Successional Reserves is to reduce the risk of future stand-replacement fire from heavy fuel accumulations that will result from trees killed in the 2014 Westside Fires. This section addresses how the proposed salvage of fire-killed trees in the Westside Fire Recovery project would contribute to Forest Plan goals for fire management (Forest Plan, page 4-8) and be compatible with Forest Plan direction to protect and enhance late-successional ecosystems within Late Successional Reserves (Forest Plan, page 4-83).

Late Successional Reserves are described in the Record of Decision (ROD) for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl (also known as the Northwest Forest Plan (NWFP)) which is incorporated in the Forest Plan for the Klamath National Forest; Late Successional Reserves are part of Management Area (MA) 5 in the Forest Plan. The objective of Late Successional Reserves is to protect and enhance conditions of late-successional and old-growth forest ecosystems, which serve as habitat for late-successional and old-growth related species including the northern spotted owl (NWFP Standards and Guidelines C-9; Forest Plan, page 4-83).

The Forest Plan provided specific guidelines for risk reduction in Late Successional Reserves (4-87) as follows:

- MA5-27 Certain risk management activities, if properly planned and implemented, may reduce the probability of major stand-replacing natural events such as fire.
- MA5-28 Silvicultural activities aimed at reducing risk shall focus on younger stands in Late Successional Reserves. The objective will be to accelerate development of late-successional conditions while making the future stand less susceptible to natural disturbances. Salvage activities should focus on the reduction of catastrophic insect, disease and fire threats. Treatments should be designed to provide effective fuel breaks wherever possible. (Emphasis added). However, the scale of salvage and other treatments should not generally result in degeneration of currently suitable owl habitat or other late-successional conditions.
- MA5-29 In some Late Successional Reserves in these provinces, management that goes beyond these guidelines may be considered. Levels of risk in those Late Successional Reserves are particularly high and may require additional measures. Consequently, management activities designed to reduce risk levels are encouraged in those Late Successional Reserves even if a portion of the activities must take place in currently late-successional habitat. While risk-reduction efforts should generally be focused on young stands, activities in older stands may be appropriate if:

    1) the proposed management activities will clearly result in greater assurance of long-term maintenance of habitat,
    2) the activities are clearly needed to reduce risks and

3) the activities will not prevent the Late Successional Reserves from playing an effective role in the objectives for which they were established.

Such activities in older stands may also be undertaken in Late Successional Reserves in other provinces if levels of fire risk are particularly high. Additional information is available in Chapter 3 and Appendix E.

Purpose and Need for Action

There is a need to close the gap between the existing and desired condition (Table 1-7), while protecting forest resources within the project area.

There is a need for worker and public safety and access.

Fire-killed trees (i.e. snags) are often unstable and at risk of falling or snapping off. As snags in burned areas are exposed to winter rains, snow, and winds and subsequently deteriorate and decay, risk to human health and safety substantially increase. Snags need to be addressed in order to minimize unnecessary safety hazards for the public who recreate in the area. Safety for forest workers also needs to be provided. Forest workers will work within the burned areas in the years to come, accomplishing reforestation, fuels reduction, and other resource management activities. Hazard trees also threaten public and worker access along miles of roads. It is also imperative that infrastructure, especially utility lines, roads, trailheads, campgrounds, fire lookouts, and bridges are maintained for safe use by the public and workers.

Proposed activities to address this component of the purpose and need include:

- Salvage harvest of fire-killed trees selected based on criteria described in the salvage section in Alternative 2 of Chapter 2.
- Salvage of fire-killed and other hazard trees along roadways and near infrastructure.
- Removal of roadside hazard treesto maintain current and future safe ingress and egress from the forest.

There is a need for safe conditions for firefighters performing fire suppression for community protection.

As snags continue to decay, break, and fall, surface fuel loading and the severity and intensity of future fires will increase. Increased fire intensities and fallen snags will inhibit the effective control of future fires and/or put fire suppression crews at increased risk. Fallen hazard trees will also impact road access along miles of roadways, impairing fire suppression efforts. Local communities and residential enclaves are nestled within and adjacent to forests in a fire-adapted ecosystem. Hazardous trees and fuels conditions need to be abated, where they exist within the wildland urban interface, especially within one-quarter mile of private property in burned areas and areas identified as strategic. Strategic areas are likely areas where fires can be successfully contained or controlled in order to have better conditions for suppressing future fires. The goal of these areas are to protect lives and properties of our local communities.

Proposed activities to address this component of the purpose and need include:

- Salvage harvest of fire-killed trees selected based on criteria described in the salvage section in Alternative 2 of Chapter 2.

- Felling and removal of fire-killed and other hazard trees along roadways to maintain current and future safe ingress and egress from the forest and near infrastructure;
- Creation of shaded fuel breaks on selected strategic ridgetops to facilitate future fire suppression efforts;
- Reduction of fuels by piling and burning, mastication, and underburning within the wildland urban interface and other strategic areas; and
- Planting in certain areas promoting forested conditions over brush-field conditions to improve future fire control.

There is a need for a project that is economically viable, meeting project objectives and benefiting our local communities.

The Forest Plan directs the Forest to harvest dead or dying trees to achieve a number of purposes including the production of wood products, as consistent with Forest-wide and management area goals. Dead timber loses significant commodity value (50 percent or more within two years) if left standing too long and is most profitable if harvested as soon as possible. Because of decay rates of trees which vary by species (Dale 1987 and Lowell et al. 1992 as cited in Kocher et al. 2009), it is important to offer timber sales while the wood is still marketable. Table 1-6 summarizes the decay rate by year after tree death for white fire, ponderosa pine, Jeffery pine, sugar pine, and Douglas-fir.

Table 1-6: Conifer decay rates after fire (Dale 1987 and Lowell et al. 1992 as cited in Kocher et al. 2009)

Years after tree death	White fir	Ponderosa Pine or Jeffery Pine	Sugar Pine	Douglas-fir
1	10-20% of volume decayed	25% of sapwood blue stained*	Extensive blue stain in sapwood	Minimal decay; some cracks in heartwood
2	50% of volume decayed	All wood blue stained; 50% of sapwood decayed	75% of sapwood decayed	25-50% of sapwood decayed
3	100% of volume decayed	All sapwood and some heartwood decayed	All sapwood and some heartwood decayed	All sapwood decayed; 1 inch of heartwood decayed
4	--	70% of volume decayed	50% of volume decayed	2 inches of heartwood decayed
5	--	90% of volume decayed	50% of volume decayed	3 inches of heartwood decayed

Source: Dale, J.W.Fire damage literature summary. Unpublished paper. Vallejo, CA: USDA, Forest Service, Pacific Southwest Region, State and Private Forestry, Forest Pest Management 1987. Lowell, E.C., S. A. Willits, and R. L. Krahmer. Deterioration of fire-killed and fire-damaged timber in the western United State. Gen. Tech. Rep. PNW-GTR-292. Portland, OR: USDA, Forest Service, Pacific Northwest Research Station, 1992.

*Blue stain is a discoloration of the sapwood of pines due to fungal infection; considered a visual defect that often reduces the value of the wood. Sapwood is the white or light-colored wood that encircles the pink heartwood.

Capturing the marketability of the fire-killed trees and hazard trees provides the agency a viable means of fully implementing the project and potentially funding restoration, including reforestation for future wildlife habitat and the improvement of watershed conditions for fish habitat. Otherwise, the Forest will need to use appropriated dollars to remove only the snags and hazard trees most critical for public and worker safety and access. Much of the proposed project will not happen if appropriated dollars are the only funding mechanism. Capturing the maximum economic value of the salvaged timber also benefits Siskiyou County and the surrounding communities by maintaining and/or

creating jobs in forest management and providing timber to the local mills which are major employers of these rural communities.

Proposed activities to address this component of the purpose and need include:

- Salvage harvest of fire-killed trees selected based on criteria described in the salvage section in Alternative 2 of Chapter 2; and
- Felling and removal of fire-killed and other hazard trees along roadways and near infrastructure.

There is a need for restored and fire-resilient forested ecosystems.

Although wildfires provide some benefits to forest ecosystems (such as snag and downed wood creation and short-term fuels reduction in areas of low intensity burns), intensely burned forested areas may be slow to recover and heavy fuel loads will result from fallen snags. Following a high-severity wildfire, heavy fuel loading predisposes an area to high-intensity and high-severity wildfires in the future. Such fires inhibit forest stand regeneration and result in stand type changes to brush or other non-forested vegetation types; this inhibits or delays reaching the desired conditions of the Forest Plan or providing for future forested wildlife habitat per Forest Plan goals and direction. High-severity fires also put remaining wildlife habitat at risk of future loss. There is a need to reduce the amount and continuity of fuels at the landscape scale to reduce the size and severity of future fires (Thompson et al. 2007). By reducing fuels created by the 2014 fires and replanting selected areas, the likelihood and speed by which burned, forested areas are restored is increased. This results in a more fire-resilient forested ecosystem for the benefit of wildlife habitat and watershed conditions.

Activities to address this need include:

- Salvage harvest of moderate- to high-severity fire-killed trees is proposed to reduce the risk of future stand-replacement fire from heavy fuel accumulations that will result from trees killed in the 2014 Westside Fires (see Risk Reduction Salvage in Late Successional Reserves section in this chapter and Appendix E). Areas selected for salvage harvest are based on the criteria described in Chapter 2 to prevent high fuel loads from fire-killed trees in the future;
- Reduction of fuels by piling and burning, mastication, and underburning within the wildland urban interface and other strategic areas as defined in Chapter 2;
- Replanting of burned areas with an appropriate species mix and spacing for the site; and
- Retention of clumps of snags within treatment areas to ensure that habitat for snag-dependent species is retained.

Table 1-7: Existing and Desired Conditions

Statement of Need	Existing Condition	Desired condition
Worker and public safety and access	Infrastructure, including utility lines, roads, bridges, trailheads, campgrounds, and fire lookouts within the project area, are surrounded by fire-killed and damaged trees and preexisting danger trees that pose a hazard to the public and Forest workers and restrict access. As snags in burned areas are exposed to winter rains, snow, and winds and subsequently deteriorate and decay, risk to human health and safety substantially increase.	Public and forest worker access to public lands along all roadways and trailheads are unimpeded to the extent possible. Hazards from falling danger trees are mitigated to the extent possible, especially nearby roadways and other infrastructure. Salvage harvest areas have reduced amounts of snags, providing for improved safety conditions for forest workers.
Safe conditions for firefighters performing fire suppression for community protection	Within the wildland urban interface, local communities and residential enclaves are nestled within and adjacent to forests in a fire-adapted ecosystem. As snags continue to decay, break, and fall, surface fuel loading and the severity and intensity of future fires will increase. Increased fire intensities and fallen snags inhibit the effective control of future fires and/or put fire suppression crews at increased risk. Progressively increasing fuel loadings where potential flame lengths are projected to exceed four feet. Flame lengths over four feet are resistant to fire suppression tactics. Fallen hazard trees impact road access along miles of roadways, impairing fire suppression efforts.	Hazardous trees and fuels conditions are abated within the wildland urban interface, especially within one-quarter mile of private property structures. Fuel loading is reduced within strategic areas. Fuel breaks are created and maintained for community protection. Probability of future high-intensity wildfires is reduced. Fuel loadings commensurate with surface flame lengths of less than four feet (should the area burn again). Hazards from falling snags are mitigated to the extent possible, improving access for fire suppression and community protection. Risk and effectiveness of fire suppression is improved due to fire breaks, reduced fuel loading, reduced snags, and unimpeded access.
A project that is economically viable	The estimated volume and economic value of the timber is not captured. The project is not implemented and the benefits of improved safety, access, fuels conditions for fire suppression and community protection, and restored and fire-resilient forested ecosystems have not been achieved. Jobs for the local community have not been created.	Dead or dying trees are harvested to produce wood products as consistent with Forest goals. (Forest Plan, pages 4-131 to 4-132 and 4-49). The timber sale and receipts are used to fund project implementation and restoration work, including fuels reduction, reforestation for future wildlife habitat, and the improvement of watershed conditions for fish habitat. Private industry jobs in the forest management sector of the county will be created and/or maintained.

Statement of Need	Existing Condition	Desired condition
Restored and fire-resilient forested ecosystems	Within the wildland urban interface, local communities and residential enclaves are nestled within and adjacent to forests in a fire-adapted ecosystem. Approximately 27% of the fire areas exhibit high vegetation burn severity (75-100% vegetative canopy killed) effects. Most trees within high severity burn areas are expected to die. Approximately 6% of the fire areas burned with moderate severity (50-75% vegetative canopy killed), and a substantial portion of those trees have been killed by fire, and surviving trees are expected to experience high mortality due to fire injury, insects, and the effects of prolonged drought. Progressively increasing fuel loads where potential flame lengths are projected to exceed four feet. Flame lengths over four feet are resistant to fire suppression tactics. Large portions of late successional reserves and habitat burned with high-severity fire are not likely to develop as late successional forests within the next 200 years or more.(Appendix E) Extensive portions of the Klamath River, Scott River and Salmon River watersheds burned. Tributary drainages in these watersheds were affected.	The long-term desired future condition for the project area is a healthy forested landscape with diverse ecosystem conditions reflective of historic vegetation and the ecological capability of the landscape. This includes some natural openings and native browse species vegetation within a largely continuous conifer-dominated landscape. To the extent possible, fire will play a natural role in the ecosystem. However, the desired condition will also include reduced risk of high intensity fire within the wildland urban interface. Fuel loadings commensurate with project surface flame lengths of less than four feet. Within late successional reserves, in the short term, clumps of leave snags will provide post-fire habitat components for a variety of wildlife species. In the long term, a conifer overstory with some understory vegetation components will provide forage and cover for wildlife species. The probability of the loss of remaining or future wildlife habitat from high severity wildfire is reduced. In the long term, fire-resilient forested ecosystems experience less high severity fires, lessening impacts to watershed conditions from future fires.

Proposed Action as Scoped

The project area was adjusted based on more accurate information following field review between scoping and publishing the draft EIS. The proposed action proposed treatment on about 63,883 acres. Based on refining the project area boundary since scoping the draft EIS considered about 62,400 acres for treatment with some overlap of treatments limiting the footprint of the project to about 50,900 acres. After scoping, the proposed action was refined to respond to public comments and internal concerns. A list of these changes were documented in Chapter 1 and were also incorporated into the description of Alternative 2 in Chapter 2 of the draft EIS. Additional clarification or changes needed between draft and final EIS are listed in Chapter 1 and are captured in the description of alternatives in Chapter 2 of this document. An evolution of the proposed action is included in Appendix A with a map that shows how the footprint of the project changed during each phase of the project (Appendix A)

The Westside Fire Recovery project, as described in the scoping notice for the project issued in September 2014, included four overlapping types of treatment: (1) salvage harvest; (2) roadside hazard treatments; (3) hazardous fuel treatments; and (4) site preparation, planting, and release. In addition to the above treatments, the proposed action, as scoped, included treatment along 506 miles of National Forest System roads and 172 miles of state and county roads.

See project website http://www.fs.fed.us/nepa/nepa_project_exp.php?project=45579 for a description of the proposed action as scoped.

Decision Framework

The responsible official for this project is the Forest Supervisor for the Klamath National Forest. This environmental impact statement is not a decision document; it discloses the environmental consequences of implementing the no action alternative or an action alternative. The environmental impact statement also aids the responsible official in determining whether the effects disclosed will have a significant effect on the environment. After analyzing and responding to public comment, the responsible official will make a decision and issue a Record of Decision.

As the Responsible Official, the Forest Supervisor may decide to: (1) select the proposed action; (2) select one of the alternatives; (3) select one of the alternatives after modifying the alternative with additional mitigating measures or a combination of activities from other alternatives; or, (4) select the no action alternative, choosing not to authorize the Westside Fire Recovery project. In making this decision, the Forest Supervisor will consider:

- How well does the selected alternative meet the purpose and need described in this EIS?
- How well does the selected alternative move the project area toward the desired conditions established in the Forest Plan?
- Does the selected alternative mitigate potential adverse effects?

The final decision will be based on the information in this document and the supporting information contained in the project record, consideration of public comments, how well the selected alternative meets the purpose and need for the project, and whether the

selected alternative complies with agency policy, applicable state and federal laws, and Forest Plan direction.

Emergency Situation Determination

In order to facilitate implementation of the project, the Forest requested and was granted an Emergency Situation Determination by Chief Tidwell pursuant to 36 CFR 218.21 on May 13, 2015. Under 36 CFR 218.21(d), a proposed action is not subject to the pre-decisional objection process if the Chief or Associate Chief of the Forest Service determines that an emergency situation exists with respect to all or part of the proposed action or activity. An emergency situation is defined as:

> *"A situation on National Forest System (NFS) lands for which immediate implementation of a decision is necessary to achieve one or more of the following: relief from hazards threatening human health and safety; mitigation of threats to natural resources on NFS or adjacent lands; avoiding a loss of commodity value sufficient to jeopardize the agency's ability to accomplish project objectives directly related to resource protection or restoration." (36 CFR 218.21(b), 2015)*

Excerpts from the May 13, 2015 approval letter by Chief Tidwell:

> *In 2014, the Pacific Southwest Region (Region 5) experienced 1,460 fires on Forest Service managed land, impacting 399,713 acres of national forests. Substantial impacts to human safety, recreation, wildlife habitat, watersheds, and general forest health were felt across the region. Many acres were left in a deforested condition. In response to these impacts, Region 5 received a great deal of interest from the public, counterparts within the Agency at the national level, and Congress asked how the region could work to restore these acres. Regional Forester Moore is requesting five ESDs to cover specific actions within fire areas that cover 285,346 acres.*
>
> *According to Regional Forester Moore's cover letter requesting the ESDs, while the project areas that would be covered by these emergency processes only cover a fraction of the acres affected by the fires experienced in the Pacific Southwest Region in 2014, the acres selected were carefully chosen based on an effort to reduce threats to human safety, wildlife, watersheds, soils, and to promote restoration and reforestation. The projects treat areas that are frequently used for recreation, by agency employees conducting administrative duties, or that are critical to fuels management objectives. While it is critical that the agency restore national forest land and mitigate harmful impacts as much as possible, it is also important that these decisions not unduly impact the remaining resources. We have attempted to strike that balance in the development of these projects. We recognize the importance of the public involvement process/or these projects and are aware that these expedited emergency processes impact the structure of that process. Recognizing that impact, we have made efforts to find ways to involve the public throughout the planning process and to ensure that public concerns are heard, considered, and that the responsible official is factoring that input into the final decision. Increased opportunity for public involvement has been a particularly important part of the two EIS projects, King and Westside, as we balance the need to move quickly while the importance of engaging and responding to the public.*

Alternative Arrangements

On March 6, 2015, the Council on Environmental Quality granted the Forest Service's request for Alternative Arrangements pursuant to 40 CFR 1506.11. As a result, he Forest Service shortened the comment period for the draft EIS from 45 to 30 days, shortening the 45-day comment period requirement for the draft EIS by 15 days, resulting in a 30-day comment period (40 CFR 1506.10(c)). The Forest subsequently extended the comment period for 15 days in response to public requests for additional review and comment time.

The agency is not seeking any additional alternative arrangements for this project.

Public Involvement

Pre-Scoping

The Forest Service conducted robust public engagement throughout the summer while the fires were active and during suppression repair and burned area emergency response (BAER) activities. During the summer, members of the community expressed interest in suppression and related repair activity and in the next steps of fire recovery proposed. The agency's public engagement efforts that began this summer during the fires were used as a platform to continue public engagement efforts and interest related to Westside Fire Recovery project. Prior to scoping for the project, the Forest Service:

- Conducted 34 public meetings during fire operations to explain operations, extent, and impacts of wildland fires on the forest;
- Delivered 200 press releases in local and internet media to give updates and conditions on fire and suppression activity, also conducting multiple radio and television interviews during fire suppression activities; and
- Posted to social media (i.e., Facebook) throughout suppression activities, reaching about 50,000 unique users at the height of activity.

Following the fires, the Forest conducted eight BAER meetings in the affected communities. In mid-November, the Forest conducted eight community-based after-action reviews. These meeting were either hosted by the Forest or in coordination with other agency and community cooperatives, to gather public feedback on the fire suppression efforts.

Scoping

The project was first published to the Schedule of Proposed Actions and the Forest website on October 1, 2014. On October 8, 2014, scoping letters were sent to interested and affected parties, including other public agencies, tribes, adjacent property owners, and interested groups and individuals.

A Notice of Intent to prepare an Environmental Impact Statement for the Westside Fire Recovery project was published in the Federal Register on October 15, 2014. The notice asked that comments on the proposed action be received within 30 days following publication in the Federal Register. On October 14, 2014 a legal notice of scoping was published in the Siskiyou Daily News, beginning the formal scoping process that guides the development of the draft EIS. Comments received by November 14, 2014, were considered in identifying issues and project development.

The Forest used news releases and social media to inform broader audiences. The Forest has created a project website[12] to provide a source for information and avenue for soliciting and providing comments, as well as the standard legal notices and public notifications to meet the requirements of the NEPA. Field trips and public open house meetings were held in the local communities of Yreka, Fort Jones, Scott Bar, Sawyers Bar, Happy Camp, Klamath River, and Seiad Valley to inform, consult, and involve

[12] http://www.fs.fed.us/nepa/nepa_project_exp.php?project=45579

interested parties in an interactive, in-person manner. These efforts also helped the Forest gauge public understanding and perception of the project. At the request of the timber industry, the Forest met with timber industry representatives who provided feedback on industry interest and capacity for salvage harvest using commercial timber sales. The Forest briefed the Siskiyou County Board of Supervisors on October 21, 2014 to present the Westside Fire Recovery proposal.

The comments received as a result of public scoping are summarized in Appendix B of the draft EIS. The interdisciplinary team met and reviewed the scoping responses the week of December 15, 2014 to formulate issues concerning the proposed action. These were sorted by relevant issues and other issues. Criteria on how these were sorted are described in more detail at the end of this chapter. Relevant issues, described later in Chapter 1, were used in the development of all action alternatives analyzed in detail. Other issues were considered and eliminated from detail study. Alternatives eliminated from detail study are described in Chapter 2.

Two local collaborative groups were formed in response to the Westside Fire Recovery proposal, including:

- Citizens' Advisory Committee, which was approved by the Siskiyou County Board of Supervisors and charged with developing consensus recommendations to federal and state agencies on a variety of topics, including the Westside Fire Recovery project.
- The locally-based National Institute for the Elimination of Catastrophic Wildfire has formed "The Westside Klamath Steering Committee" which is comprised of Siskiyou County residents and represents a wide range of interests that reflect the social and economic diversity within the affected area.

See Appendix B for Forest Service responses to recommendations provided during the comment period on the draft EIS.

Public Open Houses and Presentations Prior to Comment Period

It was the intent of the Forest that these preliminary open houses and presentations provide information for the public so that when the draft EIS was published, interested parties were prepared to make informed comments on the proposed action and alternatives within the compressed time frame provided by alternative arrangements.

The Forest Service offered open houses prior to the release of the draft EIS as follows:

- January 30, 2015- Klamath National Forest Headquarters, Yreka, CA
- January 31, 2015 - Fort Jones Community Center, Ft. Jones, CA
- February 3, 2015 - Klamath River Community Center, Klamath River, CA
- February 4, 2015 - Karuk Senior Nutrition Center, Happy Camp, CA
- February 6, 2015 - Salmon River Restoration Building, Sawyers Bar, CA
- February 13, 2015 - Seiad Valley Volunteer Fire Department, Seiad Valley, CA

Presentations of preliminary information to interested parties or local governmental entities prior to the release of the draft EIS were as follows:

- November 18, 2014 – Meeting with Bruce Courtright, Ray Haupt, Larry Alexander
- November 25, 2014 – Meeting with Fire Safe Council of Siskiyou County, Advisory Board
- December 17, 2014 – Meeting with Siskiyou Fire Safe Council
- January 8, 2015 – Meeting with Backcountry Horsemen
- January 13, 2015 - Siskiyou County Board of Supervisors, Yreka, CA;

- January 21, 2015 – Meeting with Fire Safe Council
- January 26, 2015 - Timber Industry Field Trip, Happy Camp Complex area;
- February 5, 2015 – Presentation at Etna Rotary Monthly Meeting
- February 7, 2015 – Meeting at Siskiyou County Fire Chiefs Association
- February 11, 2015 –Meeting at CAL FIRE
- February 18, 2015 – Meeting at Fire Safe Council in Yreka
- February 23, 2015 – Meeting with The Westside Klamath Steering Committee, associated with the National Institute for the Elimination of Catastrophic Wildfire, Northern California Resource Center, Fort Jones, CA;
- February 25, 2015 - Happy Camp Fire Safe Council; and
- March 7, 2015 - Siskiyou County Fire Chiefs Association, Yreka, CA.

The Forest Service offered to provide presentations to other groups, as requested.

Preliminary maps of the proposed action and alternatives were provided to the Karuk Tribe and were also available for review by the public at the Salmon/Scott River and the Happy Camp – Oak Knoll Ranger Districts and on the Klamath National Forest website. Preliminary maps of the proposed action were also provided to interested publics who wished to review the project area in the field in advance of publication of the draft EIS.

Notification of the open houses was shared through the Forest's Facebook page, public website page notifications, and emailing more than 700 contacts including more than 30 media outlets (newspapers, broadcast and internet news sites) with the listing of venues and their respective dates and times. Meetings with local interest groups such as the Siskiyou County Fire Chiefs Association were scheduled with those groups at their request.

While less formal than public meetings, the open houses allowed for small group discussions, which provided the Forest with perspectives and insights into the opinions, local knowledge and values of the communities. At each open house, line officers, principle forest staff and members of the interdisciplinary team were available to answer questions and provide information. Maps and descriptions of the preliminary proposed action and alternatives were also provided. Members of the public were encouraged to provide comments for the record on provided flip charts. These comments were transcribed as closely to verbatim as possible and appear in Appendix B. Attendance ranged from four to five people at Klamath River to more than twenty people at Sawyers Bar.

The open houses provided the opportunity for members of the public to interact with team members and decision makers as they craft this project. Interested participants took the opportunity to ask more in-depth questions regarding policy, procedure, timelines, and opportunities to comment on the draft EIS. Many members of the public were extremely knowledgeable and well informed on fire recovery and the potential effects of various parts of the preliminary proposed action and alternatives. At each open house there were a number of thoughtful and well-rounded discussions of strategic fuel breaks, fuels reduction strategies, restoration actions and other important questions.

There is broad consensus on post-fire work on:

- roadside safety along main and important travel ways;
- defensible space around private property;
- strategic ridgetop fuel breaks; and

- fuels reduction (so that fire can be reintroduced on the Forest, and that future fires are less intense and less impacting on local communities and national forest resources).

The question of salvage of fire-killed trees generated widely diverse views including:

- Salvage as a means of fuels reduction had strong support from some parties, but less so from others.
- A common theme from supporters of salvage as a means to reduce fuels and recover economic value was to maximize the amount salvaged. Several residents of affected communities felt that an even more aggressive approach needed to be taken with the removal of the burned timber to reduce future fuel loads. The need to address the fuel loading that will increase over the next five to seven years in the post-fire area was a major topic of concern especially in and around the wildland urban interface communities. This particular subject area was an urgent theme in areas that had been evacuated in the past or during the 2014 fire season.
- Many local attendees stressed that recovery of economic value was important, particularly if it paid for future restoration, and that economic recovery should be maximized.
- Some parties felt that fire-killed trees should only be salvaged if they presented a safety hazard along main roads or posed a fuels risk to local communities, and that burned areas should otherwise not be salvaged.
- Reforestation of fire damaged sites also raised many opinions and concerns:
- Nearly all commenters on this topic wanted to make sure that species selection for reforestation was appropriate for the site in question, and that a mix of species should be planted. Several commenters noted that hot, dry south slopes and rocky sites that would not support coniferous forests should not be replanted with conifers.
- Several commenters noted that any replanting needed to be widely spaced rather than densely stocked plantations. Some commenters felt that planting trees was a poor investment in many cases, and that most sites should be allowed to re-vegetate naturally.

Comment Period on the Draft EIS

On March 6, 2015, the draft EIS and supporting documents were posted to the project's webpage. Email notifications and letters of the draft EIS comment period were sent to interested and affected parties, including other public agencies, tribes, adjacent property owners, and interested groups and individuals. On March 6, 2015, the Council on Environmental Quality granted the Forest Service alternative arrangements, shortening the required comment period on the draft EIS by 15 days or from 45 to 30 days. On March 13, 2015, a Notice of Availability was published in the Federal Register and a legal notice was published in the Siskiyou Daily News, beginning the 30-day comment period. On April 3, 2015 a notice of extension of the draft EIS comment period was published in the Federal Register and the Siskiyou Daily News. The comment period was extended an additional 15 days in response to public requests for addition review and comment time. Comments received by April 27, 2015, were considered timely and addressed in response to comments (Appendix B).

Public Open Houses and Presentations before and during Comment Period on the draft EIS

During the comment period additional field trips and public open house meetings were held in the local communities of Yreka, Fort Jones, Scott Bar, Sawyers Bar, Happy Camp, Klamath River, and Seiad. In addition to hosting field trips and public open house

meetings locally, Forest Service representatives also traveled to neighboring communities of Eureka and Redding, California and to Medford, Oregon.

The Forest Service offered open houses after the release of the draft EIS and prior to the release of the final EIS included:

- March 7, 2015 – Open House with Siskiyou County Fire Chiefs Association
- March 26, 2015 – Open House at Salmon/Scott River District Office
- March 27, 2015 – Open House at Scott Bar Community Hall
- March 31, 2015 – Open House in Happy Camp
- April 2, 2015 – Open House at Klamath River Community Center
- April 4, 2015 – Open House at Klamath HQ
- April 7, 2015 – Open House in Eureka, CA
- April 14, 2015 – Open House in Seiad Valley
- April 17, 2015 – Open House in Redding
- April 21, 2015 – Open House in Medford, OR

These open houses were similar to those hosted by the Forest between scoping and the release of the draft EIS. They provided an opportunity to share with the public information about how each alternative was developed and how they changed based on public comments received during the scoping period. It also gave the public an opportunity to voice their concerns on the effects the project may have on the community, future fuels concerns, and habitat issues for different wildlife species. These open houses also provided the opportunity to speak with people who had helped write the draft EIS. Maps were provided to members of the public showing updated maps and description of alternatives as they were being developed. This also included information about the Karuk Alternative. Handouts were provided to attendees which consisted of information about each action alternative, the timeline for the project, a link to the project website with detailed instructions on how to comment on the project.

Presentations of preliminary information to interested parties or local governmental entities after the release of the draft EIS and prior to the release of the final EIS included:

- March 14-15, 2015 – Information Booth at Sportsman's Expo
- March 20, 2015 – Meeting with the Westside Klamath Steering Committee.
- March 24, 2015 – Radio Broadcast on Jefferson Exchange Radio
- March 25, 2015 – Radio Broadcast on KSYC
- April 3, 2015 – Meeting in Seiad Valley
- April 20, 2015 – TV Interview KDRV
- April 24, 2015 – Public Tour with Klamath River FSC

Results of the Draft EIS Comment Period

A total of 13,413 comment letters were received during the Westside Fire Recovery draft EIS comment period. The agency received 265 unique letters, 21 master form letters, and 263 form plus letters (with slight modifications of the master form letters; the remainder of the letters were form letters identical to one of the 21 master form letters). A large portion of these letters were hand-delivered to the Forest Service at the Medford, Oregon open house on April 21, 2015. Other form letters were emailed to the Forest Service and included a mixture of opposition and support for the project. A large portion of the comments also expressed opinions or preferences for or against different alternatives; see Appendix B for a summary table of this review.

Many commenters expressed concerns regarding:

- Impacts to wildlife and wildlife habitat;
- Impacts to watersheds and fisheries resources;
- Procedures related to public comment and review opportunities (i.e. emergency situation determination and/or alternative arrangements) and/or decision and implementation timelines;
- Value of harvested timber;
- Fuels conditions post-fire and/or post-salvage, especially near communities and in the Wildland Urban Interface; and
- Forest Plan consistency or other legal requirements.

A table of comments received and how the Forest responded is included in Appendix B (Response to Comments).

Tribal Consultation

Tribal consultation was initiated via letters dated October 8, 2014 with the Confederated Tribes of the Grand Ronde, Confederated Tribes of the Siletz, Karuk Tribe, Klamath Tribes, and the Quartz Valley Indian Reservation. Consultation under NEPA and Section 106 continues through correspondence, meetings, government-to-government meetings, emails, telephone calls and field trips. The Shasta Nation, Inc. and the Shasta Indian Nation tribes are also involved in the processes.

The Forest is conducting consultations to solicit input from the tribal governments regarding their assessment of effects on resources traditionally used by tribes and cultural values related to those resources within the area where project activities are proposed.

Formal government-to-government meetings were held with the Karuk Tribe on November 12, 2014, February 19, 2015 and May 11, 2015; tribal council members have also been present at informal government-to-government meetings as well as staff-to-staff meetings, including weekly conference calls and in-person meetings. Formal project comments were received from the Karuk in response to scoping (November 14, 2014) and after the publication of the draft EIS. Late on March 5, 2015, the day prior to publishing the draft EIS, the Karuk submitted a project alternative. This alternative was incorporated into the draft EIS as Appendix G and was available for public comment. Because a large portion of the project area is within Karuk aboriginal territory and with the receipt of a Karuk project alternative, tribal consultation with the Karuk has been robust and is captured in the project record.

A government-to-government meeting was held with the Quartz Valley Indian Reservation on November 20, 2014 and formal project comments received on December 22, 2014. On April 2, 2015 a field trip was conducted with the Quartz Valley Indian Reservation chair and staff. Comments from the tribe were incorporated into project alternatives. Consultation and information exchange with all local tribes is ongoing.

The Forest is seeking information from Indian tribes and Native American organizations on the Westside Fire Recovery Programmatic Agreement, which specifically addresses the Section 106 of the National Historic Preservation Act process for this project. Consultation with the tribes on this agreement was initiated via letter dated February 18, 2015. The Karuk Tribal Historic Preservation Officer requested that the Advisory Council on Historic Preservation participate in the development of the programmatic agreement; the Advisory Council on Historic Preservation notified the Forest via letter

dated June 15, 2015 that they will participate. Consultation on this agreement with tribes, Native American organizations, Advisory Council on Historic Preservation and the California State Office of Historic Preservation are on-going.

Ongoing Regulatory Consultation

The Forest has been actively consulting with regulatory agencies as well as local and national elected officials. The Forest is developing a project-specific programmatic agreement with the State Historic Preservation Office for compliance with the National Historic Preservation Act (see Tribal Consultation section above). Regarding the Endangered Species Act (ESA), the Forest is consulting with the U.S. Fish and Wildlife Service about the effects of the project on the federally-listed northern spotted owl. Pacific fisher is proposed for listing as "threatened" under the ESA. The Forest Service would conference with the U. S. Fish and Wildlife Service if it is determined that the Westside Fire Recovery Project would threaten the continued existence of Pacific fisher. If Pacific fisher is listed under the ESA, the Forest Service would initiate formal consultation under Section 7 of the ESA. The Forest is also consulting with National Oceanic and Atmospheric Administration, National Marine Fisheries Service about the effects of the project on the ESA-listed Coho Salmon. The Forest is also working up-front with the North Coast Regional Water Quality Control Board regarding compliance with the Clean Water Act. The Forest will continue consultation efforts with all parties to ensure the Westside Fire Recovery Project is in full compliance with federal laws and regulations.

Issues

Scoping comments from the public, other agencies, and tribes were used to formulate issues concerning the proposed action. The Forest Service separated the issues into two groups: relevant issues and other issues. Relevant issues were defined as those directly or indirectly caused by implementing the proposed action. Other issues were identified as those: 1) outside the scope of the proposed action; 2) already decided by law, regulation, Forest Plan, or other higher level decision; 3) irrelevant to the decision to be made; or 4) conjectural and not supported by scientific or factual evidence. The Council on Environmental Quality NEPA regulations explains this delineation in Sec. 1501.7: "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…"

The Forest Service received 749 unique comments by means of 98 unique letters, and 1,556 form letters during the scoping period. Scoping comments are summarized in Appendix B. Four issues were determined to be relevant to alternative development or modification and are described in Table 1-8.

Table 1-8: Relevant issues and how they were addressed in project design

Relevant Issue #1.	**There is a disagreement about effects of salvage logging on wildlife habitat (e.g. northern spotted owl, Pacific fisher, and snag-associated species) and general wildlife habitat fragmentation and connectivity.**

Relevant Issue #1.	**There is a disagreement about effects of salvage logging on wildlife habitat (e.g. northern spotted owl, Pacific fisher, and snag-associated species) and general wildlife habitat fragmentation and connectivity.**
	Alternative 2 responds to this issue. Following scoping the proposed action was refined to remove treatment in northern spotted owl cores classified as high potential for reproduction. Units that intersected these cores were removed from salvage harvest treatment. Criteria was clarified to include only areas of moderate to high severity vegetation mortality with more than ten contiguous acres of medium to high severity vegetation mortality and less than 40 percent crown closure to avoid habitat fragmentation and address concerns about connectivity. Alternative 3 responds to this issue by removing treatment in salvage harvest units classified as moderate potential for northern spotted owl reproduction. Moderate ranked core areas were identified at an owl home range scale. Salvage harvest units were also removed from treatment if they were less than 20 acres in size to avoid habitat fragmentation and address concerns about connectivity. This alternative also removes salvage treatments in units located in the Beaver project area in order to retain fisher connectivity in Beaver Creek. Fisher habitat will be protected by not removing large decadent hardwoods with cavities, selecting Douglas-fir and ponderosa pine snags over true fir snags where possible, and retaining snags within or adjacent to unique landscape features such as rock outcroppings, seeps, and springs. The following project design features were developed or modified following scoping to address this issue: Wildlife-11, 12, 18, 19, 20, 21
Relevant Issue #2.	**There is a disagreement about the effects of salvage logging and required infrastructure on watershed health (e.g. beneficial uses, Coho Salmon habitat, and soil productivity).**
	Alternative 4 responds to this issue by identifying key watersheds and proposing to treat these watersheds differently to account for the specific conditions, water quality and fish habitat impairments, and recovery potential of each. Alternative 4 would reduce the ground disturbance-related impacts in these areas by eliminating temporary road actions (except for less than 250 feet stretches of temporary road on ridgetops). This alternative also includes restorative actions within riparian reserves where they occur within salvage harvest units, eliminates hazard tree removal on Maintenance Level 1 roads that are not used by the project, and allows for no landing construction within riparian reserves. The following project design feature was developed or modified following scoping to address this issue: Watershed-5
Relevant Issue #3.	**There is a disagreement about the effects of salvage logging and site preparation on late successional reserves and riparian reserves.**
	Alternative 2 responds to this issue following scoping by clarifying that salvage harvest treatments are not proposed in any riparian reserves associated with stream channels or in hydrologic riparian reserves. Site preparation was modified after scoping to include hand treatment only in riparian reserves within plantation site preparation and planting units. Treatment will include hand-work only (no ground-based equipment) and lop-and-scatter or other fuels reduction will be implemented if fuel loading is above seven tons per acre; fuels may be hand-piled or windrowed and burned. Alternatives 3 and 4 respond to this issue (see description of how these alternatives address relevant issues #1 and #2. Alternative 5 responds to this issue because it proposes only treatment in units within matrix lands and removes salvage harvest and site preparation from all riparian reserves and late successional reserve management areas.
Relevant Issue #4.	**There is a disagreement about whether or not the proposed action sufficiently reduces fuels adjacent to private timber lands in the Beaver Fire area.**
	Alternative 5 responds to this issue by including treatments on an additional 1,200 acres adjoining private land to increase fuel breaks along ridge and road systems within the Beaver Fire area. Units were identified based on proximity to private timberlands and the concept of connecting fuel treatments utilizing an “all-lands” approach. These additional hazardous fuels treatments in coordination with salvage harvest will reduce high densities of snags and surface fuels adjacent to private timberlands. .

Other Issues

Other issues were raised by the public that are being addressed by Alternative 1 (no action), Alternative 2 (the refined proposed action), alternatives considered but eliminated by detailed study, and/or are being handled through responses to public comment.

Other Issue #1.	**There is a disagreement about:** • **where salvage logging should be proposed (in low to moderate fire severity, where fires were ignited from below);** • **what trees will be identified for removal;** • **what the effects will be on natural growth of plants and natural fire regimes (including risks of high intensity wildfire, and culturally-important plants) and roadless area characteristics; and** • **what the cumulative effects of the project will be added to the effects of other projects.**
Other Issue #2.	There is a disagreement about the economic effects of the project: • whether enough trees will be salvage logged to provide economic benefits; • how limited operating periods will limit economic opportunities; and • whether the true environmental economic costs will be analyzed.
Other Issue #3.	There is a disagreement about the effects on safety and the environment from the number and criteria for choosing trees to be removed through roadside hazard treatments: • how many trees need be removed to provide safe travel along roads; and • how removing hazard trees, especially below roads, affects safety.
Other Issue #4.	There is a disagreement about the species and density of trees proposed for planting and the costs and benefits of reforestation through planting.
Other Issue #5	There is a disagreement about the environmental costs and benefits of the project to: • air quality; • climate change; • cultural resources; • economics; • forest health; • fire and fuels; • invasive species (noxious weeds); and • recreation and scenery; • soils, geology, and watershed protection; • vegetation, especially the timber resource; and • wildlife species and habitat (especially snag-associated species).

Chapter 2 Alternatives, Including the Refined Proposed Action

Introduction

This chapter describes and compares the alternatives considered for the Westside Fire Recovery project. It describes the seven different alternatives considered in detail, an alternative developed by the Karuk Tribe during tribal consultation, and ten alternatives considered but eliminated from detailed study. The chapter also displays, in tabular format, the alternatives considered in detail so that the alternatives and their environmental impacts can be quickly and easily compared.

Best Available Information and Data Quality

The draft and final EIS were prepared using a combination of remote sensing analysis tools such as the Rapid Assessment of Vegetation Condition after Wildfire (RAVG), soil burn severity assessments, standard Geographic Information System (GIS) spatial data, forest vegetation and transportation databases, and field verification of on-the-ground conditions. Areas proposed for treatment were field verified by resource specialists. These areas were visited by resource specialists in order to make the final EIS as accurate as possible. Mapping of proposed salvage units and site preparation and planting units is based on RAVG assessments of fire severity, Forest GIS databases, and field verification. Unit boundaries, treatment acres, and analysis of effects changed between draft and final EIS based on updated surveys and additional field reconnaissance.

Changes in Field Data between Publication of the Draft EIS and the Final

Changes in Estimated Mortality in Units:

Mortality in fire-damaged trees after a large fire is common. Trees that appear to have survived the fire (i.e. have green needles) show up as live trees in the RAVG data but later die from damage to the cambium or roots of the trees, or from secondary factors such as drought stress or insect attack. Proposed risk-reduction salvage units were located in the most severely burned areas where any surviving trees had been exposed to higher intensity fire than those in less severely burned areas. RAVG data that estimated fire-caused mortality used in publication of the draft EIS was taken from remote sensing imagery acquired in October 2014. At the time the RAVG data were acquired, many of the proposed salvage units had islands of trees that had less than 50 percent mortality. Areas with less than 50 percent mortality were shown in the DEIS as islands within salvage units that would be retained; however, fire severity in those areas had not been field verified at that time. The winter of 2014-2015 was drier and warmer than normal so fire-damaged trees likely experienced more stress than would have normally occurred. Between publication of the draft and final EIS, extensive secondary mortality from drought and insect attack has occurred in all RAVG classes. With warmer and drier weather in the spring of 2015, field crews reported many of the areas reported as having very low to low fire severity (RAVG Classes 1 and 2) in proposed treatment units were now showing additional mortality from fire damage, drought and insect attack. Most patches of less than 75 percent mortality in the RAVG data (Classes 1, 2 and 3) have advanced at least one class, or are now totally dead. Essentially all of the pockets of moderate fire severity (RAVG Class 3) in proposed salvage units are now greater than 75

percent dead. An estimated 75 percent of the RAVG Class 2 (25 to 50 percent mortality) in salvage units have become RAVG Class 3 or 4 stands (greater than 50 percent mortality). An estimated 50 percent of the very low severity (RAVG Class 1) stands within salvage units have become RAVG Class 3 or 4 stands (greater than 50 percent mortality).

In the draft EIS, in Alternatives 2 through 5, salvage treatment areas avoided hydrologic Riparian Reserves and areas where less than 50 percent mortality occurred; this is also the case for Alternative 2 Modified in the final EIS. Since receiving information about the increased mortality that has occurred since October 2014, acre estimates for proposed salvage harvest and graphs of salvage harvest and retention areas in each of these alternatives have been modified to reflect the additional mortality that had occurred by the time the final EIS was completed. Salvage harvest treatment acres are estimated acres within units where more than 50 percent mortality occurred and where salvage activity is proposed. Units are larger than potential treatment areas because they include salvage harvest acres plus areas where no harvest will occur. These include hydrologic riparian reserves, areas with less than 50 percent mortality within unit boundaries, and additional snag retention areas.

In Alternative 3 Modified, remaining areas of lower mortality were flagged out of units, or designated as snag retention areas which are marked on the ground. As a result, Alternative 3 Modified shows no islands of RAVG 1 or 2 areas because there are none within unit boundaries. In all stands within proposed salvage units, individual trees with greater than 70 percent probability of mortality have been marked for retention.

Changes in Riparian Reserves:

Riparian Reserve boundaries in Alternatives 2, 3, 4, 5 and Alternative 2 Modified are based on the Forest GIS layer. This is a map product derived from remote sensing and topographic data. In Alternative 3 Modified, Riparian Reserves have been field verified and marked on the ground.

Alternatives Considered in Detail

In the draft EIS the Forest originally developed 14 action alternatives to the proposed action, four of which were designed to achieve were studied in detail because they fully met the purpose and need of the project. These alternatives were developed based on the issues identified through public comment during the scoping process. Project design features were developed and incorporated into the alternatives considered in detail to minimize or eliminate negative effects of the project, and protect and promote late successional habitat, consistent with the Forest Plan. The final EIS added language to clarify existing alternatives and project design features described in the draft EIS based on comments received during the comment period and though consultation with regulatory agencies and local tribes. These modifications are listed in Chapter 1 of this document.

For this final EIS, a total of 18 alternatives were considered, 7 alternatives in detail and the 10 alternatives considered but eliminated from detailed study. In addition to the 14 action alternatives developed for the draft EIS the Forest Service received an alternative from the Karuk Tribe on March 5, 2015, the day before printing of the draft EIS. The Karuk alternative was incorporated into Appendix G of the draft EIS and was available

for public review and comment during the draft EIS comment period. Lastly, the Forest Service developed two additional alternatives between the draft and final EIS that are analyzed in detail in the final EIS and will be considered in the decision. These latter alternatives are reflective of ideas raised during the public comment period on the draft EIS, collaborative efforts, and consultation with regulatory agencies and federally-recognized tribes. Alternative 2 Modified and Alternative 3 Modified are a combination of actions already proposed in the alternatives presented for public comment in the draft EIS. These two additional alternatives are within the range of actions already proposed and their effects are within the scope of analysis already considered in the draft EIS. The no action alternative, proposed action, and other alternatives studied in detail are described below. The agency also considered and analyzed the no action alternative in detail. Maps showing areas considered for treatment for each action alternative studied in detail are found in Appendix A.

Alternative 1

Alternative 1 is the no action alternative and proposes no treatment within the project area as part of the implementation of this project. Other projects and activities within the project area will be implemented as analyzed and planned by other analyses and subsequent decisions. The no action alternative provides reviewers a baseline to compare the magnitude of environmental effects of the action alternatives for this project. It also provides a picture of the results if natural regeneration were to take place across the entire project area.

Alternative 2

Alternative 2 was originally scoped as the proposed action which was developed in response to landscape-level changes to forested habitat resulting from the 2014 wildfires on the Forest. Alternative 2 was originally designed with the intention of meeting the purpose and need of the project, while being consistent with Forest Plan direction and law, regulation, and policy. After initial evaluation, the Forest Service resource specialists identified areas that would meet the purpose and need of the project on a landscape scale. Alternative 2 was later refined following scoping and the comment period on the draft EIS, and after the Forest identified areas where resources may be negatively impacted by implementation of Alternative 2. The description of Alternative 2 and acres of treatment proposed in this alternative were adjusted based on site-specific information collected after field verification and as needed to meet Forest Plan direction and applicable, law regulation, and policy. See Appendix A for a detailed map and description of the evolution of the project.

Acres by treatment type are described in detail below and do not account for the overlap in treatment types. This project includes the following five types of treatments: (1) salvage harvest; (2) roadside hazard treatments; (3) hazardous fuel treatments (including wildland urban interface, fuels management zones, roadside fuels treatments, and prescribed burning) (4) site preparation, reforestation, and release; and (5) hand treatment in Riparian Reserves. Hand treatment in Riparian Reserves was originally discussed as part of the site preparation treatment but was removed from that description to clarify that the proposed treatment does not always include planting and to be easily comparable to the other alternatives with similar treatments. All five of these treatments were developed to provide fire managers improved options for effectively managing potential future

wildfires. Criteria used to identify areas for treatment are described below as part of each treatment type.

Connected actions are also described as part of Alternative 2. Included in this description of connected actions are existing legacy sediment sites that were identified and will be scheduled for treatment in compliance with the Clean Water Act as a condition of the North Coast Regional Water Quality Control Board waiver of waste discharge requirements (Order No. R1-2010-0029). Some legacy site work is covered under previous NEPA documents and will not be discussed as part of Alternative 2.

Timing of treatments

Salvage harvest and roadside hazard treatments will begin immediately following the decision and will be completed as soon as possible, likely within a year or less. Site preparation, planting, and the majority of fuels treatments will also begin immediately where possible (with some following salvage harvest and roadside hazard treatments, as needed). The majority of site preparation, planting, and fuels treatments will be completed within three years of the decision. Five years after the fire, conditions will be ripe for underburning. Our target for completion of all project treatments is within seven to eight years of the decision.

Salvage Harvest (about 7,940 treatment acres within 11,090 acres of units)

The intended purpose of salvage of fire-killed trees is to reduce the amount and continuity of fuels that would be created when those trees break or fall to the ground and become surface fuel. Risk reduction salvage units have been proposed because of their location relative to private lands, communities at risk, important access / ingress / egress roads and proposed ridgetop fuel breaks. These actions compliment proposed fuel reduction and strategic fuel management zones as part of a landscape scale strategy to reduce the size and severity of future fires. Creating large blocks where fuel loads have been reduced in concert with ridgetop fuel breaks also provides control points for fire suppression, and increases the likelihood that large fires could be contained along watershed boundaries. Reducing the size and severity of future fires serves to reduce risk to wildlife habitat and improves the likelihood of firefighting success. Salvage harvest would also promote ecosystem sustainability by increasing the likelihood and speed by which burned forested areas are reforested by opening areas for safe planting.

- Areas proposed for salvage harvest treatment include:
    1. Areas with more than ten contiguous acres of moderate- to high-severity vegetation mortality and less than 40 percent crown closure;
    2. Areas determined to be feasible in terms of logging systems, accessibility, and economics; and
    3. Units outside of northern spotted owl core areas where there is less than 50 percent of effective nesting, roosting or foraging habitat remaining within the core area.

Between the draft EIS and final EIS additional treatment units were dropped, removing about 610 acres from proposed salvage harvest due to economic viability of units, public comment, and/or consultation. Overall salvage harvest treatment is proposed in about 7,940 acres within the larger unit boundaries, using the acreage refinements based on increased mortality between October 2014 and July 2015. Unit acres total about 11,090

acres and are larger than potential treatment areas because they include areas where no harvest will occur such as hydrologic riparian reserves and areas with less than 50 percent mortality that are within unit boundaries as well as salvage harvest acres (Table 2-1).

Standing dead trees 14 inches in diameter at breast height or greater will be considered for salvage using the guidelines in Report #RO-11-01 "*Marking Guidelines for Fire-Injured Trees in California*" (Smith & Cluck, 2011). These guidelines were developed using peer-reviewed scientific literature to evaluate tree species for mortality in northern California. These guidelines provide a sliding scale of the probability of mortality in different tree species based on the percentage of volume of the tree burned or length of crown scorched by fire. Fire affected trees with a 70 percent or greater chance of dying within the next three to five years will be considered for salvage harvest.

Recommendations identified in the Forest-wide Late Successional Reserve Assessment (USDA 1999) follow Forest Plan direction focusing on long-range objectives and direct management actions following a stand-replacing event to be designed to accelerate or not impede the development of late-successional characteristics. Management direction for salvage in Late Successional Reserves (Forest Plan, pages 4-87 through 4-88) will be followed throughout the project. Project design features are incorporated into the project design to ensure this, as described in Table 2-42.

Salvage logging treatments will be accomplished by a combination of ground-based, skyline, and helicopter logging systems (Table 2-1). All salvage units will be reforested (see reforestation section below) with the need for site preparation evaluated per criteria outlined in site-preparation section below.

No salvage harvest is proposed within wilderness, backcountry, research natural areas, designated or recommended wild rivers, inventoried roadless areas, riparian reserves associated with stream channels (hydrologic riparian reserves) or high ranked northern spotted owl cores as described in Alternative 3 in the project area.[13]

The Westside Fire Recovery project seeks to meet the objective of retaining large material (including snags and coarse woody debris) until the next stand is capable of producing such material by:

- Retaining large "legacy" green trees wherever they occur. By virtue of their location and/or inherent resistance to fire, large green trees are most likely to persist until the next stand can develop large structures.
- Retaining snags in Riparian Reserves. This has the effect of retaining the larger trees, on average, on the landscape in locations that historically burned with less intensity. Large snags are more likely to persist than small snags.
- Designating additional snag retention areas in association with Riparian Reserves or in pockets of larger trees. Emphasis for additional snag retention areas was placed on lower slopes that historically have burned with lower intensity.
- Reducing fuels around Riparian Reserves and snag retention areas by salvage harvest and follow-up activity-fuel treatment. By reducing the amount and continuity of surface fuels, the risk of future high severity fire affecting remaining snags and down wood is reduced (Figure 7 of Appendix E).

[13] This refers to hydrologic not geologic riparian reserves. Salvage harvest is proposed in geologic riparian reserves. Hydrologic riparian reserves will likely need to be crossed to access certain harvest stands.

- Treating small fuels in Riparian Reserves by broadcast burning at the time that activity fuels are treated. This reduces the small surface fuels that readily ignite and carry fire but is unlikely to harm most of the larger snags because they will not yet have developed the surface that is receptive to embers.

Table 2-1: Acres of salvage harvest treatment within Alternative 2 units by logging system

Logging System	Beaver Fire	Happy Camp Complex	Whites Fire	Grand Total
	Acres of Treatment[a] (within Unit)[b]			
Ground-based	420 (660)	410 (670)	20 (40)	850 (1,370)
Skyline	170 (200)	3,380 (4,670)	180 (270)	3,680 (5,140)
Helicopter	0	3,000 (4,050)	360 (540)	3,410 (4,580)
Total Treatment Acres (Unit)	**590 (860)**	**6,790 (9,390)**	**560 (850)**	**7,940 (11,090)**

[a] Treatments are estimated acres within units where more than 50 percent mortality occurred and where salvage activity is proposed. Treatment areas avoid hydrologic riparian reserves and areas where less than 50 percent mortality occurred.

[b] Units are larger than treatment areas because they include areas where no harvest will occur such as hydrologic riparian reserves and areas with less than 50 percent mortality that are within unit boundaries as well as salvage harvest acres.

Both acres of treatment and acres within units are estimates based on GIS and field data. Values are rounded to the nearest ten acres.

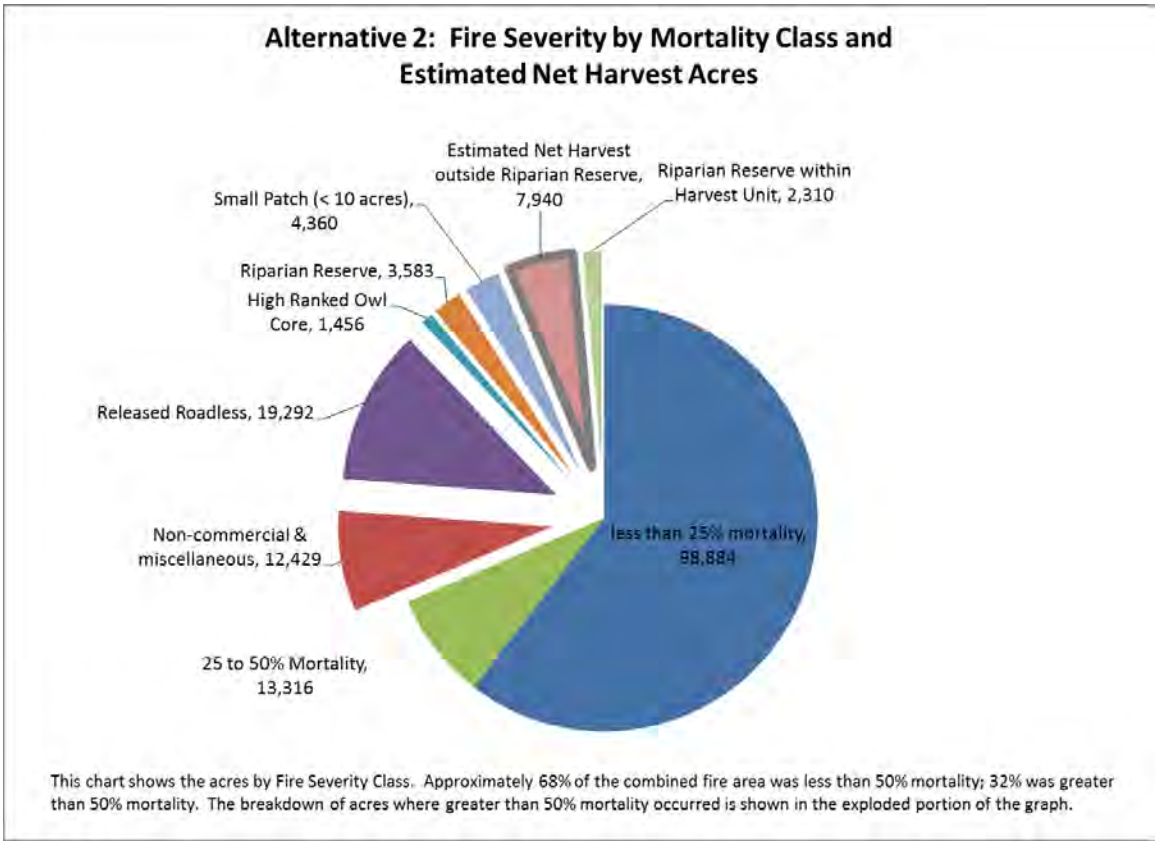

Figure 2-1: Fire Severity by Mortality Class and Estimated Net Harvest Acres in Alternative 2

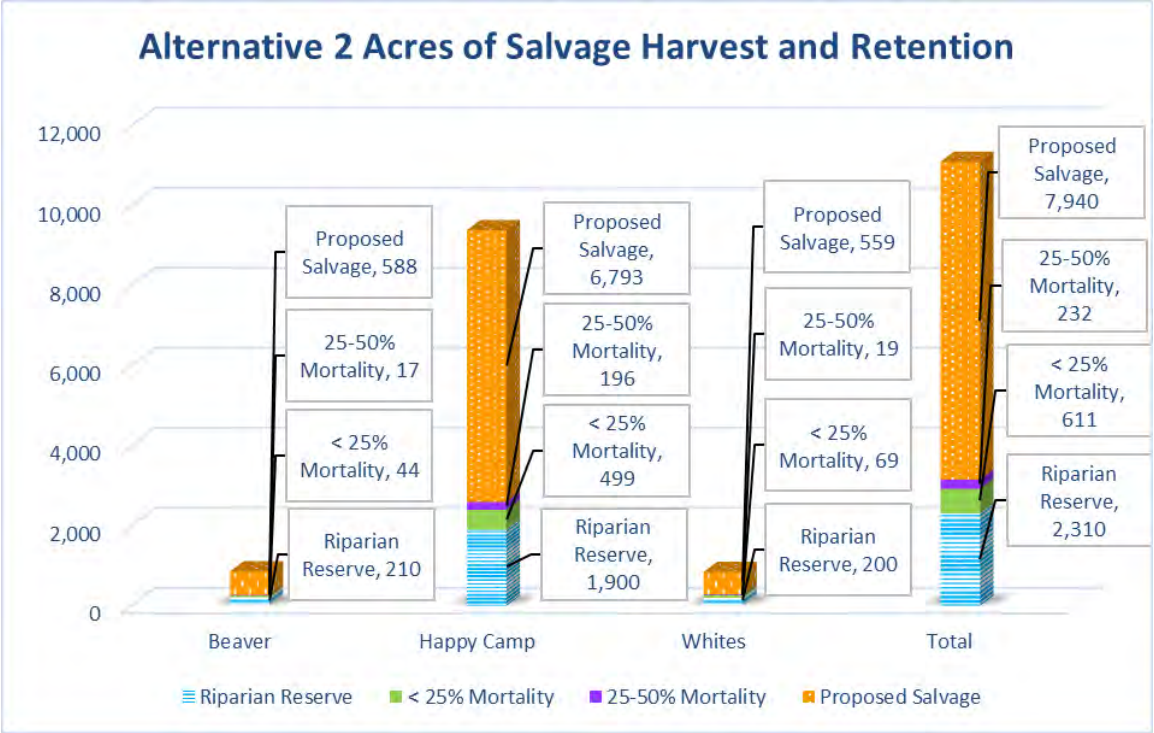

Figure 2-2: Acres of Salvage Harvest and Retention within Treatment Units in Alternative 2

Roadside Hazard Treatments (640 miles of roadways being evaluated; 5,080 acres of estimated treatment)

Roadside hazard treatment was developed to provide for both public and Forest worker safety and future fire suppression efforts. Roads classified in all maintenance levels (described in Table 2-2) will be considered for roadside hazard treatments. A hazard (or danger) tree is defined as a standing tree that presents a hazard to people due to conditions such as deterioration of or damage to the root system, trunk, stem, or limbs or the direction or lean of the tree (29 CFR 1910.266(c); FSH 6709.11, glossary). Only hazard trees identified by this definition will be removed. Where no hazard trees are present, there will be no hazard tree removal.

The Forest will evaluate 640 miles of Forest System roads, county roads, and state highways for roadside hazard trees. Within the evaluated areas, hazard trees will be identified to be cut and possibly removed as it meets the criteria described below. Trees along all Forest System roads within the project boundary will be evaluated for the potential of a hazard tree to hit the road using the guidelines of "assessing targets" in the Regional Hazard Tree Guidelines for Forest Service Facilities and Roads in the Pacific Southwest Region (Angwin et al. 2012, page 8). Roadside hazard reduction is proposed within 250 feet on either side of these roads to address hazards. This includes Maintenance Level 1 (see Table 2-2) roads used by Forest Service employees and contractors for administrative purposes. Because of slope, a few fire-killed trees farther than 250 feet from a road may still present a hazard to the road and thus need to be removed. However, the majority of hazard trees will be within the 250-foot buffer of a road.

Two different assessments will be made using the Hazard Tree Guidelines in identifying roadside hazard trees along the Forest System roads. First, to identify fire-injured or fire-killed trees burned in the 2014 fires along Forest Service system roads within the project area that have a 60 percent or greater chance of dying within three to five years, definitions in Report #RO-11-01 "Marking Guidelines for Fire-Injured Trees in California" (Smith & Cluck, 2011) were used. These trees will be removed if they are a potential threat to the roadway.

Second, for trees that do not have a 60 percent or greater chance of dying within three to five years due to fire-injury, the Hazard Tree Guidelines will be used to identify if these trees are a moderate or high potential hazard to the roadway (Angwin et al. 2012, page 20). Moderate hazards are those hazards that can be monitored or mitigated to abate hazard. Live trees or trees that are still green but have defects that may classify them as potential hazards according to the Hazard Tree Guidelines will not be cut immediately but will be monitored and evaluated for possible future removal if they are classified as having moderate hazard potential. Trees identified as having high hazard potential will be removed promptly. All dead trees, standing trees 4.5 feet or taller without a green point of growth, that are defined as hazards will be removed.

Merchantable trees will be removed when consistent with applicable project design features (Botany-3, Recreation/Scenery-11, Watershed-12, 13, and 14, and Wildlife-19, as described in Table 2-42. Removal of merchantable roadside hazard trees will include the use of ground-based, skyline, and helicopter logging systems. Non-merchantable trees will be piled and burned where the treatment is along a strategic road for hazardous fuels treatments, described below. Non-merchantable trees will be cut and left when they are not along a road defined as strategic for fire and needing fuels treatment. Per agency policy already in place, the public may obtain a permit to remove felled trees for firewood in accordance with permit requirements. The agency anticipates the local public will remove firewood along roadways, especially near communities.

Where there is overlap with salvage treatment units, both hazard trees and those trees fitting the salvage harvest prescriptions will be cut and removed in accordance with project design features.

Fire severity and vegetation type data were used estimate the acres proposed for roadside hazard treatment. The vast majority of the trees proposed for harvest are found within the "concentrated areas" located within forested areas of high or moderate severity with generally larger blocks of tree mortality. Approximate acres of concentrated treatments were determined by including only forested areas (greater than 10 inches in diameter at breast height) of moderate or high fire severity outside of salvage harvest units and plantations. Approximate acres of scattered treatments were determined by including only forested areas (greater than 10 inches in diameter at breast height) of low or very low fire severity inside or outside of salvage harvest units. Within the 640 miles of roadways being evaluated, it is estimated that logging within roadside hazard treatments is proposed within a total of 5,080 acres, including 1,422 acres of "concentrated" treatment and 3,658 acres of "scattered" treatment.

Miles by maintenance level considered for roadside hazard treatments are described in Table 2-2. Maps showing areas considered for roadside hazard treatment are found in Appendix A.

Table 2-2: Miles of Roadside Hazard Treatments by National Forest Transportation System Maintenance Level

Road Type by Maintenance Level	Beaver Fire	Happy Camp Complex	Whites Fire	Grand Total
Level 1 (basic custodial care, closed to public)	17	49	3	69
Level 2 (high clearance vehicles)	66	183	31	280
Level 3 (suitable for passenger cars)	30	67	15	112
Level 4 (moderate degree of user comfort)	2	7	0	9
Level 5 (high degree of user comfort)	2	0	0	2
County Roads and State Highways	49	96	27	172
Grand Total (miles)	166	402	76	644

Hazardous Fuels Treatments (about 22,220 acres)

In addition to salvage harvest, roadside hazard treatments, and site preparation treatments described in this alternative, hazardous fuel treatments will further reduce the dangers associated with heavy fuel loading, especially within the wildland urban interface. The total acres proposed for hazardous fuels treatments were reduced from 22,890 acres to 22,220 acres between draft and final EIS[14]. Hazardous fuels treatments are not within Wilderness, research natural area, or wild river land allocations. Hazardous fuels treatments may occur in both hydrologic and geologic Riparian Reserves.

Fuels treatments were developed using the criteria listed below and include: lop and scattering, chipping, mastication, broadcast burning, jackpot burning, and pile burning.

The following criteria were used to identify areas, strategic roads and ridgelines needing hazardous fuels treatments:

- One-quarter mile buffer from private property structures in burned areas or within areas that underwent fire suppression-related activity;
- 500 feet from infrastructure (e.g. utility lines, communication sites, campgrounds, lookouts, bridges, etc.);
- 250 feet on either side of Forest roads and ridgelines, used historically for fire suppression purposes; and
- Areas determined to be feasible in terms of slope, accessibility, existing fuels conditions, and logical holding features such as roads, streams, and ridges.

Table 2-3: Acres of hazardous fuels treatment by treatment type

Fuels Treatment Type	Beaver Fire	Happy Camp Complex	Whites Fire	Grand Total
Wildland Urban Interface	610	1,200	410	2,220
Fuels Management Zones	870	3,020	920	4,810
Roadside Fuels Treatments	610	3,010	810	4,420
Prescribed Burn	0	1,560	9,210	10,770
Grand Total (acres)	2,090	8,790	11,350	22,220

Information on how each fuels treatment will be implemented is described in detail below. These descriptions are categorized based on type of treatment or their location

[14] This change of about 670 acres is due to removal of acres of prescribed fire in the Whites fire area that were incorrectly mapped in the Marble Mountain Wilderness.

within the project area. Description of treatments within the wildland urban interface, fuel management zones, roadsides, and in areas proposed for prescribed burning are provided below.

Wildland Urban Interface (about 2,220 acres)

A combination of mechanical, mastication, and hand work is planned. Areas identified for treatment with mechanical equipment will include a combination of cutting trees and other understory vegetation. After mechanical or mastication treatments, activity-generated slash will be piled and burned. Areas treated only by hand thinning will remove dead vegetation or trees under 12 inches in diameter and will be disposed of by chipping, piling with follow-up burning, or lopping and scattering of fuels. Live understory vegetation (less than 12 inches in diameter) will be removed to reduce flame length, intensity, and the potential for crown fire activity. The objective is to have an area with a reduced fuel load and minimized ladder fuels to create a more defensible wildland urban interface during future fire events.

Fuels Management Zones (about 4,810 acres)

The primary locations of fuels management zones are strategic ridge systems used to contain the 2014 fires as well as historic fire lines from previous large fires within the project area. Treatments in these zones aim to maintain existing control lines by removing all dead vegetation and live brush greater than two feet tall, and by thinning live conifer trees less than 12 inches in diameter at breast height to approximately 20-foot spacing. Hardwoods would be retained. Retained conifers will be pruned up to seven feet above the ground within these zones to increase canopy base height, and reduce ladder fuels and the potential for crown fire initiation. Activity-generated fuels will be treated by a variety of methods. Where hand thinning is proposed, lopping and scattering of fuels, piling and burning, and/or chipping will be used to reduce fuels. Mechanical or mastication equipment may be used to pile activity fuels within these areas in addition to, or in lieu of, hand work.

Roadside Fuels Treatments (about 4,420 acres)

Roadside treatments along roads identified as strategic for firefighting will help to hold a planned or unplanned fire within the project area. Roadside treatments outside of identified strategic road systems will include removal of activity-generated fuels to provide access for fire suppression resources responding to future unplanned ignitions. Activities similar to those described above within fuels management zones will be used to treat roadside fuels.

Prescribed Burn (about 10,770 acres)

Prescribed burning is proposed under weather conditions which promote low-intensity fires. A mosaic post-burn condition will result from prescribed burning with isolated pockets of tree mortality, and burned and unburned understory vegetation. A mosaic burn is anticipated where some areas fully consume surface fuels and other areas are partially burned or unburned.

Second-entry burns in units identified for prescribed burning will be used to maintain surface fuel loading and increase heterogeneity of forest structure and vegetation by consuming surface fuels and small understory vegetation. Many of the prescribed burning

locations will use existing control lines established in recent large fires within the project area. Firelines will be constructed around the perimeter of the prescribed burn and will include using dozers to re-scrape control lines to mineral soil. Natural barriers to fire like rock outcrops or talus would be used where they exist around. In areas where control lines are not accessible by equipment, hand-line construction to mineral soil will occur. Removal of understory vegetation along control lines will include cutting brush and conifer trees less than 12 inches in diameter to facilitate holding operations during prescribed fire implementation.

Site Preparation, Reforestation and Release

Site-preparation, reforestation, and release treatments are designed to increase the likelihood and speed by which burned forested areas are reforested following fires. More rapid and successful reforestation is accomplished by reducing fuel loading and creating openings for safe planting. Careful evaluations were made to prioritize treatment units likely to support successful reforestation. Units within the project area are highly variable; therefore, criteria differ slightly for determining site-preparation needs within natural units versus existing plantations.

For the purposes of this project, reforestation needs were stratified into three categories for field evaluation: 1) burned conifer plantations (plantations); 2) conifer units not proposed for salvage harvest for which there is a need to reforest with conifer species (natural stands); and 3) conifer units where salvage harvest is implemented (net salvage harvest acres).

- *Plantations:* Site-preparation in plantations includes plantations that existed prior to the 2014 fires where most of the unit was lost due to the 2014 wildfires. Based on the criteria listed below, these plantations were also identified as unable to naturally recover. Most plantations planned for treatment consist of dead trees less than 16 inches in diameter at breast height. In some areas trees larger than 16 inches will be treated to reduce hazards to workers and the public, and to reduce fuel loading to achieve flame lengths of less than four feet over the next 20 years.
- *Natural Units (Non-salvage Harvested):* Natural units are units not scheduled for salvage harvest that were burned during the 2014 fires where trees are generally less than 20 inches diameter at breast height. These units were assessed for reforestation using the criteria listed below. These units will only be treated where mitigation of the snag hazards can be completed prior to planting.
- *Salvage Harvest Acres:* Site-preparation for reforestation within acres that are salvage harvested will follow harvest activities. Site preparation will only be done where fuel loading after harvest is greater than seven tons per acre (including standing dead fuels or one-hour, ten-hour, or 100-hour fuels as defined in the glossary). Otherwise, these units will be planted without site preparation.

Areas were considered for site preparation, planting and release if they:

- Were identified as areas determined to have been historically dominated by conifers, as determined by the 1945 Wieslander Vegetation mapping (Kelly, M.B. et. al 2005) in addition to visual cues based upon Forest Service professional judgment;
- Had successful vegetation growth prior to the 2014 fires;
- Had evidence that, prior to the fire, conifers were successfully re-establishing, and competing vegetation (brush and hardwoods) were not dominating the site;
- Had little availability of natural seed source within seed distribution distances;

- Had favorable site class, aspect, slope position, and elevation for artificial regeneration; and,
- Had favorable regeneration potential by prioritizing areas based on site quality and moisture availability and avoiding areas with a history of repetitive high severity burns if likely to re-burn before stand reaches level of fire resilience.

Site Preparation (about 15,800 acres)

Site preparation reduces fuel loads so that future fire severity is reduced and to create Site preparation reduces fuel loads so that future fire severity is reduced and to create areas for planting. Site preparation consists of cutting non-merchantable material and disposing of it by piling and burning, by leaving the material in place and remove by prescribed underburning, or masticating vegetation. Reduced fuel loads after site preparation treatments would increase the probability that trees, snags and coarse woody debris will persist on the landscape even with the historic fire frequencies experienced in the project area. Fuels treatments are described in more detail in the hazardous fuels treatment section above. Site preparation in units where planting is proposed is designed to maintain desired conditions of surface, canopy and ladder fuels.

Site preparation treatment acres were added and published incorrectly in the draft EIS. The correct number of acres proposed for treatment in the draft EIS was originally 14,184 acres which was subsequently corrected following field verification. Site preparation is proposed on 15,800 acres using the refined net acres of salvage harvest based on increased mortality between October 2014 and July 2015 (see the Changes in Field Data section at the beginning of this chapter). Follow-up maintenance will focus on strategic ridge- and road-systems intersect units proposed for site preparation and planting. Depending on site location, site preparation will include the following treatments (see Appendix A for maps of treatment locations):

- Fuels maintenance will involve thinning or cutting of understory vegetation and piling and burning of surface fuels to maintain desired fuel conditions. Conifer trees up to 12 inches in diameter at breast height may be cut and the retained trees pruned to increase canopy base heights in order to decrease fire behavior at the surface and transition to over-story fuels (see the description of site preparation above).
- Manual site preparation will fall standing dead conifers, hardwoods, and brush less than ten inches diameter at breast height with a chainsaw or other cutting implement on slopes greater than 35 percent. Felled material in excess of that needed for coarse woody debris or ground cover may be piled, or windrowed by hand, and burned or felled and left in place and underburned to complete site preparation activities. Material greater than ten inches in diameter will be cut and left or skyline yarded on steep slopes because of concerns about safety and effectiveness of treating large, heavy material by hand on steep ground. Manual site preparation may also be used on slopes less than 35 percent where it is cost-efficient to do so, or where resource concerns limit the use of mechanical site-preparation methods.
- Skyline yarding will be used on slopes greater than 35 percent with high densities of dead trees. Trees generally less than 16 inches in diameter will be skyline yarded, decked or piled on roadside landings. Piled material may be made available to the public for firewood cutting. Pile burning will complete site preparation activities.
- Mastication will be used to shred dead trees, hardwoods and brush less than 12 inches in diameter into pieces less than three inches diameter distributing them across the unit on slopes less than 35 percent.
- Mechanical yarding and slash piling of dead trees generally less than 16 inches in diameter will be used on slopes less than 35 percent. Material in excess of that needed for coarse woody debris and effective ground cover will be cut and piled using ground-based equipment

or cut and skidded to a landing where the material will be burned. Piled material of preferred firewood species may be made available to the public for firewood cutting following project activities. Materials less than 16 inches in diameter at breast height may also be felled, left in place and prescribe burned.

- Following mechanical site preparation activities, units will be identified (Watershed-25 and Watershed-26, Table 2-42of Chapter 2) as areas where sub-soiling or deep tillage will be used to help break up the dense soil and improve infiltration, aeration, and tree growth. Ripping may also be considered to help mechanically break up soils by raking across unit contours. No sub-soiling, deep tillage or ripping is proposed in hydrologic Riparian Reserves.

Reforestation

Reforestation prescriptions, including planting conifers or encouraging the growth of hardwoods, are designed to reflect projected unit composition based on historic condition information for both hardwoods and conifers. Units identified for proposed planting include areas where no suitable green trees exist or the number of remaining green trees can't provide a seed source for natural regeneration. Planting is proposed in areas where residual green trees were assessed during site visits for immediate seed-cone potential and were found to be inadequate for providing a reliable seed source. Remaining green trees will contribute to overall post-fire stocking levels but cannot be relied upon solely for overall re-seeding needs. Planting is not proposed in areas that are identified as wet or dry meadows.

Planting prescriptions are based on historic unit conditions, projected unit composition, and the likelihood of long-term survivability of project units within a fire ecosystem. Overall, species considered for planting in the project area include Douglas-fir, sugar pine, ponderosa pine, incense cedar, white fir, and red fir. A mosaic distribution will be achieved over time due to the spatial variability achieved by micro-site selection for planting. Conifers will not be planted next to green hardwoods; when determining if trees meet the average spacing for the stand, hardwoods will be included. Seedlings will be widely spaced on poorer sites including southerly aspects and/or rocky soils. Trees will be planted in clusters to achieve groups of conifers throughout the landscape to mimic natural units. Seedling survival rates and competition from brush species will create a natural mosaic of species and stocking densities. In order to effectively reforest these units, an average of 130 to 300 trees per acre will be planted to achieve a target stocking level of 75 to 225 variably spaced trees per acre, depending on the site conditions described below. There is no intention to create densely stocked plantations of continuous fuels. Initial recommendations for the spacing of conifer seedlings considered Forest Plan land management objectives for projected stocking needs, and the likelihood of achieving those objectives, for each unit evaluated for reforestation.

Tree planting will be by hand methods, using either bare root or container stock. Hand planting will increase the likelihood for survival and provide for the desired spatial variability within treatment units and across the project area. The tree species planted will roughly correspond with historical unit composition, varying by forest type from unit to unit. In general, mostly pines will be planted on droughty south-facing slopes and ridges. South-facing slopes and ridges will be planted at lower densities compared to other areas within the project. Douglas-fir will be planted at higher densities as the primary species on lower sheltered slopes and northern aspects. True fir will be re-established at the higher elevations at the highest density to reflect how these units would have naturally

established. Hardwoods will not be planted, due to their ability to naturally regenerate following fire either by epimoric sprouting, belowground sprouting, or by natural re-establishment as seedlings from seed caches found within the stand. Epicormic sprouting refers to the shoots that grow from buds on stems or branches of hardwoods, often in response to stress. Growth of existing hardwoods will be encouraged; hardwoods will be included in the target stocking for units in areas where they exist.

Additional planting establishment techniques may be used to increase survival of planted trees. These techniques include, but are not limited to, animal protection devices for browse reduction; shade blocks for improved microsite conditions; and hand grubbing to remove competing vegetation around seedlings for survival.

Release

The release treatment will follow planting or natural regeneration to increase the establishment of seedlings. Release treatments include manually removing competing plants or water uptake from competing plant roots by "grubbing" around conifer seedlings or natural hardwood seedlings. Grubbing consists of removing all vegetation within a minimum of a five-foot radius from planted or natural regenerated seedlings.

Table 2-4: Site preparation, Reforestation, and Release by unit type

Site Preparation, Reforestation and Release Unit Type	Beaver Fire	Happy Camp Complex	Whites Fire	Grand Total
Plantations	1,160	5,040	610	6,810
Within Natural Units (Non-salvage Harvested)	620	400	30	1,050
Within Salvage Harvest Units	590	6,790	560	7,940
Total Site Preparation Acres	2,370	12,230	1,200	15,800

Hand Treatment in Riparian Reserves (about 370 acres[15])

In Riparian Reserves within the plantation site-preparation and planting units, dead trees less than 16 inches in diameter at breast height may be cut and felled if necessary for long-term fuels reduction or reestablishment of riparian vegetation. Treatments are proposed to achieve ground cover and allow for natural regeneration of vegetation. Treatments are proposed only in areas of high and moderate vegetation mortality and where the overhead hazards can be mitigated without equipment entry into the Riparian Reserves. Follow-up slash treatment will include hand-work only (no ground-based equipment) and would be implemented only if fuel load (one-hour, ten-hour, or 100-hour fuels) is above seven tons per acre; fuels may be hand-piled, lopped and scattered, broadcast burned or windrowed and burned.

Connected Actions

Road Access

Project access will require the use of about 562 miles of National Forest Transportation System (Forest System), county, and state roads. Forest System roads will be maintained

[15] Estimated acres were calculated using GIS and omitted RAVG class 1 and 2 (or areas with less than 50% mortality).

as needed for project implementation as displayed in Table 2-5. There will be no roads added to the Forest System as a result of this project. About five miles of new temporary roads will be constructed. About nine miles of temporary roads on existing roadbeds and another nine miles of temporary road on previously decommissioned roads will be used for project access. Where temporary road actions occur on roadbeds that have existing legacy sediment sources, these legacy sediment sites would be treated and the roadbed appropriately hydrologically stabilized as part of the project. All temporary roads, including those previously decommissioned, will be closed and hydrologically stabilized after completion of the project according to the project design features (Watershed-5 and Watershed-24) found in Table 2-42.

Table 2-5: Miles of road access by Forest System maintenance level and temporary road access

Type of Road Access	Beaver Fire	Happy Camp Complex	Whites Fire	Grand Total
Forest System, County, and State	146	353	63	562
New Temporary Road	0	3.5	0.1	3.6
Temporary Road on Existing Roadbed	2.8	5.8	0.7	9.3
Temporary Road on Re-opened Decommissioned Road	0	9.0	0	9.0
Grand Total	148.8	371.3	63.8	583.9

Landings

Existing landings will be used where possible. Landing size will be commensurate with operational safety. Helicopter landings will be two acres in size or less. Skyline landings will use roads wherever possible. New skyline landings off the road system and ground-based landings will average one acre in size but will not exceed 1.5 acres in size. Both new and existing landings will be hydrologically stabilized after use, according to the project design features (Watershed-5 and Watershed-24) found in Table 2-42.

Legacy Sediment Sites (Elk Creek Watershed)

The portion of Elk Creek watershed within the Happy Camp Complex project area contains about 150 sites within 33 miles of road. Most of the legacy sites are located on or adjacent to the Forest System roads. The other legacy sites are located on existing landings or roadbeds (historic routes, abandoned temporary roads, or decommissioned roads). Legacy site treatments are shown in Appendix A and will include the treatments shown in Table 2-6.

Road storm-proofing treatments between individual sites will occur on about 33 miles of Forest System roads (15N02, 15N75, 16N05, 16N39 and 45N19). Treatments between legacy sites may include the following: where possible, reconstruct road prism to an out-sloped configuration, otherwise reduce inboard ditch length by adding additional relief culverts or dips; reduce road prism width; remove berms; place rip-rap below outlets of ditch relief culverts; recondition road subgrade and travel surface by applying crushed aggregate; add rolling dips where needed to control road surface runoff; or stabilize road prism slumps with retaining walls or rock buttresses.

Table 2-6: Description of treatment, number of sites, and actions needed for legacy site treatment

Treatment	Number of Sites	Description of Action Needed:

Treatment	Number of Sites	Description of Action Needed:
Culvert Upgrades	About 45	Replace culverts to accommodate the 100-year peak flow.
Diversion Prevention	About 51 sites (17 included in culvert upgrade)	Construct armored rolling dips to prevent streams from diverting down roadways should the culvert plug or fail.
Aquatic Organism Passage	3 sites	Replace existing stream crossing with bottomless arch culvert to improve or restore aquatic organism passage.
Retaining Wall	About 7 sites	Construct retaining wall, rock buttress, reinforced embankment, or equivalent. Where road prism has slumped or failed.
Fill Reduction	About 16 sites	Remove excess fill materials from the top of stream crossings to reduce the amount of fill available for discharge should the culvert plug or fail; add riprap to armor fill slopes.
Fill Removal	About 27 sites	Remove all fill materials from stream channels, swales, road shoulders and sliver fills; these treatments would occur on closed Forest roads and existing roadbeds.
Repair/Maintain Existing Infrastructure	About 16 sites	Clean culvert inlets, ditches, etc., repair damaged culvert inlets, shorten “shotgun” culvert outlets, place riprap below culvert outlets to reduce hill slope erosion, remove cut slope slide materials

Alternative 3

Alternative 3 was developed in response to relevant issues one and three and public comments raised about the effects of the Alternative 2 on spotted owl and fisher habitat, habitat connectivity, and legacy components. Legacy components are those habitat features that take a long time to develop (e.g. large old-growth trees, legacy trees, and large downed logs). Alternative 3 emphasizes the development of future late successional habitat, habitat connectivity, northern spotted owl habitat and retention of legacy components within the post-fire landscape.

Spotted owl activity centers within the project area were evaluated and prioritized in order to identify sites with the highest likelihood of post-fire owl occupancy. In order to more fully respond to recommendations described in Recovery Action 10 of the 2012 Revised Recovery Plan, known spotted owl activity centers in the project area were evaluated based on the amount of suitable habitat remaining after the 2014 fires within the 0.5-mile core areas (500-acre areas centered on clusters of best available locations such as known nest and roost sites). Activity centers containing at least 50 percent (250 acres) suitable nesting, roosting and/or foraging habitat within the core area and an additional 1,086 acres nesting/roosting and/or foraging habitat in the outer home range (0.5 to 1.3 miles) were classified as having “high potential” for the owls associated with that site to remain on site, continue to reproduce, and therefore contribute to the demographics of the spotted owl population in the area.

Activity centers containing less than 50 percent suitable nesting/roosting and/or foraging habitat within the core area were evaluated at the 1.3-mile home range scale. Home ranges containing more than 20 percent suitable nesting/roosting and/or foraging habitat were classified as having “moderate potential” for the owls associated with that site to remain on site, reproduce, and contribute to the demographics of the population in the area. The Level One consultation team (consisting of biologists from the Forest and the Yreka Office of the U.S. Fish and Wildlife Service) acknowledged uncertainty in site location but assumed that shifts in locations could occur in response to the modifications

and/or loss of habitat caused by high- and moderate-severity fire. Those with "moderate potential" may shift away from their original core use area, but remain within their home range, in areas where adequate suitable habitat exists post-fire.

Low-potential sites were defined as having less than 20 percent suitable habitat remaining within the 1.3-mile home range. These sites were assumed highly unlikely to persist or contribute to the demographics of the northern spotted owl population.

Occupied sites, where owls are thought to have *not* been displaced by the 2014 fires, would potentially be at a higher risk of impacts from post-fire activities; sites where owls were likely displaced due to habitat loss from the highest severity fire and are no longer present in the immediate area would potentially be at a lower risk from post-fire activities.

Changes from the Alternative 2:

- No salvage harvest in units (see list of units in project design features, Table 2-42) within "moderate potential" northern spotted owl core areas except for specifically designated core areas, as described above.
- No salvage harvest in units less than 20 acres in size
- No salvage harvest in the Beaver fire area.

Alternative 3 is also designed to retain legacy components for future habitat development, reduce effects to northern spotted owl habitat, and lessen the effects to connectivity while still meeting the purpose and need for action. Table 2-7 describes in detail how each concern was addressed.

Table 2-7: Concerns addressed by the development of Alternative 3

Concern About:	Addressed by:
The effects of salvage logging on the long term development of the affected stand for future late-successional habitat, as described by the Regional Ecosystem Office/LSR working group, interdisciplinary team internal review, and as raised by the public	Retaining important habitat elements such as large trees, snags, and coarse woody debris while avoiding treatment in mixed-severity fire-affected forested areas. Many northern spotted owl activity centers were affected by the fire and this alternative is designed to reduce the effects of treatments on sites likely to persist in the future while balancing the need to reduce the potential of future high-severity fire affecting additional habitat. Large trees and snags provide valuable wildlife habitat for many species and this alternative will retain more of these legacy features to provide structure for the development of late-successional habitat. This alternative will benefit the federally-listed northern spotted owl, proposed-for-federally-listing Pacific fisher, survey and manage species, management indicator species and Forest Service Sensitive species by minimizing the impacts from fuels treatments.

Concern About:	Addressed by:
Habitat Connectivity	Habitat connectivity was affected by the 2014 fires and this alternative modifies proposed treatments in order to address connectivity in areas that may provide wildlife with the opportunity to move from one patch of habitat to another.
Post-fire natural stand development[16] and habitat requirements of post fire or snag associated species	Integrating recent science on post-fire natural stand development. This will be addressed with the MIS and Forest Service sensitive species analysis, as well as the snag and legacy tree pdfs. In addition, areas outside of units and mixed severity patches within the project area will provide habitat for a variety of wildlife species. Retaining snags and legacy features on the landscape will provide future structure for wildlife species. Salvage units and burned plantations will be replanted. As these stands develop, retained snag and legacy features will provide structure found in a more mature forest. In the short term species will also benefit from the pulse of dead and dying trees, grasses and forbs found within the project area.
The short term impacts to northern spotted owl that may occupy fire-affected forested areas, as well as long-term use of small pockets of mixed burn severity within active northern spotted owl activity centers	Nesting, roosting and foraging habitat and mixed burn severity inclusions (RAVG grid code 1 or 2) within treatment units will not be salvage harvested. Removing fuels within treatment units has the potential to create short-term impacts to spotted owl foraging and prey habitat. This will be balanced with fuels treatments and replanting the salvaged treatment units. The long-term goals are to reduce fire risk, protect remaining northern spotted owl nesting, roosting and foraging habitat, and replant treatment units. Replanting treatment units will move the project area toward late seral conditions more quickly than without treatment.
Large woody debris retention	Conserving an irreplaceable resource (Forest Plan, page 4-4), retention of large woody debris would slowly improve soil organic matter, and would be especially beneficial where organic matter has been lost to high soil burn severity. Retention of large woody debris is valuable to many wildlife species. Down wood provides sites for denning, resting and escape cover. Improved soil organic matter will improve tree growth over the long term that would aid in habitat development.

Treatments proposed in Alternative 3 are the same as Alternative 2 with the following exceptions:

Salvage Harvest (about 6,590 treatment acres within 9,040 acres of units)

Alternative 3 proposes salvage harvest on approximately 6,590 acres, using the acreage refinements based on increased mortality between October 2014 and July 2015, within about 9,040 acres of salvage units on Forest lands, reducing the number of acres of proposed salvage by 1,350 acres as compared to Alternative 2. This alternative proposes no salvage treatment within core areas classified as having either “high potential” or “moderate potential,” with the exception of four “moderate potential” core areas (KL1265, KL4133, KLNew3A, and KL1202) displayed on in Appendix A. These four sites experienced significant amounts of high-severity fire that removed virtually all suitable habitat within the 0.5-mile core areas but sufficient habitat remained in the home ranges. The Level One consultation team assumed this adjacent habitat would allow for the northern spotted owls to potentially shift their core area to use existing suitable habitat adjacent to the severely burned, previously occupied core areas.

In addition to the project design features (Wildlife-11, -12, and -13) designed to minimize effects to connectivity and fisher habitat, Alternative 3 removed all proposed salvage units within the Beaver project area. These units were removed to retain northern spotted

[16] e.g. *Fire Science Brief* 2009, Wagenbrenner 2015, Hanson et al 2013, PSW GTR-247, Bond et al 2013, Hutto 2006

owl connectivity, retain post-fire foraging habitat, and to respond to the need for protecting fisher habitat characteristics.

Between the draft and final EIS additional units were dropped from this alternative due to economic viability of units, public comment, or consultation. This alternative removed 560 acres from proposed salvage harvest between draft and final EIS.

Retention of large material (including snags and coarse woody debris) will be accomplished as described in Alternative 2.

Table 2-8: Acres of salvage harvest proposed in Alternative 3 by logging system

Logging System	Beaver Fire	Happy Camp Complex	Whites Fire	Grand Total
	Acres of Treatment[a] (within Unit)[b]			
Ground-based	0 (0)	340 (550)	20 (40)	370 (590)
Skyline	0 (0)	3,060 (4,170)	150 (220)	3,210 (4,400)
Helicopter	0 (0)	2,730 (3,640)	290 (420)	3,010 (4,050)
Total Treatment Acres (Unit)	**0 (0)**	**6,130 (8,360)**	**460 (680)**	**6,590 (9,040)**

[a] Treatments are estimated acres within units where more than 50 percent mortality occurred and where salvage activity is proposed. Treatment areas avoid hydrologic riparian reserves and areas where less than 50 percent mortality occurred.

[b] Units are larger than treatment areas because they include areas where no harvest will occur such as hydrologic riparian reserves and areas with less than 50 percent mortality that are within unit boundaries as well as salvage harvest acres.

Both acres of treatment and acres within units are estimates based on GIS and field data. Values are rounded to the nearest ten acres.

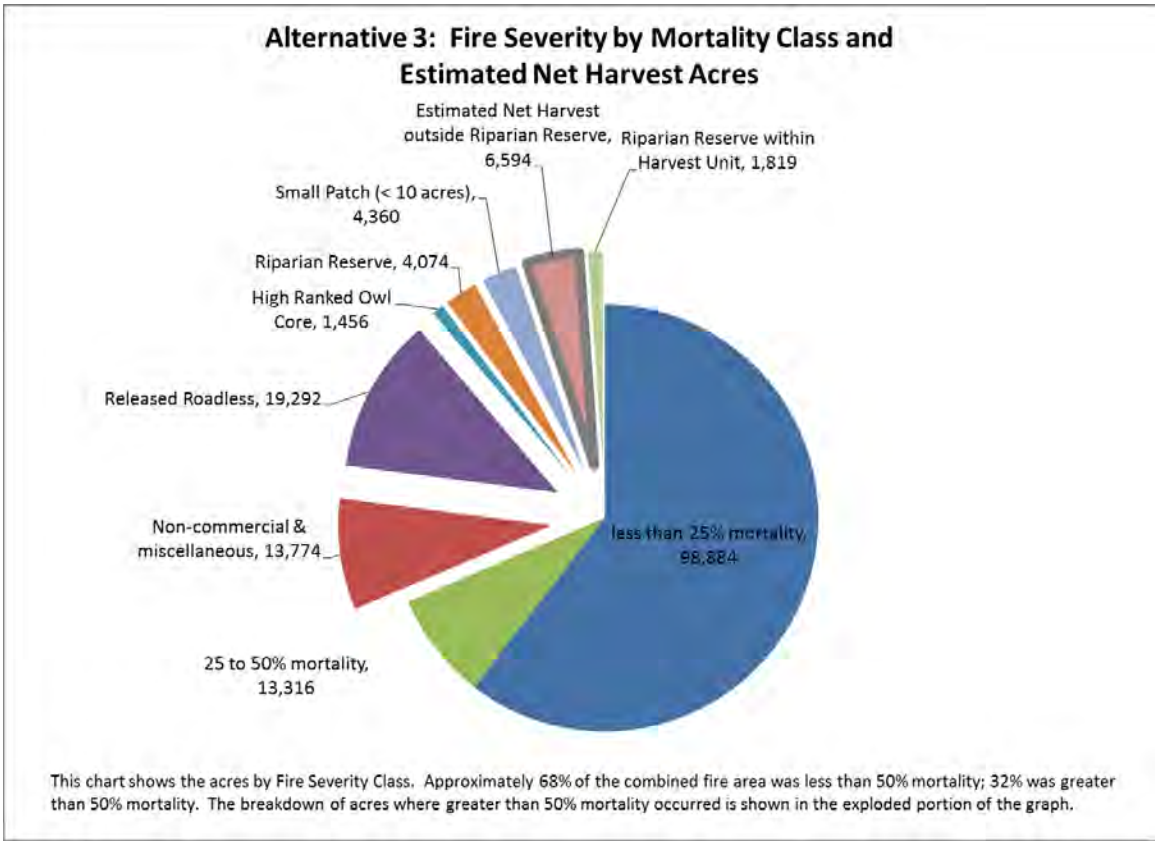

Figure 2-3: Fire Severity by Mortality Class and Estimated Net Harvest Acres in Alternative 3

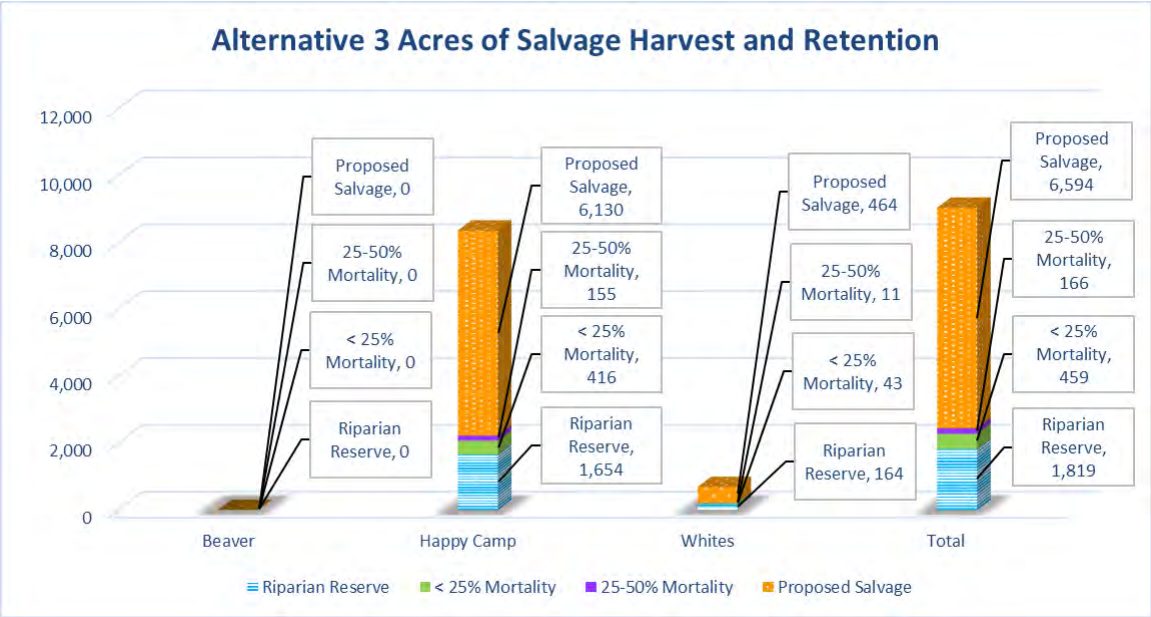

Figure 2-4: Acres of Salvage Harvest and Retention within Treatment Units in Alternative 3

Roadside Hazard Treatment (640 miles of roadways being evaluated; 5,080 acres of estimated treatment)

Roadside hazard treatments are as described in Alternative 2. Changes made between draft and final EIS to acres and the description of the Alternative 2 are also applicable to this alternative. Acres associated with these treatments are listed in Table 2-2.

Hazardous Fuel Treatment (about 22,220 acres)

Hazardous fuels treatments and proposed units are as described in Alternative 2. Changes made between draft and final EIS to acres and the description of the Alternative 2 are also applicable to this alternative. Acres associated with these treatments are listed in Table 2-3.

Site Preparation, Reforestation, and Release

Site preparation, reforestation, and release as described in Alternative 2 will be implemented on about 7,860 acres of plantations and natural units (non-salvage harvest units), and in 6,590 acres of salvage harvest using the refined acreage based on mortality increases from October 2014 to July 2015. Acres were adjusted based on the amount of salvage harvest acres removed from treatment for this alternative. Based on the removal of salvage harvest treatment acres within core areas classified as having either ‘high potential’ or ‘moderate potential,’ and the removal of salvage treatment in the Beaver project, site preparation, reforestation, and release acres decreased from Alternative 2.

Table 2-9: Acres of site preparation, reforestation, and release in Alternative 3 by unit treatment type

Site Preparation, Reforestation and Release Unit Type	Beaver Fire	Happy Camp Complex	Whites Fire	Grand Total
Plantations	1,160	5,040	610	6,810

Site Preparation, Reforestation and Release Unit Type	Beaver Fire	Happy Camp Complex	Whites Fire	Grand Total
Natural Units (Non-salvage Harvested)	620	400	30	1,050
Salvage Harvest Units	0	6,130	460	6,590
Total Acres	1,780	11,570	1,100	14,450

Hand Treatment in Riparian Reserves (0 acres)

No hand treatment in Riparian Reserves is proposed in this alternative.

Connected Actions

Road Access

Project access for this alternative is the same as Alternative 2. Implementation of this alternative will require the use of Forest System roads, State, and County Roads as displayed in Table 2-10. Access is similar to that of Alternative 2, but small sections of roads used for temporary access on existing roadbeds and re-opened decommissioned roads were removed because units associated with these sections of roads were removed. System roads will be maintained as needed for Alternative 3 implementation.

Table 2-10: Miles of road access for Alternative 3 by Forest Transportation System maintenance level and temporary road access

Type of Road Access	Beaver Fire	Happy Camp Complex	Whites Fire	Grand Total
Forest System, County, and State	146	353	63	562
New Temporary	0	3.4	0.1	3.5
Temporary Road on Existing Roadbed	1.5	4.6	0.7	6.8
Temporary Road on Re-opened Decommissioned Road	0	8.6	0	8.6
Grand Total	147.5	370.6	63.8	580.9

Landings and Legacy Sites

Both landings and legacy site actions are as described in Alternative 2. Alternative 3 is the same as Alternative 2 with the exception that fewer landings will be needed to implement this alternative because access to dropped units will no longer be needed.

Alternative 4

Alternative 4 was developed to reduce impacts to watersheds, including those containing federally-listed Coho Salmon. Alternative 4 was developed through consultation discussions between the Forest Service and National Marine Fisheries Service and in response to relevant issues #2 and #3 (see Chapter 1) raised about the effects of the proposed action on watershed conditions and recovery. Soils and riparian areas were impacted to varying degrees across the project area due to the 2014 wildfires and, in some areas, the effects were severe and likely to result in downstream impacts to water quality and fisheries habitat. Riparian and aquatic resources in general across the project area are negatively affected by the current post-fire conditions due to changes in natural processes such as hillslope erosion and stream sedimentation, and changed conditions such as effective stream shade and flow regime. Considering the impacted current

condition, the concern is that further ground disturbance, especially in the most impacted and/or sensitive watershed areas, may result in additional negative effects to aquatic resources including habitat for federally-listed (under the Endangered Species Act) Coho Salmon.

Alternative 4 was designed to reduce watershed disturbance and impacts to water quality and fisheries, relative to Alternative 2, while still meeting the purpose and need for action. Alternative 4 reduces or eliminates temporary road actions, especially within Key Watersheds (Forest Plan, pages 4-25 to 4-26). The interdisciplinary team has identified the areas (7th field watersheds) that are most sensitive to further ground disturbance, based on existing watershed condition and distribution of federally-listed fish. The criteria used to identify the most sensitive 7th field watersheds included the following:

1. Existing watershed disturbance—measured by analysis of fire impacts (vegetation and soil burn severity) and Cumulative Watershed Effects model values (Appendix B in the Hydrology Amendment on the project website) for existing condition (which includes BAER work);
2. Unstable slopes and landslide potential—quantitatively reflected in Cumulative Watershed Effects values, and further evaluated based on field review and information on past site-specific disturbance and recovery;
3. Stream monitoring data—Forest-level water quality monitoring (sediment and temperature) of reference and managed streams, mostly pre- 2014 fires;
4. Federally-listed (under the Endangered Species Act) Coho Salmon—proximity/probability and magnitude/duration of likely impacts to Coho Salmon and their habitat;
5. Key Watersheds—within the project area the key watersheds identified in the Forest Plan: Salmon River, and Elk and Grider creeks; and
6. Professional judgment—informed by field visits, literature review, and site-specific knowledge.

The following viewsheds were identified as the most sensitive 7th field watersheds (drainages):

- Three drainages along Beaver Creek including: Buckhorn Gul-Beaver, Dutch, and Lower West Fork Beaver;
- Walker Creek;
- Doggett Creek;
- Caroline Creek along the Klamath River;
- Kohl Creek;
- Music Creek;
- O'Neil Creek;
- Three drainages along Elk Creek including: Lower East Fork Elk, Upper East Fork Elk, and Upper Elk;
- China Creek;
- Four drainages along Grider Creek including: Cliff Valley, Lower Grider, Upper Grider, and Rancheria Creek;
- Tompkins Creek; and
- Whites Gulch

Alternative 4 proposes to treat these watersheds differently to account for the specific conditions, water quality and fish habitat impairments, and recovery potential of each.

Alternative 4 would reduce the impacts related to ground disturbance in these areas by eliminating temporary road actions (except for less than 250-foot stretches of temporary road on ridgetops). This alternative also includes restorative actions within Riparian Reserves where they occur within salvage harvest units, eliminates hazard tree removal on Maintenance Level 1 roads that are not used by the project, and allows for no landing construction within riparian reserves (several exceptions to no landings in Riparian Reserves apply with Alternative 2; these exceptions do not apply with Alternative 4).

Changes from the Alternative 2

Within the identified 7th field watersheds, along with all project design features, the following additional restrictions/mitigations are proposed:

- As in Alternative 2, hand treatments are proposed in Riparian Reserves within site preparation and planting units. Alternative 4 adds this same treatment to Riparian Reserve within salvage units;
- No use of temporary roads on existing roadbeds, or on reopened previously decommissioned roads, with the following exception:
    1. Use of temporary roads on existing roadbeds will be limited to segments along ridgetops and those not hydrologically connected to the drainage network (no stream crossings or temporary roads adjacent to streams).
    2. In Key Watersheds, all temporary roads will be less than 250 feet in length, on ridgetops and not hydrologically connected to the drainage network (no stream crossings or temporary roads adjacent to streams);
- No use of Maintenance Level 1 roads if stream-crossing reconstruction is needed; and
- Maintenance Level 1 roads that are not needed to implement actions in this project will not have hazard trees removed.

Treatments proposed in Alternative 4 are the same as Alternative 2 with the following exceptions:

Salvage Harvest (about 6,910 treatment acres within 9,700 acres of units)

Alternative 4 proposes salvage logging treatments on approximately 6,910 acres, using the acreage refinements based on increased mortality between October 2014 and July 2015, within about 9,700 acres of salvage units on Forest lands, thereby reducing the number of acres of proposed salvage by about 1,030 acres as compared to Alternative 2. Acres for salvage harvest were adjusted based on accessibility following the removal of temporary roads on existing roadbeds, including temporary roads on previously decommissioned roads, and removing Maintenance Level 1 roads where stream-crossing reconstruction is needed. Retention of large material (including snags and coarse woody debris) will be accomplished as described in Alternative 2.

Table 2-11: Acres of salvage harvest in Alternative 4 by logging system

Logging System	Beaver Fire	Happy Camp Complex	Whites Fire	Grand Total
	Acres of Treatment[a] (within Unit)[b]			
Ground-based	380 (600)	380 (600)	20 (40)	760 (1,240)
Skyline	140 (160)	2,400 (3,330)	180 (270)	2,670 (3,750)
Helicopter	0 (0)	3,070 (4,170)	360 (540)	3,480 (4,710)

Logging System	Beaver Fire	Happy Camp Complex	Whites Fire	Grand Total
Total Treatment Acres (Unit)	**520 (750)**	**5,830 (8,100)**	**560 (850)**	**6,910 (9,700)**

[a] Treatments are estimated acres within units where more than 50 percent mortality occurred and where salvage activity is proposed. Treatment areas avoid hydrologic riparian reserves and areas where less than 50 percent mortality occurred.

[b] Units are larger than treatment areas because they include areas where no harvest will occur such as hydrologic riparian reserves and areas with less than 50 percent mortality that are within unit boundaries as well as salvage harvest acres.

Both acres of treatment and acres within units are estimates based on GIS and field data. Values are rounded to the nearest ten acres.

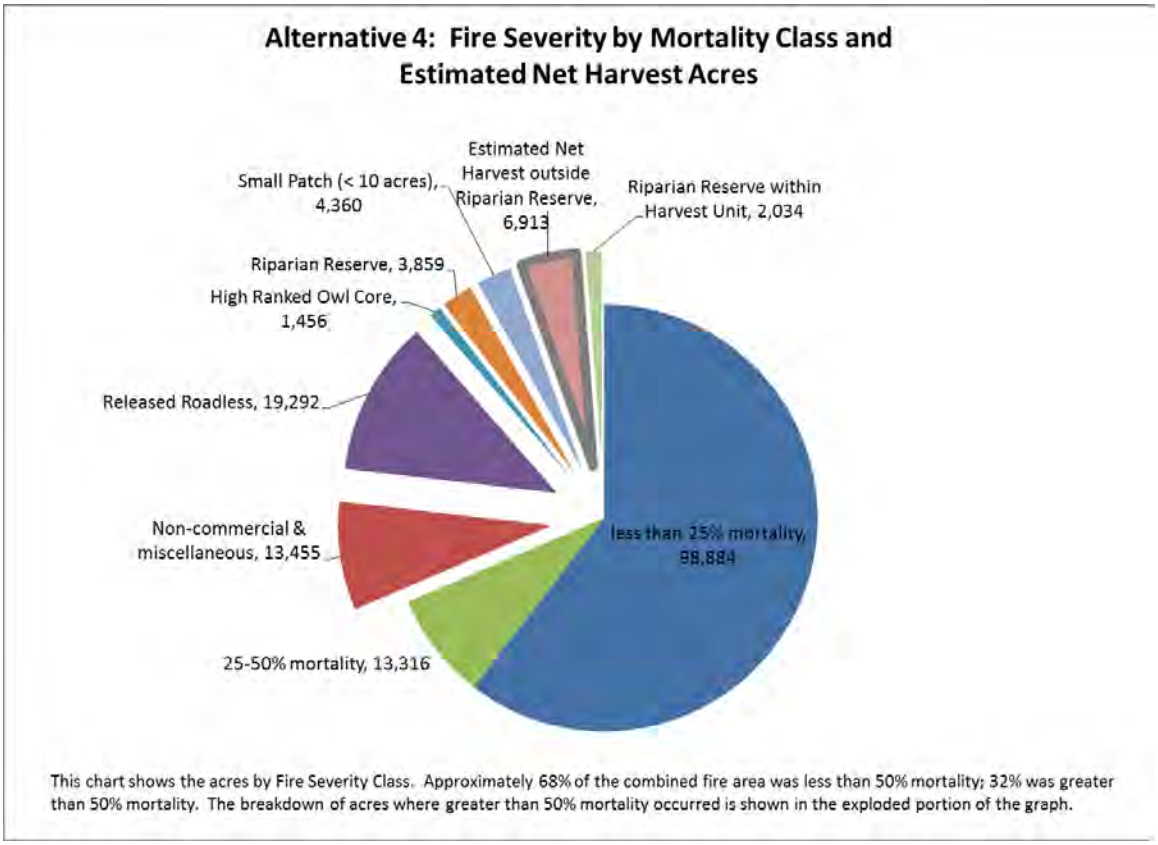

Figure 2-5: Fire Severity by Mortality Class and Estimated Net Harvest Acres in Alternative 4

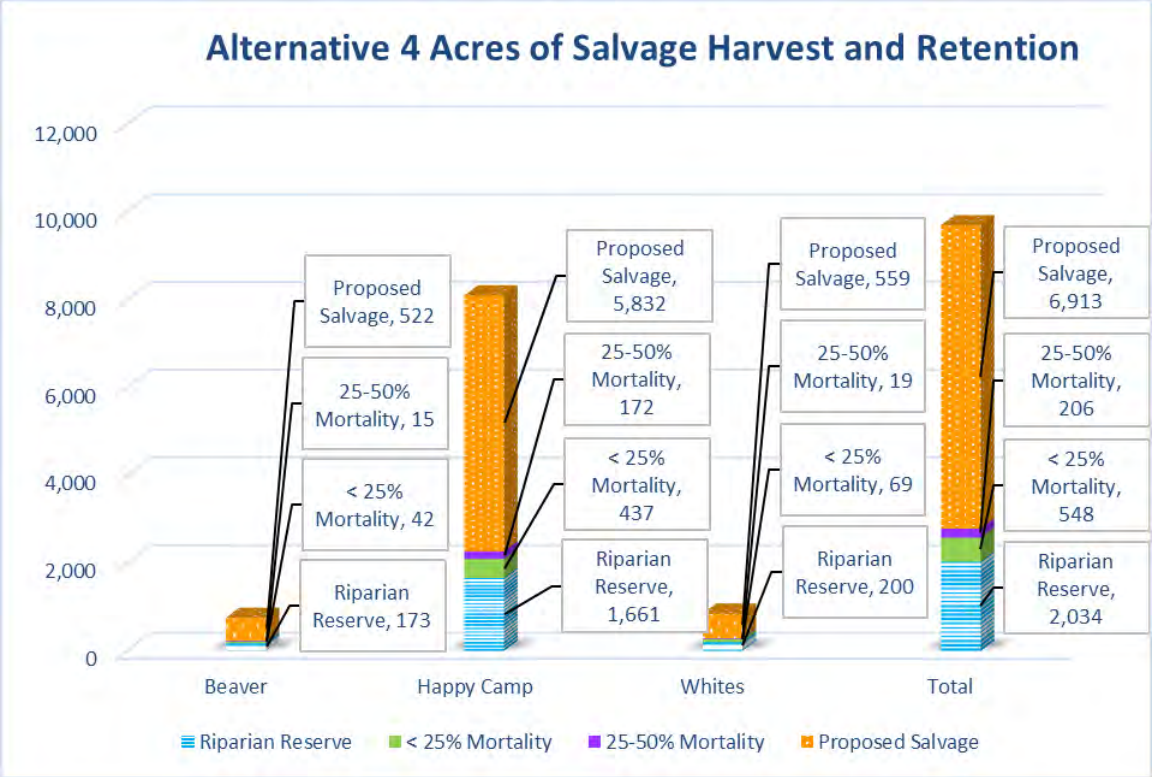

Figure 2-6: Acres of Salvage Harvest and Retention within Treatment Units in Alternative 4

Roadside Hazard Treatments (620 miles of roadways being evaluated; 4,920 acres of estimated treatment)

Alternative 4 proposes treatment along about 620 miles of roads or a maximum of about 19,580 acres of roadside hazard treatment. Roadside hazard treatment and criteria used to identify hazard or danger trees are as described in Alternative 2. Miles of roads and acres for roadside hazard treatment were adjusted based on the removal of treatment along Maintenance Level 1 roads which were removed from this alternative because they were not needed to implement actions for Alternative 4.

Hazardous Fuel Treatments (about 22,220 acres)

Hazardous fuels treatments and proposed units are as described in Alternative 2. Changes made between draft and final EIS to acres and the description of the Alternative 2 are also applicable to this alternative. Acres associated with these treatments are listed in Table 2-3.

Site Preparation, Reforestation, and Release (about 14,770 acres)

Site preparation, reforestation, and release as described in Alternative 2 will be implemented in 7,860 acres of plantations and natural units (non-salvage harvest units), and on 6,910 acres of salvage harvest acres, using the acreage refinements based on increased mortality between October 2014 and July 2015. No planting is proposed in the portions of salvage harvest units that overlap Riparian Reserves. Acres were adjusted based on the amount of salvage harvest acres removed from treatment based on changes in road use and access.

Table 2-12: Acres of site preparation, planting, and release in Alternative 4 by treatment type

Treatment Type	Beaver Fire	Happy Camp Complex	Whites Fire	Grand Total
Plantations	1,160	5,040	610	6,810
Within Natural Units (Non-salvage Harvested)	620	400	30	1,050
Within Salvage Harvest Units	520	5,830	560	6,910
Total Site Preparation	2,300	11,270	1,200	14,770

Hand Treatments in Riparian Reserves (about 1,830 acres[17])

This alternative expands hand treatments in all Riparian Reserves within salvage harvest units and in site preparation and planting treatments within Riparian Reserves; like Alternative 2, this treatment is proposed in Happy Camp and Whites fire areas only. Manual or hand treatment will fall standing dead conifers, up to 16 inches in diameter at breast height, with a chainsaw or other cutting implement, then cut and scattered throughout the riparian area to achieve 70 percent soil cover in Riparian Reserves within salvage harvest units. On slopes greater than 35 percent, manual felling of standing dead conifers, hardwoods, and brush will be limited to material less than ten inches diameter at breast height, due to concerns about safety and effectiveness of treating large, heavy material by hand on steep ground. The goal of hand treatment in Riparian Reserves is to promote more rapid soil recovery and natural regeneration without additional planting in these units. After treatment, if one-hour, ten-hour, or 100-hour fuels exceed seven tons per acre (and/or greater than 70 percent soil cover), excess fuels can be piled and burned or broadcast burned. One-hour, ten-hour, or 100-hour fuels are defined in the Glossary of this document.

Connected Actions

Road Access

Project access will require the use of Forest System roads, State and County Roads. Forest System roads will be maintained as needed for Alternative 4 implementation, as displayed in Table 2-13. There will be no roads added to the Forest System as a result of this project, however about two miles of new temporary roads will be constructed. This alternative limits the mileage of temporary roads on existing roadbeds, including temporary roads on reopened previously decommissioned roads, with the following exceptions: (1) new temporary roads in key watersheds will be less than 250 feet in length; and (2) all temporary roads will be limited to segments on ridgetops and not hydrologically connected to the drainage network (no stream crossings or temporary roads adjacent to streams). These two exceptions account for about five miles of temporary roads on existing roadbeds being used for project access in this alternative. One mile of temporary road, is proposed on reopened previously decommissioned roads. All temporary roads, including the previously decommissioned roads, will be closed and hydrologically stabilized, according the project design features, after completion of the project.

[17] Estimated acres were calculated using GIS and omitted RAVG class 1 and 2 (or areas with less than 50% mortality).

Table 2-13: Miles of road access for Alternative 4

Type of Road Access	Beaver Fire	Happy Camp Complex	Whites Fire	Grand Total
Forest System, County, and State	146	353	63	562
New Temporary	0	1.1	0.1	1.2
Temporary Road on Existing Roadbed	0.3	1.3	0.6	2.2
Temporary Road on Re-opened Decommissioned Road	0	0.4	0	0.4
Grand Total	146.3	355.8	63.7	565.8

Landings and Legacy Sites

Both landings and legacy site actions are as described in Alternative 2. Alternative 4 is the same as Alternative 2 with the exception that fewer landing will be required to implement Alternative 4.

Alternative 5

Alternative 5 is responsive to relevant issue #3 (Chapter 1) and addresses disagreements about the effects of salvage logging and site preparation on late successional reserves, riparian reserves, and inventoried roadless areas by removing all units that overlap these areas. Alternative 5 is also responsive to relevant issue #4, by addressing disagreements about whether or not the proposed action sufficiently addresses the needs for fuels reduction adjacent to private timber lands in the Beaver fire area. Alternative 5 addresses these needs by proposing an additional 1,200 acres of hazardous fuels treatments with adjoining private land treatments to increase fuel breaks along ridge and road systems within the Beaver Fire area.

Treatments in Alternative 5 are identical to the Alternative 2 with the following exceptions:

Salvage Harvest (about 2,360 treatment acres within 3,340 acres of units)

Alternative 5 proposes salvage harvest on approximately 2,360 acres, using the acreage refinements based on increased mortality between October 2014 and July 2015within about 3,340 acres of salvage units on Forest lands, thereby reducing the amount of acres of proposed salvage by 5,580 acres as compared to Alternative 2. Salvage harvest (as described in Alternative 2) is only proposed within management areas (MA) considered as matrix lands that exist within the project area, including Retention (MA 11), Scenic Rivers (MA 12), Recreation Rivers (MA 13), Partial Retention (MA 15), and General Forest (MA 17) management areas (matrix lands are defined on the 1994 Forest Plan EIS, Preferred Alternative Land Allocations Map). Compared to Alternative 2, Alternative 5 does not propose salvage harvest within special habitat (MA 5) which includes Late Successional Reserves and special habitat for bald eagle or falcon; neither Alternative 2 nor Alternative 5 propose salvage harvest in special interest areas (MA 7), hydrologic Riparian Reserves (MA-10), or in inventoried roadless areas. Retention of large material (including snags and coarse woody debris) will be accomplished as described in Alternative 2.

Table 2-14: Acres of treatment proposed in Alternative 5 by logging systems.

Logging System	Beaver Fire	Happy Camp Complex	Whites Fire	Grand Total

	Acres of Treatment[a] (within Unit)[b]			
Ground-based	420 (660)	140 (230)	0 (20)	560 (910)
Skyline	160 (170)	570 (800)	0 (0)	690 (970)
Helicopter	0 (0)	1,040 (1,410)	30 (60)	1,110 (1,470)
Total Treatment Acres (Unit)	580 (830)	1,750 (2,440)	30 (60)	2,360 (3,340)

[a] Treatments are estimated acres within units where more than 50 percent mortality occurred and where salvage activity is proposed. Treatment areas avoid hydrologic riparian reserves and areas where less than 50 percent mortality occurred.

[b] Units are larger than treatment areas because they include areas where no harvest will occur such as hydrologic riparian reserves and areas with less than 50 percent mortality that are within unit boundaries as well as salvage harvest acres.

Both acres of treatment and acres within units are estimates based on GIS and field data. Values are rounded to the nearest ten acres.

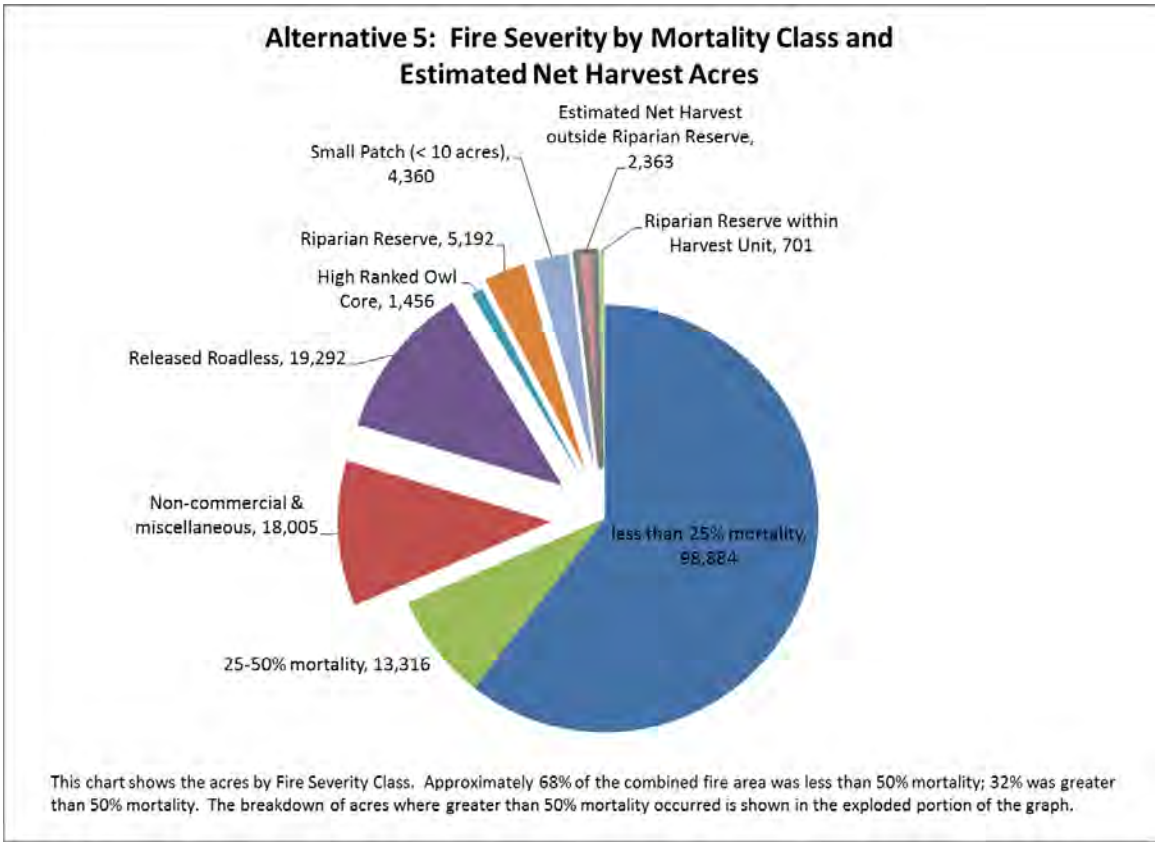

Figure 2-7: Fire Severity by Mortality Class and Estimated Net Harvest Acres in Alternative 5

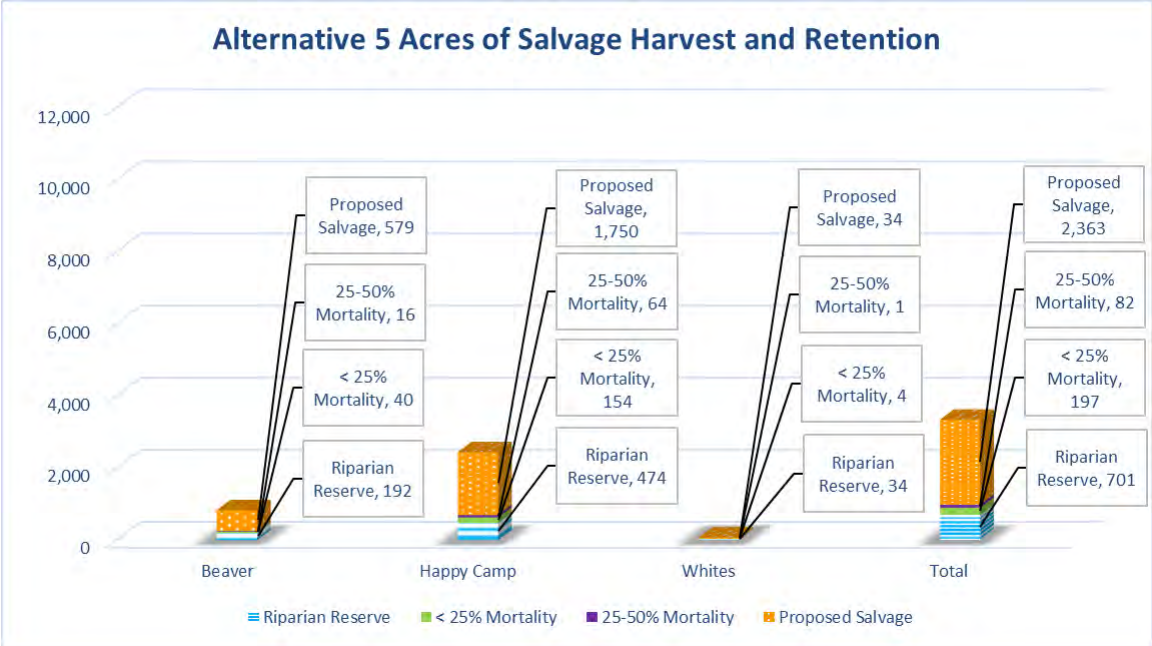

Figure 2-8: Acres of Salvage Harvest and Retention within Treatment Units in Alternative 5

Roadside Hazard Treatments (640 miles of roadways being evaluated; 5,080 acres of estimated treatment)

Roadside hazard treatments are as described in Alternative 2. Changes made between draft and final EIS to acres, and the description of the Alternative 2, are also applicable to this alternative. Acres associated with these treatments are listed in Table 2-2.

Hazardous Fuels Treatments (about 23,430 acres)

Hazardous fuels treatments are proposed on an additional 1,200 acres adjoining private land treatments to increase fuel breaks along ridgelines and road systems within the Beaver fire area. Units were identified based on proximity to private timberlands. These additional hazardous fuels treatments, in coordination with salvage harvest, will reduce high densities of snags and surface fuels adjacent to private timberlands.

Table 2-15: Alternative 5 fuels treatment acres by treatment type.

Fuels Treatment Type	Beaver Fire	Happy Camp Complex	Whites Fire	Grand Total
Wildland Urban Interface	610	1,200	410	2,220
Fuels Management Zones	2,080	3,020	920	6,020
Roadside Fuels Treatments	610	3,010	810	4,420
Prescribed Burn	0	1,560	9,210	10,770
Grand Total	3,300	8,790	11,350	23,430

Site Preparation, Reforestation, and Release (about 6,210 acres)

Site preparation, reforestation, and release are proposed only within management areas considered as matrix lands, as identified in the description of salvage harvest in this alternative. Compared to Alternative 2, Alternative 5 does not propose site preparation,

planting, and release in salvage harvest units that are within special habitat (MA 5) which includes Late Successional Reserves and habitat for eagle and falcon, special interest areas (MA 7), hydrologic riparian reserves (MA 10), and inventoried roadless areas (not defined as a management area in the Forest Plan).

Table 2-16: Acres of proposed site preparation, reforestation, and release for Alternative 5 by treatment type

Treatment Type	Beaver Fire	Happy Camp Complex	Whites Fire	Grand Total
Plantations	1,150	1,960	0	3,120
Natural Units (Non-salvage Harvested)	620	120	0	1,050
Salvage Harvest Acres	580	1,750	30	2,360
Total	2,350	3,830	30	6,210

Hand Treatment in Riparian Reserves (0 acres)

No hand treatment in Riparian Reserves is proposed.

Connected Actions

Road Access

Project access will require the use of Forest System roads, State and county roads. There will be no roads added to the Forest System as a result of this project. Almost one mile of new temporary road will be constructed, about four miles of temporary roads on existing roadbeds will be used, and less than two miles of temporary road on reopened decommissioned roads will be used for project access. All temporary roads, including those on previously decommissioned roads, will be closed and hydrologically stabilized according the project design features, after completion of the project.

Table 2-17: Miles of road access for Alternative 5 by type of road

Type of Road Access	Beaver Fire	Happy Camp Complex	Whites Fire	Grand Total
Forest System, County, and State	146	353	63	562
New Temporary	0	0.8	0	0.8
Temporary Road on Existing Roadbed	2.8	1.7	0	4.5
Temporary Road on Re-opened Decommissioned Road	0	1.5	0	1.5
Grand Total	148.5	357.0	63	568.8

Landings and Legacy Sites

Both landings and legacy site actions are as described in Alternative 2. Alternative 5 is the same as Alternative 2 with the exception that fewer landing will be needed to implement this alternative.

Alternative 2 Modified

Alternative 2 Modified was developed during early consultation with U.S. Fish and Wildlife Service to minimize the impacts of salvage harvest on the northern spotted owl. Treatments for Alternative 2 Modified are similar to Alternative 2; each treatment was

adjusted slightly after meeting with representatives from the U.S. Fish and Wildlife Service. Modifications to the descriptions of treatment are described below.

Salvage Harvest (about 7,070 treatment acres within 9,720 acres of units)

Alternative 2 Modified proposes salvage harvest treatment is only proposed in about 7,070net acres, using the acreage refinements based on increased mortality between October 2014 and July 2015, within the larger unit boundaries. The gross unit acres total about 9,720 acres, this is larger than potential treatments areas (net acres) because they include areas where no harvest will occur such as hydrologic riparian reserves and areas with less than 50 percent mortality that are within unit boundaries as well as salvage harvest acres.

Areas proposed for treatment in Alternative 2 Modified were adjusted after units were dropped within each fire-related project area. Salvage units were dropped in the Happy Camp and the Whites project areas during consultation with the U.S. Fish and Wildlife Service. These units were removed from proposed salvage treatment if they were within northern spotted owl core areas classified as having moderate potential for owls to remain on site, reproduce, and contribute to the demographics of the population of the area. See Alternative 3 for a complete description how owl cores were classified as high, moderate, or low. Salvage harvest units in T47N, R2W, Section 32 and T46N, R2W, Section 4 were also removed from the Beaver project area to retain fisher habitat connectivity, or if units were within owl cores classified as moderate as in the Happy Camp and Whites fire-related project areas. Units were also removed from treatment if treatments were no longer economically feasible to implement. Retention of large material (including snags and coarse woody debris) will be accomplished as described in Alternative 2.

Table 2-18: Acres of salvage proposed in Alternative 2 Modified by logging systems.

Logging System	Beaver Fire	Happy Camp Complex	Whites Fire	Grand Total
	Acres of Treatment[a] (within Unit)[b]			
Ground-based	140 (230)	370 (600)	20 (40)	530 (870)
Skyline	80 (110)	3,090 (4,220)	160 (260)	3,320 (4,560)
Helicopter	0 (0)	2,880 (3,840)	320 (460)	3,220 (4,300)
Total Treatment Acres (Unit)	**220 (340)**	**6,340 (8,650)**	**500 (740)**	**7,070 (9,720)**

[a] Treatments are estimated acres within units where more than 50 percent mortality occurred and where salvage activity is proposed. Treatment areas avoid hydrologic riparian reserves and areas where less than 50 percent mortality occurred.

[b] Units are larger than treatment areas because they include areas where no harvest will occur such as hydrologic riparian reserves and areas with less than 50 percent mortality that are within unit boundaries as well as salvage harvest acres.

Both acres of treatment and acres within units are estimates based on GIS and field data. Values are rounded to the nearest ten acres.

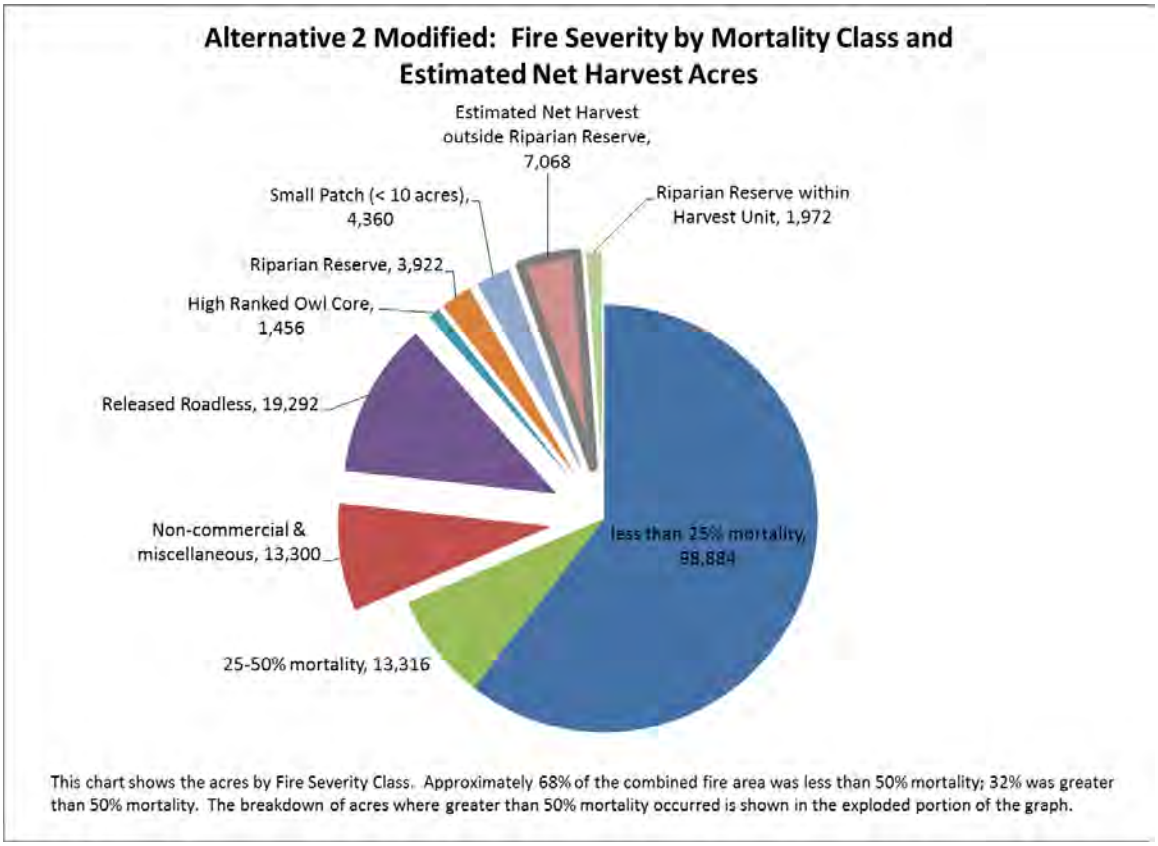

Figure 2-9: Fire Severity by Mortality Class and Estimated Net Harvest Acres in Alternative 2 Modified

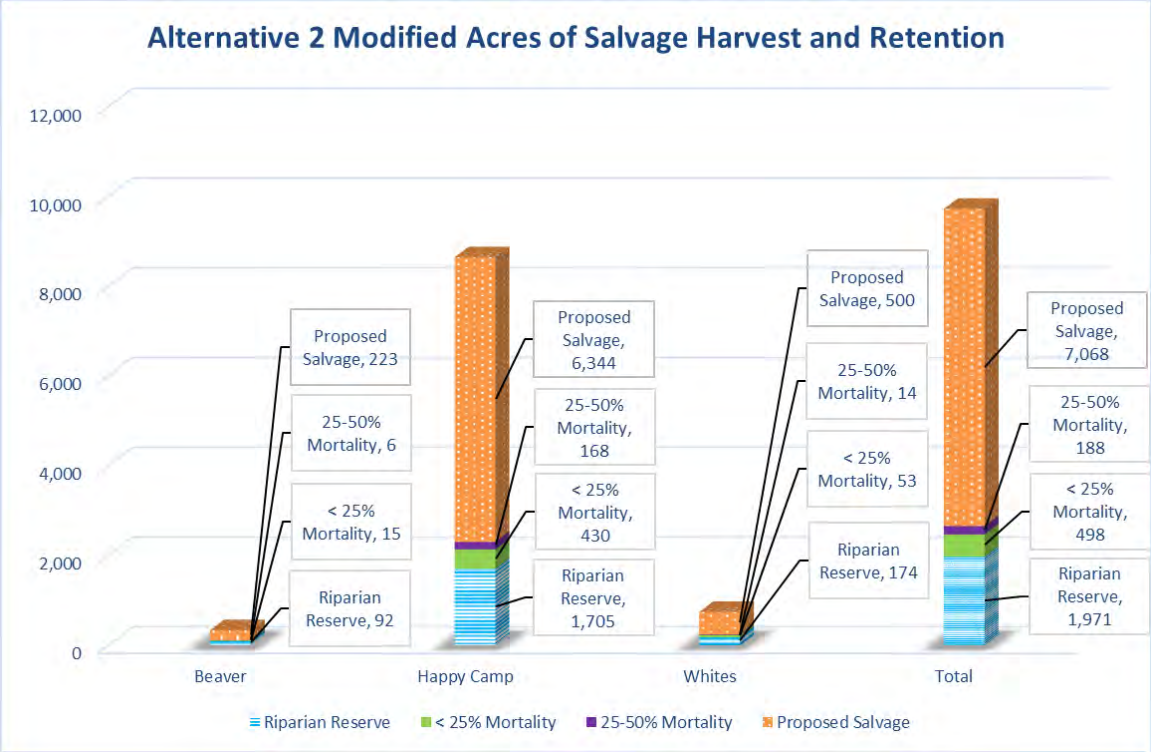

Figure 2-10: Acres of Salvage Harvest and Retention within Treatment Units in Alternative 2 Modified

Roadside Hazard Treatments (640 miles of roadways being evaluated; 4,226 acres of estimated treatment)

In Alternative 2 Modified, marking guidelines were adjusted to respond to public comment and adjusted based on consultation with U.S. Fish and Wildlife Service. Acres associated with roadside hazard treatments are listed in Table 2-2. Alternative 2 Modified adjusts the percentage of mortality for fire-injured trees as follows: all trees less than 45 inches in diameter that were burned in the 2014 fires along Forest System roads within the project area will be considered for removal if they are dead or have a 60 percent or greater chance of dying within three to five years; and trees burned in the 2014 fires, that are greater than 45 inches in diameter, will be considered for removal only if they are dead or have a 90 percent or greater chance of dying within three to five years as defined by Report #RO-11-01 "Marking Guidelines for Fire-Injured Trees in California" (Smith & Cluck, 2011).

The actual area where harvest will occur will not be known until on-the-ground hazard tree evaluations are completed. Mileages of treatment proposed are a maximum and the numbers are merely representative of the entire length and area being evaluated for hazard tree identification and removal. Acres used for analysis were calculated using all fire severity classes with a 200-foot buffer on either side of affected roads. GIS was used to narrow down the amount of acres of roadside hazard considered for hazard tree removal. As a result, the area actually treated by roadside hazard removal will likely be smaller than the estimated 16,005 acres. Fire severity and vegetation type data were used estimate the acres proposed for roadside hazard treatment. The vast majority of the trees proposed for harvest are found within the "concentrated areas" located within forested

areas of high or moderate severity with generally larger blocks of tree mortality. Approximate acres of concentrated treatments were determined by including only forested areas (greater than 10 inches in diameter) of moderate or high fire severity outside of salvage harvest units and plantations. Approximate acres of scattered treatments were determined by including only forested areas (greater than 10 inches in diameter) of low or very low fire severity inside or outside of salvage harvest units. Within the 640 miles of roadways being evaluated, it is estimated that logging within roadside hazard treatments is proposed within a total of 4,226 acres, including 1,293 acres of "concentrated" treatment and 2,933 acres of "scattered" treatment.

Hazardous Fuels Treatments

The wildland urban interface (WUI) and roadside fuels treatments (roadside fuels) are discussed together for Alternative 2 Modified. In Alternative 2 Modified, the prescription of these two treatments was changed to minimize the impact to fisher habitat connectivity and to address fuels concerns in areas with high solar radiation based on slope and aspect. Treatments will include a combination of mechanical, mastication, and hand work to cut dead and dying trees between eight and 14 inches in diameter. Other understory vegetation, including conifers and hardwoods two feet or taller and less than eight inches in diameter, will be thinned, and brush greater than two feet tall will be removed.

After treatment, activity-generated slash and brush will be piled and burned. Retained conifers and hardwoods will be pruned up to seven feet above the ground on the uphill side of trees to increase canopy base height, and reduce ladder fuels and the potential for crown fire initiation. Hanging branches will be removed if they hang below seven feet above ground level. Areas identified as WUI or roadside fuels will be treated differently based on solar radiation exposure, slope, and aspect. Hot Slope and Cool Slope treatments are described below:

- "Hot Slope" (complete understory treatments) are proposed in areas of higher solar radiation, including upper slope positions and westerly and southerly aspects. Treatment spacing will average 20 to 25 feet between leave trees. Leave trees will contain a mixture of hardwood and conifer species; those with good color and vigor will be retained.
- "Cool Slope" (modified understory treatments) are proposed in areas with important wildlife habitat elements and on areas of low solar radiation, northerly and easterly slopes, and on lower slopes in all aspects. Leave tree spacing will average 15 feet. Leave trees will be retained in mosaic pattern, incorporating clumps of at least ¼ acre in size which will be interspersed throughout areas proposed for modified understory WUI and roadside fuels treatments; leave trees will cover 10 to 20 percent of the areas. Preference for retention will be hardwoods located away from areas identified as strategic for fuels reduction (e.g. future locations to hold fireline for planned or unplanned fire within the project area).

Table 2-19: Alternative 2 Modified fuels treatment acres by treatment type.

Fuels Treatment Type	Beaver Fire	Happy Camp Complex	Whites Fire	Grand Total
Wildland Urban Interface	610	1,200	410	2,220
Fuels Management Zones	950	3,020	920	4,890
Roadside Fuels Treatments	610	3,010	810	4,420
Prescribed Burn	0	1,560	9,210	10,770
Grand Total (acres)	2,170	8,790	11,350	22,300

Site Preparation, Reforestation, and Release

Site preparation, reforestation, and release as described in Alternative 2 will be implemented on 7,860 acres of plantations and natural units (units that will not be salvage harvested), and in 7,070 acres of salvage harvest using refined acreage based on mortality between October 2014 and July 2015. Only the areas actually salvage harvested will be site prepared and planted, not the entire units. Total acres to be site prepared and planted were adjusted based on the amount of salvage harvest acres removed from treatment for this alternative. Where salvage acres were dropped, site preparation and planting is no longer proposed. For mastication and mechanical yarding units, with the exception of treatment on granitic and schist soil types (project design feature Watershed-9 in Table 2-42) the treatment has been modified to include slopes of up to 45 percent in Alternative 2 Modified.

Table 2-20: Acres of proposed site preparation, reforestation, and release for Alternative 2 Modified by treatment type

Site Preparation, Reforestation and Release Unit Type	Beaver Fire	Happy Camp Complex	Whites Fire	Grand Total
Plantations	1,160	5,040	610	6,810
Natural Units (Non-salvage Harvested)	620	400	30	1,050
Salvage Harvest Units	220	6,340	500	7,070
Total Acres	2,000	11,780	1,140	14,930

Hand Treatment in Riparian Reserves (about 60 acres[18])

Like Alternative 4, Alternative 2 Modified proposes hand treatment where Riparian Reserves overlap salvage units and existing plantations proposed for site preparation and planting in only the Happy Camp and Whites project areas. This alternative limits hand treatment within these units to the upper one-third of slopes of Riparian Reserves where they overlap site preparation and salvage units to achieve ground cover requirements and to allow for regeneration of vegetation. Within Riparian Reserves, the upper limit of dead tree removal was reduced from 16 to ten inches diameter at breast height. No planting is proposed in Riparian Reserves in this alternative.

Connected Actions

Road Access

Project access will require the use of Forest System roads, State and County Roads. Forest System roads will be maintained as needed for Alternative 2 Modified implementation as displayed in Table 2-21. There will be no roads added to the Forest System as a result of this project. About three miles of new temporary roads will be constructed. Alternative 2 Modified reduces the number of miles of temporary road on existing roadbeds to about seven miles, and the miles of temporary road on reopened decommissioned roads to less than six miles. All temporary roads, including those previously decommissioned, will be closed and hydrologically stabilized according the project design features at the completion of the project.

[18] Estimated acres were calculated using GIS and omitted RAVG class 1 and 2 (or areas with less than 50% mortality).

Table 2-21: Miles of road access for Alternative 2 Modified by type of road

Type of Road Access	Beaver Fire	Happy Camp Complex	Whites Fire	Grand Total
Forest System, County, and State	146	353	63	562
New Temporary	0	3.3	0.1	3.4
Temporary Road on Existing Roadbed	1.1	5.5	0.7	7.3
Temporary Road on Re-opened Decommissioned Road	0	5.6	0	5.6
Grand Total	147.1	367.5	63.8	578.3

Landings and Legacy Sites

Both landings and legacy site actions are as described in Alternative 2. Alternative 2 Modified is the same as Alternative 2 with the exception that fewer landing will be needed to implement this alternative.

Alternative 3 Modified

Alternative 3 Modified was developed during additional consultation with regulatory agencies, including U.S. Fish and Wildlife Service, National Marine Fisheries Service, and the Water Board, local tribes, and in response to comments. This alternative combined elements for action alternatives proposed in the draft EIS. Many of the actions proposed in the draft EIS benefited multiple resources; however, during the comment period members of the public stated that Alternatives 3 and 4 divided wildlife and watershed concerns when they could have been addressed in the same alternative. Alternative 3 Modified responds to these comments. It emphasizes the development of future late-successional habitat (see Appendix E), habitat connectivity, northern spotted owl habitat, additional snag retention areas, and retention of legacy components, while minimizing potential negative effects of treatment to watershed conditions.

Alternative 3 Modified was also developed by incorporating elements of both Alternative 5 and the Karuk Alternative to help restore fire to the landscape. This alternative proposes additional fuels treatments.

Salvage Harvest (about 5,760 treatment acres within 6,890 acres of units)

Alternative 3 Modified proposes salvage logging treatments on approximately 5,760 net acres, using the refined acreage based on mortality from October 2014 to July 2015, within about 6,890 gross acres of salvage units on Forest lands. Alternative 3 Modified was developed based on Alternative 3; both alternatives remove all salvage harvest acres from the Beaver project area. In addition to units dropped as part of Alternative 3, 830 of additional salvage units were dropped in the Happy Camp and the Whites project areas in Alternative 3 Modified. These changes were based on additional modifications identified during consultation with the U.S. Fish and Wildlife Service. Units were dropped as described in Alternative 3 and Alternative 2 Modified; additional units were dropped if they were no longer economically viable or to address public comments, as well as to address wildlife concerns identified during streamlined consultation with the U.S. Fish and Wildlife Service. These additional units were reevaluated by the Forest and removed from treatment if they did not contribute to the overall fuels strategy and if they were within northern spotted owl core areas classified as having high or moderate potential for owls to remain on site, reproduce, and contribute to the demographics of the population of the area. High or moderate owl cores are defined in the description of Alternative 3 in

this chapter. Acres within treatment areas were adjusted after units were dropped within each fire-related project area and additional corridors were added for habitat connectivity. Retention of large material (including snags and coarse woody debris) will be accomplished as described in Alternative 2.

Table 2-22: Acres of salvage harvest proposed in Alternative 3 Modified by logging systems.

Logging System	Beaver Fire	Happy Camp Complex	Whites Fire	Grand Total
	Acres of Treatment[a] (within Unit)[b]			
Ground-based	0 (0)	480 (490)	40 (40)	520 (530)
Skyline	0 (0)	2,800 (3,200)	170 (210)	2,970 (3,410)
Helicopter	0 (0)	1,930 (2,520)	340 (440)	2,270 (2,960)
Total Treatment Acres (Unit)	**0 (0)**	**5,200 (6,210)**	**550 (680)**	**5,760 (6,890)**

[a] Treatments are estimated acres within units where more than 50 percent mortality occurred and where salvage activity is proposed. Treatment areas avoid hydrologic riparian reserves and areas where less than 50 percent mortality occurred.

[b] Units are larger than treatment areas because they include areas where no harvest will occur such as hydrologic riparian reserves and areas with less than 50 percent mortality that are within unit boundaries as well as salvage harvest acres.

Both acres of treatment and acres within units are estimates based on GIS and field data. Values are rounded to the nearest ten acres.

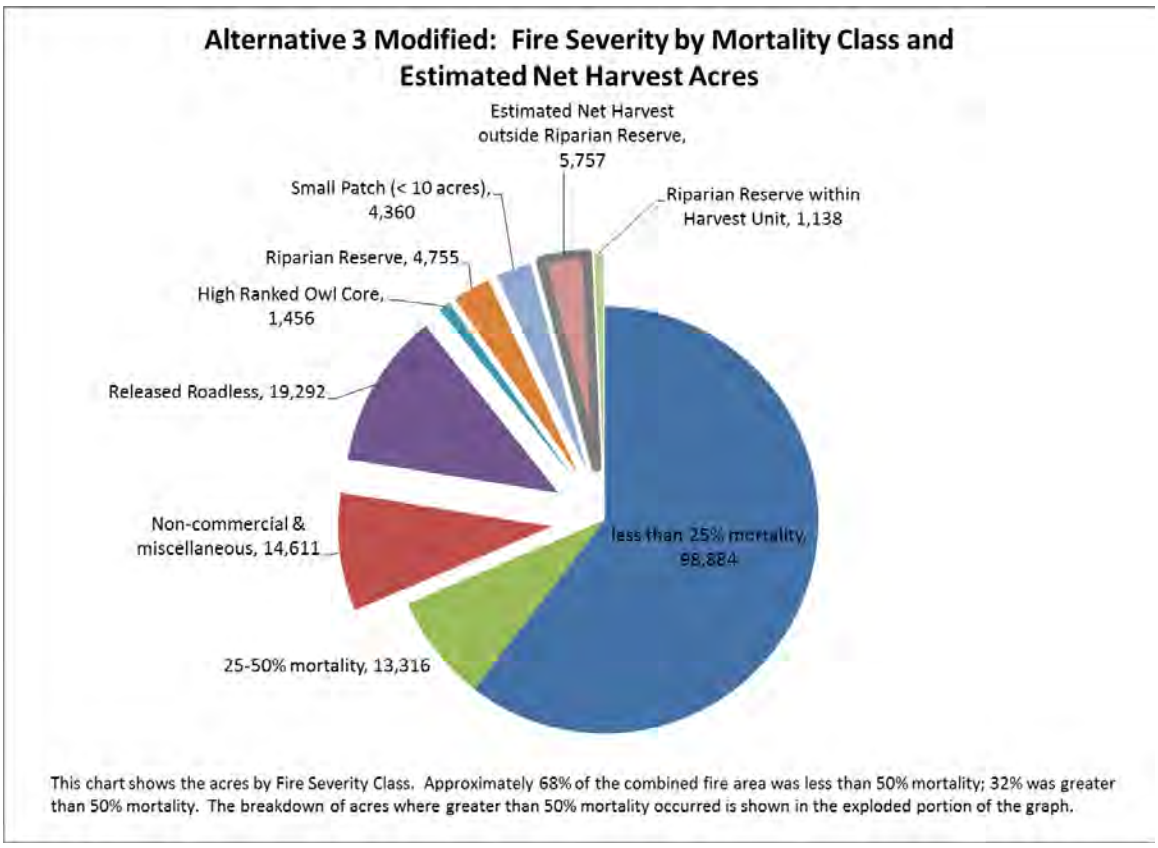

Figure 2-11: Fire Severity by Mortality Class and Estimated Net Harvest Alternative 3 Modified

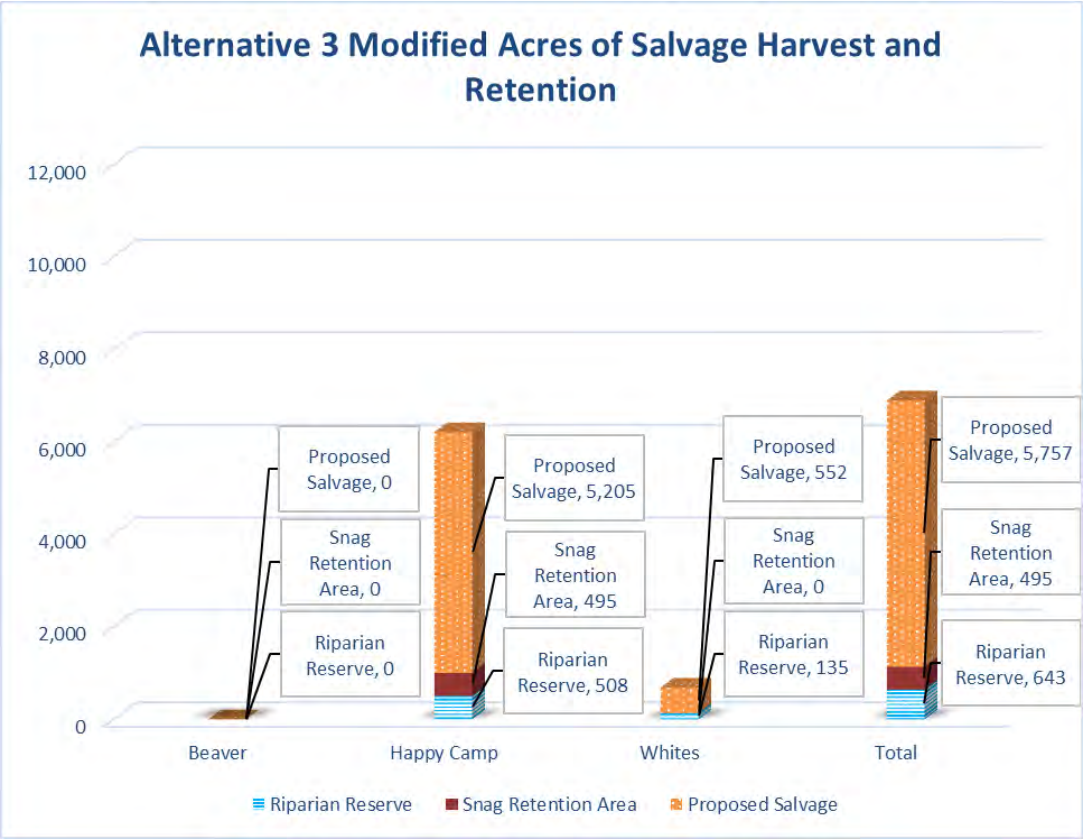

Figure 2-12: Acres of Salvage Harvest and Retention within Treatment Units in Alternative 3 Modified

Roadside Hazard Treatments (about 320 miles of roadways being evaluated; 4,168 acres of estimated treatment)

Same as Alternative 2 Modified, except additional field reconnaissance provided better information on where fire-killed roadside hazard trees would be removed. A total of about 320 miles of roads were removed from consideration for roadside hazard as compared to Alternative 2. The Forest deleted from roadside hazard removal any areas that were not directly affected by the 2014 fires, and no hazard tree removal is proposed adjacent to roads in need of substantial work to again be drivable. Hazard trees (also known as danger trees) outside fire affected areas will be removed if they are determined to be an imminent hazard.

Table 2-23: Miles of road by maintenance level along which roadside hazard will be treated in Alternative 3 Modified

Road Type by Maintenance Level	Beaver Fire	Happy Camp Complex	Whites Fire	Grand Total
Level 1 (basic custodial care, closed to public)	8.5	24.4	1.5	34.4
Level 2 (high clearance vehicles)	32.6	124.2	24.3	181.1
Level 3 (suitable for passenger cars)	3.8	60.5	16.6	80.9
Level 4 (moderate degree of user comfort)	0.1	0	0	0.1
Level 5 (high degree of user comfort)	0.6	0	0	0.6
County Roads and State Highways	2.5	5.4	12.2	20.0

Road Type by Maintenance Level	Beaver Fire	Happy Camp Complex	Whites Fire	Grand Total
Grand Total (miles)	48.0	214.6		317.2

The actual area where harvest will occur will not be known until on-the-ground hazard tree evaluations are completed. Mileages of treatment proposed are a maximum and the numbers are merely representative of the entire length and area being evaluated for hazard tree identification and removal. Acres used for analysis were calculated using all fire severity classes with a 200-foot buffer on either side of affected roads. GIS was used to narrow down the amount of acres of roadside hazard considered for hazard tree removal. As a result, the area actually treated by roadside hazard removal will likely be smaller than the estimated 14,322 acres. Fire severity and vegetation type data were used estimate the acres proposed for roadside hazard treatment. The vast majority of the trees proposed for harvest are found within the "concentrated areas" located within forested areas of high or moderate severity with generally larger blocks of tree mortality. Approximate acres of concentrated treatments were determined by including only forested areas (>10" in DBH) of moderate or high fire severity outside of salvage harvest units and plantations. Approximate acres of scattered treatments were determined by including only forested areas (>10" in DBH) of low or very low fire severity inside or outside of salvage harvest units. Within the 320 miles of roadways being evaluated, it is estimated that logging within roadside hazard treatments is proposed within a total of 4,168 acres, including 1,330 acres of "concentrated" treatment and 2,838 acres of "scattered" treatment.

Hazardous Fuels Treatments (about 24,450 acres)

In addition to modifying wildland urban interface (WUI) and roadside fuels treatments (roadside fuels) to "hot slope" or "cool slope" treatments as describe in Alternative 2 Modified, prescribed burns adjacent to private timberlands from Alternative 5 were incorporated into Alternative 3 Modified. Fuels treatments were also added on the south and west sides of section 32 in T47N R2W in the Beaver fire area. Since salvage harvest units 1129 and 1140 were dropped, fuels treatments were added in this section of the Beaver fire along private property boundaries. In addition to the additional fuel breaks in the Happy Camp and Whites fire areas, wildland urban interface, and roadside fuels treatments were added to this alternative based on some of the recommendations in the Karuk Alternative.

Table 2-24: Alternative 3 Modified fuels treatment acres by treatment type.

Fuels Treatment Type	Beaver Fire	Happy Camp Complex	Whites Fire	Grand Total
Wildland Urban Interface	630	1,460	550	2,630
Fuels Management Zones	1,530	2,620	780	4,930
Roadside Fuels Treatments	700	4,120	890	5,710
Prescribed Burn	450	1,540	9,190	11,180
Grand Total (acres)	3,310	9,740	11,410	24,450

Site Preparation, Reforestation, and Release (about 12,890 acres)

Site preparation and planting units were removed from Alternative 3 Modified to address public comments, economic feasibility, and wildlife concerns identified during consultation with the U.S. Fish and Wildlife Service. Units were removed (P199, P200,

P201, P341, P342, P343) where site preparation and planting boundaries overlapped existing or historic meadows; if meadows are identified during implementation in overlapping site preparation or salvage units, planting will not be implemented (project design feature Range-3 on Table 2-42). No skyline yarding will be used for treatment in plantation units proposed for site preparation and planting. Proposed treatment for units P087 and P091 are now proposed for site preparation by hand cutting and piling. Units still proposed for site preparation, reforestation, and release will be implemented as described in Alternative 2 within other plantations and natural units (units that are not salvage harvested), and on all salvage harvest acres.

In addition to the areas dropped from site preparation and planting, the total number of site preparation, reforestation, and release acres were also adjusted based on the number of salvage harvest acres proposed for treatment for this alternative. For mastication and mechanical yarding units, with the exception of treatment on granitic and schist soil types (project design feature Watershed-9 on Table 2-42) the treatment has been modified to include slopes of up to 45 percent in this alternative. Mastication and mechanical units will exclude equipment on granitic and schist soil types on slopes greater than 35 percent.

Table 2-25: Acres of proposed site preparation, reforestation, and release for Alternative 3 Modified by treatment type

Site Preparation, Reforestation and Release Unit Type	Beaver Fire	Happy Camp Complex	Whites Fire	Grand Total
Plantations	1,130	4,610	560	6,290
Natural Units (Non-salvage Harvested)	530	310	0	840
Salvage Harvest Units	0	5,200	550	5,760
Total Acres	1,660	10,120	1,110	12,890

Hand Treatment in Riparian Reserves (about 590 acres[19])

Like Alternative 2, this alternative proposes hand treatment only where Riparian Reserves overlap site preparation and planting in areas identified as plantations. Alternative 3 Modified proposes hand treatment in all fire areas, including the Beaver Fire area, where Riparian Reserves overlap site preparation units. Within Riparian Reserves, the upper limit of dead tree removal was reduced from 16 to ten inches diameter at breast height. After hand treatment (as described in Alternative 2) is complete, the need for planting will be evaluated and planting would occur only where necessary to re-establish conifers as a component of the Riparian Reserve. Live hardwoods would count towards stocking levels. Follow-up hand treatments are proposed to help facilitate growth of natural regeneration of hardwoods and conifer seedlings.

Connected Actions

Road Access

Project access will require the use of Forest System roads, State and County Roads. Forest System roads will be maintained as needed for Alternative 3 Modified

[19] Estimated acres were calculated using GIS and omitted RAVG class 1 and 2 (or areas with less than 50% mortality).

implementation as displayed in Table 2-13. There will be no roads added to the Forest System as a result of this project; about three miles of new temporary roads will be constructed. This alternative reduces the mileage of temporary roads on existing roadbeds that will be used for project access to less than five miles. All temporary roads associated with salvage in the Beaver project area were dropped due to dropping the associated salvage units. In the Beaver project area, there are no new temporary roads and no temporary road actions that involve stream crossings. About five miles of temporary roads on re-opened decommissioned roads are proposed for use. The decommissioned section of Forest Road 46N62 (also referred to as the "Caroline Creek Road") will remain closed. Sections of decommissioned road associated with dropped salvage units were also dropped; these include decommissioned sections of 45N56YA, 46N42Y, and 46N78 which will remain closed. All temporary roads, including those on previously decommissioned roads, will be closed and hydrologically stabilized according the project design features.

Table 2-26: Miles of road access for Alternative 3 Modified by Forest Transportation System maintenance level and temporary road access

Type of Road Access	Beaver Fire	Happy Camp Complex	Whites Fire	Grand Total
Forest System, County, and State	48	210	55	317
New Temporary	0	3.3	0	3.3
Temporary Road on Existing Roadbed	0	3.9	0.7	4.6
Temporary Road on Re-opened Decommissioned Road	0	4.8	0	4.8
Grand Total	48	222.0	55.7	329.7

Landings and Legacy Sites

Both landings and legacy site actions are as described in Alternative 2. Alternative 3 Modified is the same as Alternative 2 with the exception that fewer landing will be needed to implement this alternative.

Monitoring

As project actions are implemented, they are monitored by Forest Service personnel as part of normal operating procedures. Forest Service employees monitor timber marking of harvest units to ensure that prescriptions and marking guides are being followed. Forest Service sale administrators monitor the harvest to assure that Forest Plan standards and guidelines, best management practices, and project design features are being implemented. Seedling growth and quality are monitored and inspected in the nursery prior to planting trees. Contract inspectors will work with planting crews to ensure that planting prescriptions are followed and release methods are suitable for enhancing survival of seedlings. Subsequent surveys will be conducted to document seedling survival, stocking densities and species diversity within treatment areas. Areas that are planted will also be assessed for overall vigor, growth, amount (and species) of competing vegetation, and seedling damage.

As fuels treatments are implemented, projects are monitored as part of normal operating procedures. Prior to prescribed burning, burn plans are developed. Burn plans for prescribed fire require monitoring of the burning to ensure that project objectives are being achieved.

Project design features identified for wildlife species within the analysis will be monitored for effectiveness during implementation and assumptions made pertaining to effects to species will be verified. The U.S. Fish and Wildlife Service will continue involvement through the life of the project as part of the consultation process by providing recommendations for minimizing effects if new information becomes available through northern spotted owl monitoring and the application of protection measures. The U.S. Fish and Wildlife may have terms and conditions associated with the Biological Opinion that may require additional monitoring. Pre-implementation surveys for northern goshawk, peregrine falcon, and bald eagles have been completed and nests identified will be monitored throughout project implementation.

The Forest Noxious Weed Detection and Treatment Program will continue to monitor for new infestations of invasive plant species that may be introduced or spread throughout the project area and Forest lands. Project implementation monitoring will be conducted for both invasive species and Sensitive botanical species, where effectiveness of project design features, as implemented on the ground will be noted. The viability of Sensitive botanical populations will be assessed as part of this process. Results will be documented in the Forest annual monitoring reports.

Best Management Practices Evaluation Program monitoring will occur on a sample of the BMPs appropriate for this project which are listed in Appendix D. Because many project treatments do not occur within the same year, these treatments will be included in Best Management Practices Evaluation Program monitoring pools for up to a decade as needed. The Forest Sediment Monitoring Plan (USDA Forest Service 2013c) and Shade Monitoring Plan (USDA Forest Service 2011a) will be implemented for Total Maximum Daily Load compliance as displayed in the North Coast Region Basin Plan (North Coast Region Water Quality Control Board 2011). As described in the Fisheries Biological Assessment and Addendum, project hazard tree marking near streams that contain Coho salmon Critical Habitat has, and will continue to be, monitored by fisheries biologists from the Forest Service, National Marine Fisheries Service, and the Karuk Tribe. This monitoring will ensure that hazard trees in these near stream areas are marked according to EIS descriptions and project design features. As described in project design features, Forest Service fisheries biologists will be involved in decisions about where water drafting will occur. Information about where project water drafting is occurring, especially during June-September, will be shared and these activities may be monitored by Forest Service, National Marine Fisheries Service, or Karuk Tribe fisheries biologists.

Monitoring of at-risk historic properties and/or cultural resources during implementation may be conducted to ensure the effectiveness of resource protection measures pursuant to the Regional Programmatic Agreement and/or the Westside Fire Recovery Programmatic Agreement.

Monitoring to assess the implementation and effectiveness of project design features to meet soil Standard and Guidelines in the Forest Plan may occur in the Westside project. Field investigations of soil cover, soil compaction, and impacts to soil organic matter will occur on a minimum of five percent of activity areas forest-wide, as described in Chapter 5 of the Forest Plan. Units will be selected randomly from all activity areas across the Forest where soil disturbing activities take place; the Westside project will be included in the sampling pool for soil monitoring. Results will be documented in the Forest annual monitoring reports.

Comparison of Alternatives

Comparison Tables of Miles of Roads and Acres of Treatment

Table 2-27, Table 2-28, and Table 2-29 provide brief summaries of activities for each fire area by treatment acres proposed for each alternative analyzed in detail. Table 2-30 provided a summary of the activities for the project as a whole. See treatment maps in Appendix A for maps of each alternative. Comparison Tables of Effects Related to Purpose and Need

Table 2-31 shows a comparison of the effects related to economic aspect of the purpose and need for the entire project area. Table 2-32, Table 2-33, and Table 2-34 compare alternatives on how they address the purpose and need for each fire-related project area, and Table 2-37 compare alternatives in response to relevant issues. Comparison Tables of Effects by Resource

Table 2-38, Table 2-39, and Table 2-40 display a comparison of the environmental effects by fire area of each action alternative by resource. Table 2-41displays alternatives by treatments within various land allocations.

Comparison Tables of Miles of Roads and Acres of Treatment

Table 2-27: Comparison of miles of roads and acres of treatment in the Beaver Fire Area

Treatments in Beaver Fire Area	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 2 Modified	Alternative 3 Modified
Net Salvage Acres[20]	**0**	**590**	**0**	**520**	**580**	**220**	**0**
Ground-based	0	420	0	380	420	140	0
Skyline	0	170	0	140	160	80	0
Helicopter	0	0	0	0	0	0	0
Gross Acres in Units[21]	**0**	**860**	**0**	**750**	**830**	**340**	**0**
Ground-based	0	660	0	600	660	230	0
Skyline	0	200	0	160	170	110	0
Helicopter	0	0	0	0	0	0	0
Roadside Hazard Treatments (miles/acres) Evaluated	**0**	**170 miles / maximum of 5,800 acres**	**170 miles / maximum of 5,800 acres**	**160 miles / maximum of 5,600 acres**	**170 miles / maximum of 5,800 acres**	**170 miles / maximum of 5,800 acres**	**50 miles / maximum of 2,190 acres**
Hazardous Fuel Treatments (acres)	**0**	**2,090**	**2,090**	**2,090**	**3,300**	**2,170**	**3,300**
Wildland Urban Interface	0	610	610	610	610	610	630
Fuels Management Zones	0	870	870	870	2,080	950	1,530
Roadside Fuels	0	610	610	610	610	610	700
Prescribed Burn	0	0	0	0	0	0	450
Site Preparation, Reforestation and Release Treatments (acres)	**0**	**Not including salvage=1,780 Including=2,370**	**Not including salvage=1,780 Including=1,780**	**Not including salvage=1,780 Including=2,300**	**Not including salvage=1,770 Including=2,350**	**Not including salvage=1,780 Including=2,000**	**Not including salvage=1,660 Including=1,660**
Site Prepare/reforest	0	2,370	1,780	2,300	2,350	2,000	1,660
Plantations	0	1,160	1,160	1,160	1,150	1,160	1,130
Natural Units	0	620	620	620	620	620	530
Within salvage harvest	0	590	0	520	580	220	0

[20] Net acres do not include acreage in stream-course Riparian Reserves or in areas that burned with less than 50% mortality of vegetation. Between draft EIS and final EIS, it was determined that mortality increased so these figures reflect increased mortality.

[21] Gross acres include all acres within the unit boundaries whether they will be harvested or not.

Treatments in Beaver Fire Area	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 2 Modified	Alternative 3 Modified
Riparian Reserves Hand Treatment	**0**	**0**	**0**	**0**	**0**	**0**	**90**
Road Access (miles)	**0**	**149**	**148**	**146**	**149**	**147**	**48**
Forest System Roads, County Roads and State Highways	0	146	146	146	146	146	48
New Temporary Roads	0	0	0	0	0	0	0
Temporary Roads on Existing Roadbeds	0	2.8	1.5	0.3	2.8	1.1	0
Temporary Roads on Reopened Decommissioned Roads	0	0	0	0	0	0	0

Table 2-28: Comparison of miles of roads and acres of treatment in the Happy Camp Fire Area

Treatments in Happy Camp Fire Area	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 2 Modified	Alternative 3 Modified
Net Salvage Acres[22]	**0**	**6,790**	**6,130**	**5,830**	**1,750**	**6,340**	**5,200**
Ground-based	0	410	340	360	140	370	480
Skyline	0	3,380	3,060	2,400	570	3,090	2,800
Helicopter	0	3,000	2,730	3,070	1,040	2,880	1,930
Gross Acres in Units[23]	**0**	**9,390**	**8,360**	**8,100**	**2,440**	**8,650**	**6,210**
Ground-based	0	670	550	600	230	600	490
Skyline	0	4,670	4,170	3,330	800	4,220	3,200
Helicopter	0	4,050	3,640	4,170	1,410	3,840	2,520
Roadside Hazard Treatments (miles/acres) Evaluated	**0**	**400 miles / maximum of 14,000 acres**	**400 miles / maximum of 14,000 acres**	**390 miles / maximum of 13,600 acres**	**400 miles / maximum of 14,000 acres**	**400 miles / maximum of 14,000 acres**	**215 miles / maximum of 9,730 acres**
Hazardous Fuel Treatments (acres)	**0**	**8,790**	**8,790**	**8,790**	**8,790**	**8,790**	**9,740**
Wildland Urban Interface	0	1,200	1,200	1,200	1,200	1,200	1,460

[22] Net acres do not include acreage in stream-course Riparian Reserves or in areas that burned with less than 50% mortality of vegetation. Between draft EIS and final EIS, it was determined that mortality increased so these figures reflect increased mortality.

[23] Gross acres include all acres within the unit boundaries whether they will be harvested or not.

Treatments in Happy Camp Fire Area	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 2 Modified	Alternative 3 Modified
Fuels Management Zones	0	3,020	3,020	3,020	3,020	3,020	2,620
Roadside Fuels Treatments	0	3,010	3,010	3,010	3,010	3,010	4,120
Prescribed Burn	0	1,560	1,560	1,560	1,560	1,560	1,540
Site Preparation, Reforestation and Release Treatments (acres)	**0**	**Not including salvage=5,440 Including=12,230**	**Not including salvage=5,440 Including=11,570**	**Not including salvage=5,440 Including=11,270**	**Not including salvage=2,080 Including=3,830**	**Not including salvage=5,440 Including=11,780**	**Not including salvage=4,920 Including=10,120**
Site Prepare/reforest	0	12,230	11,570	11,270	3,830	11,780	10,120
Plantations	0	5,040	5,040	5,040	1,960	5,040	4,610
Within natural units	0	400	400	400	120	400	310
Within salvage units	0	6,790	6,130	5,830	1,750	6,340	5,200
Riparian Reserve Hand Treatment	**0**	**320**	**0**	**1,770**	**0**	**50**	**480**
Road Access (miles)	**0**	**371**	**370**	**356**	**357**	**367**	**226**
Forest System Roads, County Roads and State Highways	0	353	353	353	353	353	210
New Temporary Roads	0	3.5	3.4	1.1	0.8	3.3	3.3
Temporary Roads on Existing Roadbeds	0	5.8	4.6	1.3	1.7	5.5	3.9
Temporary Roads on Reopened Decommissioned Roads	0	9.0	8.6	0.4	1.5	5.6	4.8

Table 2-29: Comparison of miles of roads and acres of treatment in the Whites Fire Area

Treatments in Whites Fire Area	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 2 Modified	Alternative 3 Modified
Net Salvage Acres[24]	**0**	**560**	**460**	**560**	**30**	**500**	**550**
Ground-based	0	20	20	20	0	20	40
Skyline	0	180	150	180	0	160	170

[24] Net acres do not include acreage in stream-course Riparian Reserves or in areas that burned with less than 50% mortality of vegetation. Between draft EIS and final EIS, it was determined that mortality increased so these figures reflect increased mortality.

Treatments in Whites Fire Area	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 2 Modified	Alternative 3 Modified
Helicopter	0	360	290	360	30	320	340
Gross Acres in Units[25]	**0**	**850**	**680**	**850**	**70**	**740**	**680**
Ground-based	0	40	40	40	20	40	40
Skyline	0	270	220	270	0	240	210
Helicopter	0	540	420	540	60	460	440
Roadside Hazard Treatments (miles/acres) Evaluated	**0**	**80 miles / maximum of 2,700 acres**	**80 miles / maximum of 2,700 acres**	**70 miles / maximum of 2,500 acres**	**80 miles / maximum of 2,700 acres**	**80 miles / maximum of 2,700 acres**	**55 miles / maximum of 2,400 acres**
Hazardous Fuel Treatments (acres)	0	11,350	11,350	11,350	11,350	11,350	11,400
Wildland Urban Interface	0	410	410	410	410	410	550
Fuels Management Zones	0	920	920	920	920	920	780
Roadside Fuels	0	810	810	810	810	810	890
Prescribed Burn	0	9,210	9,210	9,210	9,210	9,210	9,190
Site Preparation, Reforestation and Release Treatments (acres)	**0**	**Not including salvage=640 Including=1,200**	**Not including salvage=640 Including=1,100**	**Not including salvage=640 Including=1,200**	**Not including salvage=0 Including=30**	**Not including salvage=640 Including=1,140**	**Not including salvage=560 Including=1,110**
Site Prepare/reforest		1,200	1,100	1,200	30	1,140	1,110
Plantations	0	610	610	610	0	610	560
Natural Units	0	30	30	30	0	30	0
Salvage Harvest	0	560	460	560	30	500	550
Riparian Reserve Hand Treatment	**0**	**50**	**0**	**60**	**0**	**10**	**20**
Road Access (miles)	**0**	**64**	**64**	**64**	**63**	**64**	**55**
Forest System Roads, County Roads and State Highways	0	63	63	63	63	63	55
New Temporary Roads	0	0.1	0.1	0.1	0	0.1	0
Temporary Roads on Existing Roadbeds	0	0.7	0.7	0.6	0	0.7	0.7

[25] Gross acres include all acres within the unit boundaries whether they will be harvested or not.

Treatments in Whites Fire Area	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 2 Modified	Alternative 3 Modified
Temporary Roads on Reopened Decommissioned Roads	0	0	0	0	0	0	0

Table 2-30: Comparison of total miles of roads and acres of treatment in all Westside Fire Recovery Project Areas

Treatments in the Westside project area	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 2 Modified	Alternative 3 Modified
Net Salvage Acres[26]	**0**	**7,940**	**6,590**	**6,910**	**2,360**	**7,070**	**5,760**
Ground-based	0	850	370	760	560	530	520
Skyline	0	3,680	3,210	2,670	690	3,320	2,970
Helicopter	0	3,410	3,010	3,480	1,110	3,220	2,270
Gross Acres in Units[27]	**0**	**11,090**	**9,040**	**9,700**	**3,340**	**9,720**	**6,890**
Ground-based	0	1,370	590	1,240	910	870	530
Skyline	0	5,140	4,400	3,750	970	4,560	3,410
Helicopter	0	4,580	4,050	4,710	1,470	4,300	2,960
Roadside Hazard Treatments (miles/acres) Evaluated	**0**	**640 miles / maximum of 20,500 acres**	**640 miles / maximum of 20,500 acres**	**620 miles / maximum of 19,580 acres**	**640 miles/ maximum of 20,500 acres**	**640 miles/ maximum of 20,500 acres**	**320 miles / maximum of 14,320 acres**
Hazardous Fuel Treatments (acres)	0	22,220	22,220	22,220	23,430	22,300	24,450
Wildland Urban Interface	0	2,220	2,220	2,220	2,220	2,220	2,630
Fuels Management Zones	0	4,810	4,810	4,810	6,020	4,890	4,930
Roadside Fuels	0	4,420	4,420	4,420	4,420	4,420	5,710
Prescribed Burn	0	10,770	10,770	10,770	10,770	10,770	11,180
Site Preparation, Reforestation and Release Treatments (acres)	**0**	**Not including salvage=7,860 Including=15,800**	**Not including salvage=7,860 Including=14,450**	**Not including salvage=7,860 Including=14,770**	**Not including salvage=3,850 Including=6,210**	**Not including salvage=7,860 Including=14,930**	**Not including salvage=7,130 Including=12,890**

[26] Net acres do not include acreage in stream-course Riparian Reserves or in areas that burned with less than 50% mortality of vegetation. Between draft EIS and final EIS, it was determined that mortality increased so these figures reflect increased mortality.
[27] Gross acres include all acres within the unit boundaries whether they will be harvested or not.

Treatments in the Westside project area	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 2 Modified	Alternative 3 Modified
Site Prepare/reforest		15,800	14,450	14,770	6,210	14,930	12,891
Plantations	0	6,810	6,810	6,810	3,110	6,810	6,290
Natural Units	0	1,050	1,050	1,050	740	1,050	840
Within salvage acres		7,940	6,590	6,910	2,360	7,070	5,760
Riparian Reserve Hand Treatment	**0**	**370**	**0**	**1,830**	**0**	**60**	**590**
Road Access (miles)	**0**	**584**	**582**	**565**	**569**	**578**	**330**
Forest System Roads, County Roads and State Highways	0	562	562	562	562	562	317
New Temporary Roads	0	3.6	3.5	1.2	0.8	3.4	3.3
Temporary Roads on Existing Roadbeds	0	9.3	6.8	2.2	4.4	7.3	4.6
Temporary Roads on Reopened Decommissioned Roads	0	9.0	8.6	0.4	1.5	5.6	4.8

Comparison Tables of Effects Related to Purpose and Need

Table 2-31: Comparison of alternative effects related to economic aspect of the purpose and need for the entire project area.

Meeting Purpose and Need	Measurement Indicator	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 2 Modified	Alternative 3 Modified
Capture the economic value of snags and hazard trees for a viable project and benefit to local communities	Timber sale income (in millions of dollars)	$0	$210	$185	$189	$84	$179	$153
	Labor income (in millions of dollars)	$0	$53	$47	$47	$22	$46	$38
	Employment (jobs)	0	1,236	1,067	1,074	549	1,076	887

Table 2-32: Comparison of alternative effects related to the public safety, fire suppression and fire-resilient ecosystem aspects of purpose and need of the project for Beaver Fire area.

Meeting Purpose and Need	Measurement Indicator	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 2 Modified	Alternative 3 Modified

Meeting Purpose and Need	Measurement Indicator	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 2 Modified	Alternative 3 Modified
Provide for worker and public safety and access	Miles and acres of roadside hazard treatment	0 0	170 miles 5,800 acres	170 miles 5,800 acres	160 miles 5,600 acres	170 miles 5,800 acres	170 miles 5,800 acres	48 miles 2,190 acres
	Acres of fuels reduction treatment within WUI	0	610 acres	610 acres	610 acres	610 acres	610 acres	630 acres
	Acres where snags are removed by salvage and site preparation	0	590 acres salvage 1,780 acres of site preparation	0 acres salvage 1,780 acres of site preparation	520 acres salvage 1,780 acres of site preparation	580 acres salvage 1,770 acres of site preparation	220 acres of salvage 1,780 acres of site preparation	0 acres of salvage 1,660 acres of site preparation
Improve fire suppression conditions for firefighters and community protection	Acres of resistance to control improved (large fuels removed)	0	2,965 acres	2,105 acres	2,855 acres	4,135 acres	2,535 acres	2,930 acres
	Acres of fuel breaks, prescribed burning and other fuels treatments	0	2,090 acres	2,090 acres	2,090 acres	3,300 acres	2,170 acres	3,300 acres
Provide for restored and fire-resilient forested ecosystems	Acres treated to promote regeneration through salvage harvest	0	590 acres	0	520 acres	580 acres	220 acres	0
	Years to reach a mature stand in areas of salvage harvest	100+ years	40-60 years	40-60 years	40-60 years	40-60 years in matrix land; 100+ in non-matrix	40-60 years	40-60 years
	Type of vegetation regenerated in salvage harvest areas Short-term/ Long-term	Grass, forbs, brush. Brush, hardwoods, isolated parches of conifers	Brush, hardwoods, young conifers/ Mature mixed conifer stands	Same as Alternative 2	Same as Alternative 2	Same as Alternative 2 within matrix lands; isolated conifers elsewhere	Same as Alternative 2	Same as Alternative 2
	Total acres where fuels are reduced by salvage, and fuels treatments	0	590 acres salvage 2,090 acres fuels treatments	0 acres salvage 2,090 acres fuels treatments	520 acres salvage 2,090 acres fuels treatment	580 acres salvage 3,300 acres fuels treatments	220 acres salvage 2,170 acres fuels treatments	0 acres salvage 3,300 acres fuels treatments

Table 2-33: Comparison of alternative effects related to the public safety, fire suppression and fire-resilient ecosystem aspects of the purpose and need of the project for Happy Camp Fire area.

Meeting Purpose and Need	Measurement Indicator	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 2 Modified	Alternative 3 Modified

Meeting Purpose and Need	Measurement Indicator	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 2 Modified	Alternative 3 Modified
Provide for worker and public safety and access	Miles and acres of roadside hazard treatment	0 0	400 miles 14,000 acres	400 miles 14,000 acres	390 miles 13,600 acres	400 miles 14,000 acres	400 miles 14,000 acres	215 miles 9,730 acres
	Acres of fuels reduction treatment within WUI	0	1,200 acres	1,200 acres	1,200 acres	1,200 acres	1,200 acres	1,460 acres
	Acres where snags are removed by salvage and site preparation	0	6,790 acres salvage 5,440 acres of site preparation	6,130 acres salvage 5,440 acres of site preparation	5,830 acres salvage 5,440 acres of site preparation	1,750 acres salvage 2,080 acres of site preparation	6,340 acres salvage 5,440 acres of site preparation	5,200 acres salvage 4,920 acres of site preparation
Improve fire suppression conditions for firefighters and community protection	Acres of resistance to control improved (large fuels removed)	0	16,715 acres	15,685 acres	15,425 acres	6,405 acres	15,975 acres	13,975 acres
	Acres of fuel breaks, prescribed burning and other fuels treatments	0	8,790 acres	8,790 acres	8,790 acres	8,790 acres	8,790 acres	9,740 acres
Provide for restored and fire-resilient forested ecosystems	Acres treated to promote regeneration through salvage harvest	0 acres	6,790 acres	6,130 acres	5,830 acres	1,750 acres	6,340 acres	5,200 acres
	Years to reach a mature stand in areas of salvage harvest	100+ years	40-60 years	40-60 years	40-60 years	40-60 years in matrix land; 100+ in non-matrix	40-60 years	40-60 years
	Type of vegetation regenerated in salvage harvest areas Short-term/ Long-term	Grass, forbs, brush. Brush, hardwoods, isolated parches of conifers	Brush, hardwoods, young conifers/ Mature mixed conifer stands	Same as Alternative 2	Same as Alternative 2	Same as Alternative 2 within matrix lands; isolated conifers elsewhere	Same as Alternative 2	Same as Alternative 2
	Total acres where fuels are reduced by salvage, and fuels treatments	0	6,790acres salvage 8,790 acres fuels treatments	6,130 acres salvage 8,790 acres fuels treatments	5,830 acres salvage 8,790 acres fuels treatment	1,750 acres salvage 8,790 acres fuels treatments	6,340 acres salvage 8,790 acres fuels treatments	5,200 acres salvage 9,740 acres fuels treatments

Table 2-34: Comparison of alternative effects related to the public safety, fire suppression and fire-resilient ecosystem aspects of the purpose and need of the project for the Whites Fire area.

Meeting Purpose and Need	Measurement Indicator	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 2 Modified	Alternative 3 Modified

Meeting Purpose and Need	Measurement Indicator	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 2 Modified	Alternative 3 Modified
Provide for worker and public safety and access	Miles and acres of roadside hazard treatment	0 0	80 miles 2,700 acres	80 miles 2,700 acres	70 miles 2,500 acres	80 miles 2,700 acres	80 miles 2,700 acres	55 miles 2,400 acres
	Acres of fuels reduction treatment within WUI	0	410 acres	410 acres	410 acres	410 acres	410 acres	550 acres
	Acres where snags are removed by salvage and site preparation	0	560 acres salvage 640 acres site preparation	640 acres salvage 640 acres site preparation	640 acres salvage 640 acres site preparation	30 acres salvage 0 acres site preparation	500 acres salvage 640 acres site preparation	550 acres salvage 560 acres site preparation
Improve fire suppression conditions for firefighters and community protection	Acres of resistance to control improved (large fuels removed)	0	9,090 acres	8,930 acres	9,090 acres	7,680 acres	8,980 acres	8,905 acres
	Acres of fuel breaks, prescribed burning and other fuels treatments	0	11,350 acres	11,350 acres	11,350 acres	11,350 acres	11,350 acres	11,340 acres
Provide for restored and fire-resilient forested ecosystems	Acres treated to promote regeneration through salvage harvest	0	560 acres	460 acres	560 acres	30 acres	500 acres	550 acres
	Years to reach a mature stand in areas of salvage harvest	100+ years	40-60 years	40-60 years	40-60 years	40-60 years in matrix land; 100+ in non-matrix	40-60 years	40-60 years
	Type of vegetation regenerated in salvage harvest areas Short-term/ Long-term	Grass, forbs, brush. Brush, hardwoods, isolated parches of conifers	Brush, hardwoods, young conifers. Mature mixed conifer stands	Same as Alternative 2	Same as Alternative 2	Same as Alternative 2 within matrix lands; isolated conifers elsewhere	Same as Alternative 2	Same as Alternative 2
	Total acres where fuels are reduced by salvage, and fuels treatments	0	560 acres salvage, 11,350 acres fuels treatments	460 acres salvage 11,350 acres fuels treatments	560 acres salvage, 11,350 acres fuels treatment	30 acres salvage 11,350 acres fuels treatments	500 acres salvage 11,350 acres fuels treatments	550 acres salvage 11,400 acres fuels treatments

Comparison Tables of Alternative Indicators by Relevant Issue

Table 2-35: Comparison of alternative indicators by relevant issue for the Beaver Fire area.

Issue	Measurement Indicator	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 2 Modified	Alternative 3 Modified
Relevant Issue 1: Effects of salvage logging on wildlife habitat	Acres of salvage logging on terrestrial indicators in Chapter 3, Wildlife	0	See Comparison Tables of Effects by Resource Table 2-38	See Comparison Tables of Effects by Resource Table 2-38	See Comparison Tables of Effects by Resource Table 2-38	See Comparison Tables of Effects by Resource Table 2-38	See Comparison Tables of Effects by Resource Table 2-38	See Comparison Tables of Effects by Resource Table 2-38
Relevant Issue 2: Effects of salvage logging and required infrastructure on watershed health	Analysis indicators for watersheds in Chapter 3, Hydrology	0	See Comparison Tables of Effects by Resource Table 2-38	See Comparison Tables of Effects by Resource Table 2-38	See Comparison Tables of Effects by Resource Table 2-38	See Comparison Tables of Effects by Resource Table 2-38	See Comparison Tables of Effects by Resource Table 2-38	See Comparison Tables of Effects by Resource Table 2-38
Relevant Issue 3: Effects of salvage logging and site preparation on late successional reserves (LSRs), riparian reserves (RRs) and inventoried roadless areas (IRAs)	Acres of salvage logging in LSRs	0	20	0	20	0	20	0
	Acres of site preparation in LSRs	0	20	20	20	0	20	20
	Acres of salvage logging in hydrologic Riparian Reserves	0	0	0	0	0	0	0
	Acres of site preparation in hydrologic Riparian Reserves	0	0	0	0	0	0	0
	Acres of salvage logging in IRAs	N/A (no IRAs in Beaver)	N/A (no IRAs in Beaver)	N/A (no IRAs in Beaver)	N/A (no IRAs in Beaver)	N/A (no IRAs in Beaver)	N/A (no IRAs in Beaver)	N/A (no IRAs in Beaver)
	Acres of site preparation in parts of IRAs that retain roadless character	N/A (no IRAs in Beaver)	N/A (no IRAs in Beaver)	N/A (no IRAs in Beaver)	N/A (no IRAs in Beaver)	N/A (no IRAs in Beaver)	N/A (no IRAs in Beaver)	N/A (no IRAs in Beaver)
Relevant Issue 4: Adequate fuels treatments adjacent to private timberlands in the Beaver Fire area	Acres of fuels treatments adjacent to private timberlands in the Beaver Fire area	0	870	870	870	2,080	870	2,080

Table 2-36: Comparison of alternative indicators by relevant issue for the Happy Camp Fire area.

Issue	Measurement Indicator	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 2 Modified	Alternative 3 Modified
Relevant Issue 1: Effects of salvage logging on wildlife habitat	Acres of salvage logging on terrestrial indicators in Chapter.3, Wildlife	0	See Table 2-39	See Table 2-39	See Table 2-39	See Table 2-39	See Table 2-39	See Table 2-39
Relevant Issue 2: Effects of salvage logging and required infrastructure on watershed health	Analysis indicators for watersheds in Chapter 3, Hydrology	0	See Table 2-39	See Table 2-39	See Table 2-39	See Table 2-39	See Table 2-39	See Table 2-39
Relevant Issue 3: Effects of salvage logging and site preparation on late successional reserves (LSRs), riparian reserves (RRs) and inventoried roadless areas (IRAs)	Acres of salvage logging in LSRs	0	4,880	4,470	4,070	0	4,590	3,370
	Acres of site preparation in LSRs	0	3,200	3,200	3,200	0	3,200	2,920
	Acres of salvage logging in hydrologic RRs	0	0	0	0	0	0	0
	Acres of site preparation in hydrologic RRs	0	330	0	1,770	0	50	480
	Acres of salvage logging in IRAs	0	0	0	0	0	0	0
	Acres of site preparation in parts of IRAs that retain roadless character	0	120	120	120	0	120	120

Table 2-37: Comparison of alternative indicators by relevant issue for the Whites Fire area

Issue	Measurement Indicator	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alt 2 Mod	Alt 3 Mod
Relevant Issue 1: Effects of salvage logging on wildlife habitat	Acres of salvage logging on terrestrial indicators in Chapter 3, Wildlife	0	See Table 2-40	See Table 2-40	See Table 2-40	See Table 2-40	See Table 2-40	See Table 2-40
Relevant Issue 2: Effects of salvage logging and required infrastructure on watershed health	Analysis indicators for watersheds in Chapter 3, Hydrology	0	See Table 2-40	See Table 2-40	See Table 2-40	See Table 2-40	See Table 2-40	See Table 2-40
Relevant Issue 3: Effects of salvage	Acres of salvage logging in LSRs	0	490	430	490	0	450	500

Issue	Measurement Indicator	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alt 2 Mod	Alt 3 Mod
logging and site preparation on late successional reserves (LSRs), riparian reserves (RRs) and inventoried roadless areas (IRAs)	Acres of site preparation in LSRs	0	640	640	640	0	640	560
	Acres of salvage logging in hydrologic RRs	0	0	0	0	0	0	0
	Acres of site preparation in hydrologic RRs	0	20	0	160	0	0	20
	Acres of salvage logging in IRAs	0	0	0	0	0	0	0
	Acres of site preparation in parts of IRAs that retain roadless character	0	40	40	40	0	40	40

Comparison Tables of Effects by Resource

Table 2-38: Comparison of effects of all alternatives by resource for the Beaver Fire area.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 2 Modified	Alternative 3 Modified
Vegetation	Natural regeneration on 7,050 acres of moderate- to high- severity vegetation burn. Regenerates as brush, hardwoods and isolated patches of conifers in the long term; meets the National Forest Management Act (NFMA) requirement by meeting Forest Plan standards.	Natural regeneration on about 4,680 acres of moderate- to high-severity vegetation burn; 2,370 acres (34%) of moderate- to high-severity on which conifer regeneration will be accelerated. Treated areas regenerate with mature, mixed conifer stands in long term; meets NFMA and Forest Plan standards.	Natural regeneration on about 5,270 acres of moderate- to high-severity vegetation burn; 1,780 acres (25%) of moderate- to high-severity on which conifer regeneration will be accelerated. Treated areas regenerate with mature, mixed conifer stands in long term; meets NFMA and Forest Plan standards	Natural regeneration on about 4,750 acres of moderate- to high-severity vegetation burn; 2,300 acres (33%) of moderate- to high-severity on which conifer regeneration will be accelerated. Treated areas regenerate with mature, mixed conifer stands in long term; meets NFMA and Forest Plan standards	Natural regeneration on about 4,700 acres of moderate- to high-severity vegetation burn; 2,350 acres (33%) of moderate- to high-severity on which conifer regeneration will be accelerated. Treated areas regenerate with mature, mixed conifer stands in long term; meets NFMA and Forest Plan standards	Natural regeneration on about 5,050 acres of moderate- to high-severity vegetation burn; 2,000 acres (28%) of moderate- to high-severity on which conifer regeneration will be accelerated. Treated areas regenerate with mature, mixed conifer stands in long term; meets NFMA and Forest Plan standards	Natural regeneration on about 5,390 acres of moderate- to high-severity vegetation burn; 1,660 acres (24%) of moderate- to high-severity on which conifer regeneration will be accelerated. Treated areas regenerate with mature, mixed conifer stands in long term; meets NFMA and Forest Plan standards
Fuels	There will be 1,765 acres meeting desired condition for fire and fuels resources.	There will be 4,730 acres meeting desired condition for fire and fuels resources.	There will be 3,870 acres meeting desired condition for fire and fuels resources.	There will be 4,620 acres meeting desired condition for fire and fuels resources.	There will be 5,900 acres meeting desired condition for fire and fuels resources.	There will be 4,300 acres meeting desired condition for fire and fuels resources.	There will be 4,695 acres meeting desired condition for fire and fuels resources.
Wildlife: Northern Spotted Owl	There are six, eight, seven activity centers that have low, moderate and high risk to reproduction. 59% and 78% of the critical habitat subunits KLE6 and KLE7 in the project area respectively contain suitable habitat.	The effects on the activity center's risk to reproduction are not changed from Alternative 1. 58% and 78% of the critical habitat subunits KLE6 and KLE7 in the project area respectively contain suitable habitat.	The effects on the activity center's risk to reproduction are not changed from Alternative 1. 59% and 78% of the critical habitat subunits KLE6 and KLE7 in the project area respectively contain suitable habitat.	The effects to activity center's risk to reproduction and changes to critical habitat are the same as for Alternative 2.	The effects to activity center's risk to reproduction and changes to critical habitat are the same as for Alternative 2.	The effects to activity center's risk to reproduction and changes to critical habitat are the same as for Alternative 2.	The effects to activity center's risk to reproduction and changes to critical habitat are the same as for Alternative 2.
Wildlife: Bald Eagle	There is one Bald Eagle nest and it has a low risk to disturbance and risk to potential nest trees.	The risk of disturbance will be low for all three nest sites as a result of project design features. The risk to potential nest trees remains low.	The effects are the same as Alternative 2.	The effects are the same as Alternative 2	The effects are the same as Alternative 2	The effects are the same as Alternative 2	The effects are the same as Alternative 2
Wildlife: Northern Goshawk	There are three potentially occupied territories. Two have a high risk to reproduction and one has a moderate risk to reproduction.	The level of disturbance is low as a result of project design features. The risk to reproduction is the same as for Alternative 1.	Level of disturbance is the same as Alternative 2.	Level of disturbance is the same as Alternative 2.	Level of disturbance is the same as Alternative 2.	Level of disturbance is the same as Alternative 2.	Level of disturbance is the same as Alternative 2.
Wildlife: Fisher, Marten and Wolverine	There are seven, five and one watersheds with moderate, low and very low connectivity respectively. Four of the thirteen watersheds meet the home range potential criteria.	There will be four, six, and three watersheds with moderate, low and very low connectivity. The watersheds meeting the home range potential criteria are the same as for Alternative 1.	The effects are the same as for Alternative 2.	The effects are the same as Alternative 2	The effects are the same as Alternative 2	The effects are the same as Alternative 2	The effects are the same as Alternative 2
Wildlife: Pallid Bat, Townsend Big-eared Bat, Fringed myotis, Willow Flycatcher, Siskiyou Salamander, Tehama Chaparral Snail and Western Bumble Bee (Sensitive Species)	There are no potential hibernacula/ maternities that will be affected. There is no Siskiyou Mountain Salamander habitat in the fire area. There will be no Tehama Chaparral Snail habitat affected. There will be no Western Bumble Bee habitat affected.	There are seven and five potential hibernacula that have a moderate and high risk of disturbance respectively. Nine watersheds will have a low level of willow flycatcher habitat alteration. The likelihood of dispersal for the Tehama Chaparral Snail is high. One watershed will have a high level of disturbance to Western Bumble Bee habitat.	The effects for all of the species are the same as for Alternative 2.	The effects for all of the species are the same as for Alternative 2.	The effects for all of the species are the same as for Alternative 2.	The effects for all of the species are the same as for Alternative 2.	The effects for all of the species are the same as for Alternative 2.
Wildlife: Management Indicator Species	There are 23,400 acres of snag habitat and 4,250 acres of hardwood habitat in the fire area.	There will be about 9% of the snag habitat affected and 5% of the hardwood habitat affected.	There will be about 8% of the snag habitat affected and 5% of the hardwood habitat affected.	There will be about 8% of the snag habitat affected and 4% of the hardwood habitat affected.	The effects are the same as for Alternative 4.	The effects are the same as for Alternative 4.	There will be about 5% of the snag habitat affected and 2% of the hardwood habitat affected.
Range	There would be no effect on the availability of forage and a neutral effect on rangeland condition.	The availability of forage would increase; there will be a neutral effect on rangeland condition.	Same as Alternative 2.	Same as Alternative 2.	The availability of forage would increase less than with other action alternatives; there will be a neutral effect on rangeland condition.	There would be a small increase in the availability of forage; there will be a neutral effect on rangeland condition.	There would be a small increase in the availability of forage; there will be a neutral effect on rangeland condition.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 2 Modified	Alternative 3 Modified
Botany: Threatened, Endangered, and Proposed or Candidate Species	No likelihood of jeopardizing continued existence	No likelihood of jeopardizing continued existence	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2
Botany: Forest Service Sensitive Species	Static trend, no known populations present	Static trend, no known populations present	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2
Botany: Survey and Manage Species	Compliant	Compliant following implementation of PDF's	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2
Botany: Non-native Invasive Species	High	High	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2
Fish and other Aquatic Species : Indirect Effects- Sediment		Includes temporary road actions in Doggett Creek and Beaver Creek resulting in temporary site-scale impacts and long term benefits from fixing sediment sources. Over-all, discountable negative effects (due to dispersed disturbance, replanting and PDFs).	Near stream temporary road actions, and effects would be the same as for Alternative 2. Discountable negative effects.	No near stream temporary road actions proposed. Negative short term impacts (and long term benefits from addressing existing legacy sediment sites) in Doggett and Buckhorn-Beaver creeks would not occur. Discountable negative effects reduced.	Near stream temporary road actions and effects would be the same as for Alt. 2. Discountable negative effects.	1.7 miles of temp road dropped (includes all near-stream temp roads and temp roads w/ crossings), 3 landings dropped. No benefits from addressing existing legacy sediment sites on temp roads. Discountable negative effects reduced.	All temp roads and landings dropped. RR hand treatments in site prep units added; these actions would have neutral short term effects and beneficial long term effects to watershed condition.
Fish and other Aquatic Species : Indirect Effects- Temperature		Shade in RRs protected by PDFs which minimize effects of roadside hazard, temp road and landing, and fuels treatments resulting in discountable negative effects. Sedimentation can affect temps – see above for sediment impacts.	Same as Alternative 2	Slightly less potential effect of roadside hazard removal where it is reduced in extent.	Near stream temporary road actions and effects would be the same as for Alt. 2. Discountable negative effects.	Same as Alternative 2	Reduced effects from roadside hazard removal where it is reduced in extent. Also, effects are reduced because live hazard trees will not be felled.
Fish and other Aquatic Species : Indirect Effects – Large Wood		Project design features ensure retention of large wood within near stream areas for hazard tree removal and temp road actions. Discountable negative effects.	Effects would be the same as Alt. 2.	Slightly less potential effect of roadside hazard removal where it is reduced in extent, and where temp road actions are dropped (Doggett Cr and face drain to Beaver Cr).	Effects would be the same as Alt. 2.	Effects would be the same as Alt. 2.	Less potential effect of hazard tree removal where it is reduced in extent.
Fish and other Aquatic Species : Direct effects to Salmon and Steelhead		Direct effects will be minimized through designation of acceptable sites (PDF watershed-34) and use of NMFS (2001) water drafting specifications. Direct effects would be discountable and minor to anadromous fish.	Effects would be the same as Alt. 2.	Effects would be the same as Alt. 2.	Discountable negative effects would be reduced due to substantially reduced ground disturbing actions and therefore need for water drafting.	Effects would be the same as Alt. 2.	Because all salvage, temporary roads and landings have been dropped there will be less need for water drafting therefore potential effects to aquatic resources are reduced.
Fish and other Aquatic Species : Direct effects to Resident Trout		Direct effects will be minimized through designation of acceptable sites and use of PDFs and BMPs for water drafting. Direct effects would be discountable and minor to trout.	Effects would be the same as Alt. 2.	Effects would be the same as Alt. 2.	Effects would be the same as Alt. 2.	Effects would be the same as Alt. 2.	Because all salvage, temporary roads and landings have been dropped there will be less need for water drafting therefore potential effects to aquatic resources are reduced.
Fish and other Aquatic Species : Direct effects to Other Aquatic Species		Direct effects will be minimized through designation of acceptable sites (PDF watershed-34) and implementation of BMPs for water drafting. Direct effects would be discountable and minor to aquatic species.	Effects would be the same as Alt. 2.	Discountable negative effects would be reduced where near stream temporary road and crossing work are dropped (Doggett Cr and face drain to Beaver Cr).	Effects would be the same as Alt. 2.	Effects would be the same as Alt. 4.	Because all salvage, temporary roads and landings have been dropped there will be less need for water drafting therefore potential effects to aquatic resources are reduced.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 2 Modified	Alternative 3 Modified
Soils	The erosion hazard ratings remain high on 30 acres in the analysis area which does not meet desired condition for soil stability. There is a high volume of standing dead that will contribute to large woody debris and all acres meet desired condition. Soil organic matter has been affected by the 2014 wildfires on 5 acres. Past timber harvests have resulted in 269 acres not meeting desired condition for soil structure.	Soil stability would be affected on about 2,049 acres, surface organic matter on 674 acres, soil organic matter on 383 acres and soil structure on 250 acres. Legacy site treatment will improve soil stability over the long term. Project design features will minimize the effects to soil resources and the Forest Plan standards are met.	Soil stability would be affected on about 1,134 acres, surface organic matter on 143 acres, soil organic matter on 211 acres and soil structure on 109 acres. Legacy site treatment will improve soil stability over the long term. Project design features will minimize the effects to soil resources and the Forest Plan standards are met.	Soil stability would be affected on about 1,366 acres, surface organic matter on 619 acres, soil organic matter on 374 acres and soil structure on 237 acres. Legacy site treatment will improve soil stability over the long term. Project design features will minimize the effects to soil resources and the Forest Plan standards are met.	Soil stability would be affected on about 1,406 acres, surface organic matter on 673 acres, soil organic matter on 435 acres and soil structure on 260 acres. Legacy site treatment will improve soil stability over the long term. Project design features will minimize the effects to soil resources and the Forest Plan standards are met.	Soil stability would be affected on about 1,219 acres, surface organic matter on 413 acres, soil organic matter on 247 acres and soil structure on 432 acres. Legacy site treatment will improve soil stability over the long term. Project design features will minimize the effects to soil resources and the Forest Plan standards are met.	Soil stability would be affected on about 905 acres, surface organic matter on zero acres, soil organic matter on 333 acres and soil structure on 123 acres. Legacy site treatment will improve soil stability over the long term. Project design features will minimize the effects to soil resources and the Forest Plan standards are met.
Geology	There is no effect to landslide risk from the alternative. There are 13 watersheds in the project area with duration of elevated landslide risk of greater than 80 years. There will be no effect to cave resources or unique geologic features. There will be no disturbance of ultramafic bedrock.	There is no effect to landslide risk from this alternative. There will be 13 watersheds in the project area with duration of elevated risk of greater than 80 years. There are zero acres of new temporary road on ultramafic rock. There is a very low likelihood of effecting cave resources. There is no effect to unique geologic features.	The effects of the alternative are the same as for Alternative 2.	The effects of the alternative are the same as for Alternative 2.	The effects of the alternative are the same as for Alternative 2.	The effects of the alternative are the same as for Alternative 2.	The effects of the alternative are the same as for Alternative 2.
Air	There will be no nitrogen oxides, carbon dioxide or fugitive dust emissions.	There will be 5.4 tons per year of nitrogen oxide emission, 2,396 metric tons per year carbon dioxide equivalent emissions and 2 tons per year of fugitive dust from this alternative.	There will be 5.3 tons per year of nitrogen oxide emission, 2,106 metric tons per year carbon dioxide equivalent emissions and 2 tons per year of fugitive dust from this alternative.	There will be 5.4 tons per year of nitrogen oxide emission, 2,276 metric tons per year carbon dioxide equivalent emissions and 2 tons per year of fugitive dust from this alternative.	There will be 1.9 tons per year of nitrogen oxide emission, 2,158 metric tons per year carbon dioxide equivalent emissions and 1 tons per year of fugitive dust from this alternative.	There will be 5.4 tons per year of nitrogen oxide emission, 2,343 metric tons per year carbon dioxide equivalent emissions and 2 tons per year of fugitive dust from this alternative.	There will be 5.6 tons per year of nitrogen oxide emission, 3,746 metric tons per year carbon dioxide equivalent emissions and 2 tons per year of fugitive dust from this alternative.
Recreation	There would be no short-term adverse effects associated with project implementation. Increased short-term use of burn areas for firewood cutting and deer hunting. Direct long-term adverse effect to dispersed camping and hiking opportunities in burn areas from loss of shade. Increased short-term and long-term safety concerns from fallen snags. Increased maintenance costs for Forest infrastructure. No adverse effects to recreation settings from project implementation.	Recreational use is not expected to increase or decrease. Direct short-term adverse effect from smoke, road closures, or increased traffic during project implementation. Indirect short and long-term beneficial effect to big game hunting opportunities from prescribed fire and replanting. Indirect long-term beneficial effect to developed recreation facilities and dispersed campsites from fuels and roadside hazard treatments. These treatments would protect Forest Service infrastructure and/or increase safety at these sites. Indirect long-term adverse effects to recreation settings from project activities in one location.	Recreational use is not expected to increase or decrease. Direct short-term adverse effect from smoke, road closures, or increased traffic during project implementation. Indirect short and long-term beneficial effect to big game hunting opportunities from prescribed fire and replanting. Indirect long-term beneficial effect to developed recreation facilities and dispersed campsites from fuels and roadside hazard treatments. These treatments would protect Forest Service infrastructure and/or increase safety at these sites. Indirect long-term adverse effects to recreation settings from project activities in one location.	Recreational use is not expected to increase or decrease. Direct short-term adverse effect from smoke, road closures, or increased traffic during project implementation. Indirect short and long-term beneficial effect to big game hunting opportunities from prescribed fire and replanting. Indirect long-term beneficial effect to developed recreation facilities and dispersed campsites from fuels and roadside hazard treatments. These treatments would protect Forest Service infrastructure and/or increase safety at these sites. Indirect long-term adverse effects to recreation settings from project activities in one location.	Recreational use is not expected to increase or decrease. Direct short-term adverse effect from smoke, road closures, or increased traffic during project implementation. Indirect short and long-term beneficial effect to big game hunting opportunities from prescribed fire and replanting. Indirect long-term beneficial effect to developed recreation facilities and dispersed campsites from fuels and roadside hazard treatments. These treatments would protect Forest Service infrastructure and/or increase safety at these sites. Indirect long-term adverse effects to recreation settings from project activities in one location.	Recreational use is not expected to increase or decrease. Direct short-term adverse effect from smoke, road closures, or increased traffic during project implementation. Indirect short and long-term beneficial effect to big game hunting opportunities from prescribed fire and replanting. Indirect long-term beneficial effect to developed recreation facilities and dispersed campsites from fuels and roadside hazard treatments. These treatments would protect Forest Service infrastructure and/or increase safety at these sites. Indirect long-term adverse effects to recreation settings from project activities in one location.	Recreational use is not expected to increase or decrease. Direct short-term adverse effect from smoke, road closures, or increased traffic during project implementation. Indirect short and long-term beneficial effect to big game hunting opportunities from prescribed fire and replanting. Indirect long-term beneficial effect to developed recreation facilities and dispersed campsites from fuels and roadside hazard treatments. These treatments would protect Forest Service infrastructure and/or increase safety at these sites. Indirect long-term adverse effects to recreation settings from project activities in zero locations.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 2 Modified	Alternative 3 Modified
Scenery	There is no effect to Visual Quality Objectives. Long term adverse effect with permanent vegetation change away from a conifer-dominated vegetation type towards a shrub-dominated ecosystem. Achievement of the desired condition would be set back 50 plus years or more.	Minor localized short-term direct adverse effects to Visual Quality Objectives from management treatments during project implementation with the presence of equipment, smoke, stumps, exposed soils, and cut and/or piled vegetation. Indirect long-term adverse effects to viewsheds from project activities in one location. Although Visual Quality Objectives would not be met for some roadside hazard treatments in Retention Visual Quality Objectives areas, Forest Plan consistency will be met (Forest Plan S&G 11-7). Greening up" for three years after project completion would reduce visual evidence of fuels, harvest, roadside hazard, and site prep/plant activities to acceptable levels Eight of the nine viewsheds will meet Visual Quality Objectives. Indirect long-term beneficial effect to scenic character from management treatments would be speeding up recovery of the burn areas to a conifer-dominated character that is more consistent with historic scenery conditions and Desired Scenic Character.	Minor localized short-term direct adverse effects to Visual Quality Objectives from management treatments during project implementation with the presence of equipment, smoke, stumps, exposed soils, and cut and/or piled vegetation. Indirect long-term adverse effects to viewsheds from project activities in one location. Although Visual Quality Objectives would not be met for some roadside hazard treatments in Retention Visual Quality Objectives areas, Forest Plan consistency will be met (Forest Plan S&G 11-7). Greening up" for three years after project completion would reduce visual evidence of fuels, harvest, roadside hazard, and site prep/plant activities to acceptable levels Eight of the nine viewsheds will meet Visual Quality Objectives. Indirect long-term beneficial effect to scenic character from management treatments would be speeding up recovery of the burn areas to a conifer-dominated character that is more consistent with historic scenery conditions and Desired Scenic Character.	Minor localized short-term direct adverse effects to Visual Quality Objectives from management treatments during project implementation with the presence of equipment, smoke, stumps, exposed soils, and cut and/or piled vegetation. Indirect long-term adverse effects to viewsheds from project activities in one location. Although Visual Quality Objectives would not be met for some roadside hazard treatments in Retention Visual Quality Objectives areas, Forest Plan consistency will be met (Forest Plan S&G 11-7). Greening up" for three years after project completion would reduce visual evidence of fuels, harvest, roadside hazard, and site prep/plant activities to acceptable levels Eight of the nine viewsheds will meet Visual Quality Objectives. Indirect long-term beneficial effect to scenic character from management treatments would be speeding up recovery of the burn areas to a conifer-dominated character that is more consistent with historic scenery conditions and Desired Scenic Character.	Minor localized short-term direct adverse effects to Visual Quality Objectives from management treatments during project implementation with the presence of equipment, smoke, stumps, exposed soils, and cut and/or piled vegetation. Indirect long-term adverse effects to viewsheds from project activities in one location. Although Visual Quality Objectives would not be met for some roadside hazard treatments in Retention Visual Quality Objectives areas, Forest Plan consistency will be met (Forest Plan S&G 11-7). Greening up" for three years after project completion would reduce visual evidence of fuels, harvest, roadside hazard, and site prep/plant activities to acceptable levels Eight of the nine viewsheds will meet Visual Quality Objectives. Indirect long-term beneficial effect to scenic character from management treatments would be speeding up recovery of the burn areas to a conifer-dominated character that is more consistent with historic scenery conditions and Desired Scenic Character.	Minor localized short-term direct adverse effects to Visual Quality Objectives from management treatments during project implementation with the presence of equipment, smoke, stumps, exposed soils, and cut and/or piled vegetation. Indirect long-term adverse effects to viewsheds from project activities in one location. Although Visual Quality Objectives would not be met for some roadside hazard treatments in Retention Visual Quality Objectives areas, Forest Plan consistency will be met (Forest Plan S&G 11-7). Greening up" for three years after project completion would reduce visual evidence of fuels, harvest, roadside hazard, and site prep/plant activities to acceptable levels. Eight of the nine viewsheds will meet Visual Quality Objectives. Indirect long-term beneficial effect to scenic character from management treatments would be speeding up recovery of the burn areas to a conifer-dominated character that is more consistent with historic scenery conditions and Desired Scenic Character.	Minor localized short-term direct adverse effects to Visual Quality Objectives from management treatments during project implementation with the presence of equipment, smoke, stumps, exposed soils, and cut and/or piled vegetation. No indirect long term adverse effects from project activities. Visual Quality Objectives would be met for all viewsheds. Greening up" for three years after project completion would reduce visual evidence of fuels, harvest, roadside hazard, and site prep/plant activities to acceptable levels for all nine viewsheds.
Wild and Scenic Rivers	No effect to Wild and Scenic Rivers or their corridors because no action is taken.	No effect or a low risk to Wild and Scenic Rivers because none of the activities would negatively affect the outstandingly remarkable values (ORVs) of these rivers or their corridors. All ORVs would be protected.	No effect or a low risk to Wild and Scenic Rivers because none of the activities would negatively affect the outstandingly remarkable values (ORVs) of these rivers or their corridors. All ORVs would be protected.	No effect or a low risk to Wild and Scenic Rivers because none of the activities would negatively affect the outstandingly remarkable values (ORVs) of these rivers or their corridors. All ORVs would be protected.	No effect or a low risk to Wild and Scenic Rivers because none of the activities would negatively affect the outstandingly remarkable values (ORVs) of these rivers or their corridors. All ORVs would be protected.	No effect or a low risk to Wild and Scenic Rivers because none of the activities would negatively affect the outstandingly remarkable values (ORVs) of these rivers or their corridors. All ORVs would be protected.	No effect or a low risk to Wild and Scenic Rivers because none of the activities would negatively affect the outstandingly remarkable values (ORVs) of these rivers or their corridors. All ORVs would be protected.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 2 Modified	Alternative 3 Modified
Cultural Resources	There will be no direct effects to historic properties. Short-term indirect effects from no action will be negligible, but long-term will be moderate to major. No direct effects to cultural resources will occur but fire-adapted plants that are important to tribal interests will not be enhanced in the long term without prescribed burning. Long-term indirect effects would be moderate to major.	There will be no direct effects to historic properties or identified cultural resources due to the implementation of project design features and standard resource protection measures under the forthcoming project specific programmatic agreement with the State Historic Preservation Office and Advisory Council on Historic Preservation. Removal of dead and dying trees from within or adjacent to historic properties and identified cultural resources as well as reducing adjacent fuels results in direct and indirect beneficial effects that are moderate to major in both the short and long term. The protection measures that minimize the effects of fuels reduction treatments on historic properties may lead to indirect effects that increase likelihood of damage from future fires and direct public attention to heritage sites. These effects are minor in the short term but moderate to major in the long term. The exclusion of fire on certain fire-adapted cultural resources may also lead to indirect effects that reduce the viability or usability of these resources. These effects are minor in the short term but moderate to major in the long term.	Same as Alternative 2	Same as Alternative 2	Same as Alternative 2	Same as Alternative 2	Same as Alternative 2
Socio-Economics	Since no actions will occur in this alternative, an unsafe condition will continue to exist in the short term and get worse in the long term unless actions are taken outside this project to improve safety. This alternative is not consistent with the Siskiyou County Land and Resource Management Plan that encourages resource use of the Forest. No economic benefits come from this alternative.	Safer conditions would prevail in the short term with removal of roadside hazard trees along a maximum of 170 miles of roads. In the long term, safer conditions would be provided through 2,090 acres of hazardous fuels treatments. Economic returns from the entire project would include a potential $3 million return to Siskiyou County, labor income of $53 million and 1,236 jobs. This alternative is consistent with local county objectives for resource use of the Forest.	Similar to Alternative 2 except economic returns from the entire project would include a potential $2.5 million with labor income of $46 million and 1,067 jobs.	Similar to Alternative 2 except roadside hazard s would be treated along a maximum of 160 miles and economic returns from the entire project would include a potential $2.4 million with labor income of $47 million and 1,074 jobs.	Similar to Alternative 2 except hazardous fuels would be treated on 3,300 acres and economic returns from the entire project would include a potential $1.6 million with labor income of $22 million and 549 jobs.	Similar to Alternative 2 except hazardous fuels would be treated on 2,170 acres and economic returns from the entire project would include a potential $2.7 million with labor income of $46 million and 1,076 jobs.	Similar to Alternative 2 except roadside hazards would be removed along 48 miles of road, 3,300 acres of fuels would be treated, and economic returns from the entire project would include a potential $2.5 million with labor income of $38 million and 887 jobs.
Inventoried Roadless Areas	No effect because there are no inventoried roadless areas in the Beaver project area.	No effect because there are no inventoried roadless areas in the Beaver project area.	No effect because there are no inventoried roadless areas in the Beaver project area.	No effect because there are no inventoried roadless areas in the Beaver project area.	No effect because there are no inventoried roadless areas in the Beaver project area.	No effect because there are no inventoried roadless areas in the Beaver project area.	No effect because there are no inventoried roadless areas in the Beaver project area.

Table 2-39: Comparison of effects of alternative by resource for the Happy Camp Fire area.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 2 Modified	Alternative 3 Modified
Vegetation	Natural regeneration on 34,060 acres of moderate- to high-severity vegetation burn. Regenerates as brush, hardwoods and isolated patches of conifers in the long term; meets the National Forest Management Act (NFMA) requirement by meeting Forest Plan standards	Natural regeneration on about 21,830 acres of moderate- to high-severity vegetation burn; 12,230 acres (36%) of moderate- to high-severity on which conifer regeneration will be accelerated. Treated areas regenerate with mature, mixed conifer stands in long term; meets NFMA and Forest Plan standards	Natural regeneration on about 22,490 acres of moderate- to high-severity vegetation burn; 11,570 acres (34%) of moderate- to high-severity on which conifer regeneration will be accelerated. Treated areas regenerate with mature, mixed conifer stands in long term; meets NFMA and Forest Plan standards	Natural regeneration on about 22,790 acres of moderate- to high-severity vegetation burn; 11,270 acres (33%) of moderate- to high-severity on which conifer regeneration will be accelerated. Treated areas regenerate with mature, mixed conifer stands in long term; meets NFMA and Forest Plan standards	Natural regeneration on about 30,230 acres of moderate- to high-severity vegetation burn; 3,830 acres (11%) of moderate- to high-severity on which conifer regeneration will be accelerated. Treated areas (within matrix lands) regenerate with mature, mixed conifer stands in long term; meets NFMA and Forest Plan standards	Natural regeneration on about 22,280 acres of moderate- to high-severity vegetation burn; 11,780 acres (35%) of moderate- to high-severity on which conifer regeneration will be accelerated. Treated areas regenerate with mature, mixed conifer stands in long term; meets NFMA and Forest Plan standards	Natural regeneration on about 23,940 acres of moderate- to high-severity vegetation burn; 10,120 acres (30%) of moderate- to high-severity on which conifer regeneration will be accelerated. Treated areas regenerate with mature, mixed conifer stands in long term; meets NFMA and Forest Plan standards

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 2 Modified	Alternative 3 Modified
Fuels	There will be 6,895 acres meeting desired condition for fire and fuels resources.	There will be 23,610 acres meeting desired condition for fire and fuels resources.	There will be 22,580 acres meeting desired condition for fire and fuels resources.	There will be 22,320 acres meeting desired condition for fire and fuels resources.	There will be 13,300 acres meeting desired condition for fire and fuels resources.	There will be 22,870 acres meeting desired condition for fire and fuels resources.	There will be 20,870 acres meeting desired condition for fire and fuels resources.
Wildlife: Northern Spotted Owl	There are two, eleven, thirty-nine and five activity centers with very low, low, moderate and high risk to reproduction. 71%, 52%, and 60% of the critical habitat subunits KLE6, KLE7 and KLW7 in the project area respectively contain suitable habitat.	There are two, seven, forty-two and six activity centers with very low, low, moderate and high risk to reproduction. The percent of project area with suitable habitat is the same as for Alternative 1. .	There are two, nine, forty-one and five activity centers with very low, low, moderate and high risk to reproduction. The percent of project area with suitable habitat is the same as for Alternative 2.	There are two, seven, forty-two and six activity centers with very low, low, moderate and high risk to reproduction. The percent of project area with suitable habitat is the same as for Alternative 2.	There are two, eleven, thirty-nine and five activity centers with a very low, low, moderate, and high risk to reproduction. The percent of project area with suitable habitat is the same as for Alternative 2.	The effects are the same as Alternative 2.	There are two, nine, forty-one and five activity centers with very low, low, moderate and high risk to reproduction respectively. The percent of project area with suitable habitat is the same as for Alternative 2.
Wildlife: Bald Eagle	There is no risk of disturbance in this alternative. All three of the nest sites have a low risk to future nest trees.	The risk of disturbance will be low for all three nest sites as a result of project design features. The risk to future potential nest trees is low for two nests and moderate for the third.	The effects are the same as for Alternative 2.	The effects are the same as for Alternative 2.	The risk of disturbance is the same as for Alternative 2. All of the nest sites will have a low risk to future potential nest trees.	The effects are the same as for Alternative 2.	The percent of project area with suitable habitat is the same as for Alternative 2.
Wildlife: Northern Goshawk	There are nine potentially occupied territories. Six have a high risk to reproduction and three have a moderate risk to reproduction.	The level of disturbance is low as a result of project design features. The risk to reproduction is the same as for Alternative 1.	Level of disturbance is the same as Alternative 2.	Level of disturbance is the same as Alternative 2.	Level of disturbance is the same as Alternative 2.	Level of disturbance is the same as Alternative 2.	Level of disturbance is the same as Alternative 2.
Wildlife: Fisher, Marten and Wolverine	There are twenty-six and ten watersheds with moderate and low connectivity respectively. Eighteen of the thirty-six watersheds meet the home range potential criteria.	There will be thirteen, eighteen and five watersheds with moderate, low and very low connectivity. Eleven of the thirty-six watersheds meet the home range potential criteria.	The effects for connectivity and the home range potential are the same as for Alternative 2.	There are seventeen, fourteen and five watersheds with moderate, low and very low connectivity. The effects to the home range potential are the same as for Alternative 2.	There are twenty, twelve, and four watersheds with moderate, low and very low connectivity. The effects to the home range potential are the same as for Alternative 2.	There will be fourteen, seventeen and five watersheds with moderate, low and very low connectivity. The effects to the home range potential are the same as for Alternative 2.	There is twenty, fifteen and one watershed(s) with moderate, low and very low connectivity. The effects to the home range potential are the same as for Alternative 2.
Wildlife: Pallid Bat, Townsend Big-eared Bat, Fringed myotis, Willow Flycatcher, Siskiyou Salamander, Tehama Chaparral Snail and Western Bumble Bee (Sensitive Species)	There are no potential hibernacula/ maternities that will be affected. There will be no Siskiyou Mountain Salamander habitat affected. There will be no Tehama Chaparral Snail habitat affected. There will be no Western Bumble Bee habitat affected.	There eighteen, five and five potential hibernacula that have a low, moderate and high risk of disturbance respectively. Twenty-six watersheds will have a low level of willow flycatcher habitat alteration. The likelihood of dispersal for the Tehama Chaparral Snail is high. The risk of habitat disturbance is low for the Siskiyou Mountain Salamander. Four watersheds will have a high level of disturbance to Western Bumble Bee habitat.	The effects for all species are the same as for Alternative 2.	There nineteen, five and four potential hibernacula that have a low, moderate and high risk of disturbance respectively. The effects to Willow Flycatcher, Siskiyou Mountain Salamander, Tehama Chaparral Snail and Western Bumble Bee are the same as for Alternative 2.	The effects to Pallid Bat, Townsend Big-eared Bat, Fringed myotis, Willow Flycatcher, Siskiyou Mountain Salamander, Tehama Chaparral Snail and Western Bumble Bee are the same as for Alternative 2. Three watersheds will have a high level of habitat disturbance for the Western Bumble Bee.	The effects for all species are the same as for Alternative 2.	The effects for all species are the same as for Alternative 2.
Wildlife: Management Indicator Species	There are 146,700 acres of snag habitat and 4,070 acres of hardwood habitat in the fire area.	There will be about 14% of the snag habitat affected and 11% of the hardwood habitat affected.	There will be about 13% of the snag habitat affected and 11% of the hardwood habitat affected.	The effects are the same as for Alternative 3.	The effects are the same as for Alternative 3.	The effects are the same as Alternative 2.	There will be about 9% of the snag habitat affected and 6% of the hardwood habitat affected.
Survey and Manage	There will be no known sites affected by this alternative.	There will be no effect to known survey and manage sites as a result of project design features.	The effects are the same as for Alternative 2.	The effects are the same as for Alternative 2.	The effects are the same as for Alternative 2.	The effects are the same as for Alternative 2.	The effects are the same as for Alternative 2.
Range	There would be no effect on the availability of forage and a neutral effect on rangeland condition.	The availability of forage would increase; there will be a neutral effect on rangeland condition.	Same as Alternative 2.	Same as Alternative 2.	The availability of forage would increase less than with other action alternatives; there will be a neutral effect on rangeland condition.	There would be a small increase in the availability of forage; there will be a neutral effect on rangeland condition.	There would be a small increase in the availability of forage; there will be a neutral effect on rangeland condition.
Botany: Threatened, Endangered, and Proposed or Candidate Species	No likelihood of jeopardizing continued existence	No likelihood of jeopardizing continued existence	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 2 Modified	Alternative 3 Modified
Botany: Forest Service Sensitive Species	*Eriogonum hirtellum*: Static trend in population viability *Erythronium hirtellum*: Declining trend in population viability *Thermopsis robusta:* Declining trend in population viability	*Eriogonum hirtellum:* Static trend in population viability *Erythronium hirtellum:* Increasing trend in population viability *Thermopsis robusta*: Short term increasing trend in population viability	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2
Botany: Survey and Manage Species	Compliant	Compliant following implementation of PDF's	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2
Botany: Non-native Invasive Species	High	High	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2
Fish and other Aquatic Species : Indirect Effects- Sediment		Several temporary road actions within RRs, six new landings in RR, reopen of 9 miles decomm roads resulting in short term negative effects that may be adverse. Areas of road impacts: Caroline Creek (46N62), Lower Grider Creek (46N41YA), Cliff Valley Creek (46N77), and China Creek (46N78). Existing sediment sites in Grider, Kuntz, and O'Neil drainages fixed.	Near stream temporary road actions, and effects would be the same as for Alternative 2. Potential adverse effects from reopening 46N62 remain.	Temp roads with crossings dropped: Grider, Gard, Caroline, Cliff Valley and China creeks. Negative short term impacts avoided. No long term benefits from addressing existing legacy sediment sites in O'Neill Creek. Potential adverse effects from reopening 46N62 avoided. Overall, discountable short term negative effects.	Temp road actions and effects the same as Alt 4 except reopening 46N62 remains therefore potential adverse effects remain. No long term benefits from addressing existing legacy sediment sites in O'Neill Creek.	Reopening of 46N62 dropped therefore potential adverse effects are avoided. Overall, discountable negative short term effects.	Reopening of 46N62 dropped therefore potential adverse effects are avoided. Overall, discountable negative short term effects.
Fish and other Aquatic Species : Indirect Effects- Temperature		Shade in RRs protected by avoiding salvage in RRs and PDFs minimize effects of roadside and fuels treatments resulting in discountable negative effects. Sedimentation can affect temps – see above for sediment impacts.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.
Fish and other Aquatic Species : Indirect Effects – Large Wood		PDFs ensure retention of large wood near all stream channels. Discountable negative effects.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.	Less potential effect of hazard tree removal where it is reduced in extent.
Fish and other Aquatic Species : Direct effects to Salmon and Steelhead		Direct effects will be minimized through designation of acceptable sites that avoid impacts to thermal refugia and compliance with PDFs including use of NMFS (2001) water drafting specifications in Coho CH. Direct effects would be due to disturbance and likely to be discountable and minor.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.
Fish and other Aquatic Species : Direct effects to Resident Trout		Direct effects will be minimized through designation of acceptable sites that avoid impacts to thermal refugia and compliance with FS BMPs. Direct effects would be due to disturbance and likely to be discountable and minor.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.
Fish and other Aquatic Species : Direct effects to Other Aquatic Species		Direct effects will be minimized through designation of acceptable sites that avoid impacts to thermal refugia and compliance with FS BMPs. Direct effects would be due to disturbance and likely to be discountable and minor.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 2 Modified	Alternative 3 Modified
Soils	The erosion hazard ratings remain high on 26,824 acres in the analysis area which does not meet desired condition for soil stability. There is a high volume of standing dead that will contribute to large woody debris and all acres meet desired condition. Soil organic matter has been affected by the 2014 wildfires on 633 acres. Past timber harvests have resulted in 383 acres not meeting desired condition for soil structure.	Soil stability would be affected on about 2,001 acres, surface organic matter on534 acres, soil organic matter on2,106 acres and soil structure on 1,346 acres. Legacy site treatment will improve soil stability over the long term. Project design features will minimize the effects to soil resources and the Forest Plan standards are met.	Soil stability would be affected on about 1,957 acres, surface organic matter on 438 acres, soil organic matter on 2,055 acres and soil structure on 1,322 acres. Legacy site treatment will improve soil stability over the long term. Project design features will minimize the effects to soil resources and the Forest Plan standards are met.	Soil stability would be affected on about 1,838acres, surface organic matter on 481 acres, soil organic matter on 1,999 acres and soil structure on 1,251 acres. Legacy site treatment will improve soil stability over the long term. Project design features will minimize the effects to soil resources and the Forest Plan standards are met.	Soil stability would be affected on about 1,240 acres, surface organic matter on 182 acres, soil organic matter on 1,529 acres and soil structure on 926 acres. Legacy site treatment will improve soil stability over the long term. Project design features will minimize the effects to soil resources and the Forest Plan standards are met.	Soil stability would be affected on about 2,001 acres, surface organic matter on 476 acres, soil organic matter on 2,098 acres and soil structure on 1,337 acres. Legacy site treatment will improve soil stability over the long term. Project design features will minimize the effects to soil resources and the Forest Plan standards are met.	Soil stability would be affected on about 1,565 acres, surface organic matter on 299 acres, soil organic matter on 1,675 acres and soil structure on 875 acres. Legacy site treatment will improve soil stability over the long term. Project design features will minimize the effects to soil resources and the Forest Plan standards are met.
Geology	There is no effect to landslide risk from the alternative. There are 36 watersheds in the project area with duration of elevated landslide risk of greater than 80 years. There will be no effect to cave resources or unique geologic features. There will be no disturbance of ultramafic bedrock.	There is no effect to landslide risk from this alternative. There will be 24 watersheds in the project area with duration of elevated risk of greater than 80 years and 12 watersheds with a reduction of duration of less than 30 years. There are zero acres of new temporary road on ultramafic rock. There is a very low likelihood of effecting cave resources. There is no effect to unique geologic features.	There will be 25 watersheds with a duration of elevated risk of greater than 80 years and 11 watersheds with a duration of elevated risk of less than 30 years. The other effects of the alternative are the same as for Alternative 2.	There will be 27 watersheds with a duration of elevated risk of greater than 80 years and 9 watersheds with a duration of elevated risk of less than 30 years. The other effects of the alternative are the same as for Alternative 2.	There will be 34 watersheds with a duration of elevated risk of greater than 80 years and 2 watersheds with a duration of elevated risk of less than 30 years. The other effects of the alternative are the same as for Alternative 2.	There will be 25 watersheds with a duration of elevated risk of greater than 80 years and 11 watersheds with a duration of elevated risk of less than 30 years. The other effects of the alternative are the same as for Alternative 2.	There will be 26 watersheds with a duration of elevated risk of greater than 80 years and 10 watersheds with a duration of elevated risk of less than 30 years. The other effects of the alternative are the same as for Alternative 2.
Air	There will be no nitrogen oxides, carbon dioxide or fugitive dust emissions.	There will be 19 tons per year of nitrogen oxide emission, 16,578 metric tons per year carbon dioxide equivalent emissions and 35 tons per year of fugitive dust from this alternative.	There will be 19 tons per year of nitrogen oxide emission, 16,352 metric tons per year carbon dioxide equivalent emissions and 35 tons per year of fugitive dust from this alternative.	There will be 19 tons per year of nitrogen oxide emission, 15,860 metric tons per year carbon dioxide equivalent emissions and 35 tons per year of fugitive dust from this alternative.	There will be 6.7 tons per year of nitrogen oxide emission, 10,694 metric tons per year carbon dioxide equivalent emissions and 10 tons per year of fugitive dust from this alternative.	There will be 18.8 tons per year of nitrogen oxide emission, 16,572 metric tons per year carbon dioxide equivalent emissions and 35 tons per year of fugitive dust from this alternative.	There will be 19 tons per year of nitrogen oxide emission, 16,646 metric tons per year carbon dioxide equivalent emissions and 35 tons per year of fugitive dust from this alternative.
Recreation	There would be no short-term adverse effects associated with project implementation. Increased short-term use of burn areas for firewood cutting and deer hunting. Direct long-term adverse effect to dispersed camping and hiking opportunities in burn areas from loss of shade. Increased short-term and long-term safety concerns from fallen snags. Increased maintenance costs for Forest infrastructure. No adverse effects to recreation settings from project implementation.	Recreational use is not expected to increase or decrease. Direct short-term adverse effect from smoke, road closures, or increased traffic during project implementation. Indirect short and long-term beneficial effect to big game hunting opportunities from prescribed fire and replanting. Indirect long-term beneficial effect to developed recreation facilities and dispersed campsites from fuels and roadside hazard treatments. These treatments would protect Forest Service infrastructure and/or increase safety at these sites. Indirect long-term adverse effects to recreation settings from project activities in nine locations.	Recreational use is not expected to increase or decrease. Direct short-term adverse effect from smoke, road closures, or increased traffic during project implementation. Indirect short and long-term beneficial effect to big game hunting opportunities from prescribed fire and replanting. Indirect long-term beneficial effect to developed recreation facilities and dispersed campsites from fuels and roadside hazard treatments. These treatments would protect Forest Service infrastructure and/or increase safety at these sites. Indirect long-term adverse effects to recreation settings from project activities in nine locations.	Recreational use is not expected to increase or decrease. Direct short-term adverse effect from smoke, road closures, or increased traffic during project implementation. Indirect short and long-term beneficial effect to big game hunting opportunities from prescribed fire and replanting. Indirect long-term beneficial effect to developed recreation facilities and dispersed campsites from fuels and roadside hazard treatments. These treatments would protect Forest Service infrastructure and/or increase safety at these sites. Indirect long-term adverse effects to recreation settings from project activities in nine locations.	Recreational use is not expected to increase or decrease. Direct short-term adverse effect from smoke, road closures, or increased traffic during project implementation. Indirect short and long-term beneficial effect to big game hunting opportunities from prescribed fire and replanting. Indirect long-term beneficial effect to developed recreation facilities and dispersed campsites from fuels and roadside hazard treatments. These treatments would protect Forest Service infrastructure and/or increase safety at these sites. Indirect long-term adverse effects to recreation settings from project activities in nine locations.	Recreational use is not expected to increase or decrease. Direct short-term adverse effect from smoke, road closures, or increased traffic during project implementation. Indirect short and long-term beneficial effect to big game hunting opportunities from prescribed fire and replanting. Indirect long-term beneficial effect to developed recreation facilities and dispersed campsites from fuels and roadside hazard treatments. These treatments would protect Forest Service infrastructure and/or increase safety at these sites. Indirect long-term adverse effects to recreation settings from project activities in seven locations.	Recreational use is not expected to increase or decrease. Direct short-term adverse effect from smoke, road closures, or increased traffic during project implementation. Indirect short and long-term beneficial effect to big game hunting opportunities from prescribed fire and replanting. Indirect long-term beneficial effect to developed recreation facilities and dispersed campsites from fuels and roadside hazard treatments. These treatments would protect Forest Service infrastructure and/or increase safety at these sites. Indirect long-term adverse effects to recreation settings from project activities in five locations.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 2 Modified	Alternative 3 Modified
Scenery	There is no effect to Visual Quality Objectives. Long term adverse effect with permanent vegetation change away from a conifer-dominated vegetation type towards a shrub-dominated ecosystem. Achievement of the desired condition would be set back 50 plus years or more.	Minor localized short-term direct adverse effects to Visual Quality Objectives from management treatments during project implementation with the presence of equipment, smoke, stumps, exposed soils, and cut and/or piled vegetation. Indirect long-term adverse effects to viewsheds from project activities in nine locations. Although Visual Quality Objectives would not be met for some salvage harvest and roadside hazard treatments in Retention or Partial Retention Visual Quality Objectives areas, Forest Plan consistency will be met (Forest Plan S&G 11-7). “Greening up” for three years after project completion would reduce visual evidence of fuels, harvest, roadside hazard, and site prep/plant activities to acceptable levels Twenty-five of the thirty-four viewsheds will meet Visual Quality Objectives. Indirect long-term beneficial effect to scenic character from management treatments would be speeding up recovery of the burn areas to a conifer-dominated character that is more consistent with historic scenery conditions and Desired Scenic Character.	Minor localized short-term direct adverse effects to Visual Quality Objectives from management treatments during project implementation with the presence of equipment, smoke, stumps, exposed soils, and cut and/or piled vegetation. Indirect long-term adverse effects to viewsheds from project activities in nine locations. Although Visual Quality Objectives would not be met for some salvage harvest and roadside hazard treatments in Retention or Partial Retention Visual Quality Objectives areas, Forest Plan consistency will be met (Forest Plan S&G 11-7). “Greening up” for three years after project completion would reduce visual evidence of fuels, harvest, roadside hazard, and site prep/plant activities to acceptable levels Twenty-five of the thirty-four viewsheds will meet Visual Quality Objectives. Indirect long-term beneficial effect to scenic character from management treatments would be speeding up recovery of the burn areas to a conifer-dominated character that is more consistent with historic scenery conditions and Desired Scenic Character.	Minor localized short-term direct adverse effects to Visual Quality Objectives from management treatments during project implementation with the presence of equipment, smoke, stumps, exposed soils, and cut and/or piled vegetation. Indirect long-term adverse effects to viewsheds from project activities in nine locations. Although Visual Quality Objectives would not be met for some salvage harvest and roadside hazard treatments in Retention or Partial Retention Visual Quality Objectives areas, Forest Plan consistency will be met (Forest Plan S&G 11-7). “Greening up” for three years after project completion would reduce visual evidence of fuels, harvest, roadside hazard, and site prep/plant activities to acceptable levels Twenty-five of the thirty-four viewsheds Visual Quality Objectives. Indirect long-term beneficial effect to scenic character from management treatments would be speeding up recovery of the burn areas to a conifer-dominated character that is more consistent with historic scenery conditions and Desired Scenic Character.	Minor localized short-term direct adverse effects to Visual Quality Objectives from management treatments during project implementation with the presence of equipment, smoke, stumps, exposed soils, and cut and/or piled vegetation. Indirect long-term adverse effects to viewsheds from project activities in nine locations. Although Visual Quality Objectives would not be met for some salvage harvest and roadside hazard treatments in Retention or Partial Retention Visual Quality Objectives areas, Forest Plan consistency will be met (Forest Plan S&G 11-7). “Greening up” for three years after project completion would reduce visual evidence of fuels, harvest, roadside hazard, and site prep/plant activities to acceptable levels Twenty-five of the thirty-four viewsheds will meet Visual Quality Objectives. Indirect long-term beneficial effect to scenic character from management treatments would be speeding up recovery of the burn areas to a conifer-dominated character that is more consistent with historic scenery conditions and Desired Scenic Character.	Minor localized short-term direct adverse effects to Visual Quality Objectives from management treatments during project implementation with the presence of equipment, smoke, stumps, exposed soils, and cut and/or piled vegetation. Indirect long-term adverse effects to viewsheds from project activities in seven locations Although Visual Quality Objectives would not be met for some salvage harvest and roadside hazard treatments in Retention Visual Quality Objectives areas, Forest Plan consistency will be met (Forest Plan S&G 11-7). “Greening up” for three years after project completion would reduce visual evidence of fuels, harvest, roadside hazard, and site prep/plant activities to acceptable levels Twenty-seven of the thirty-four viewsheds will meet Visual Quality Objectives. Indirect long-term beneficial effect to scenic character from management treatments would be speeding up recovery of the burn areas to a conifer-dominated character that is more consistent with historic scenery conditions and Desired Scenic Character.	Minor localized short-term direct adverse effects to Visual Quality Objectives from management treatments during project implementation with the presence of equipment, smoke, stumps, exposed soils, and cut and/or piled vegetation. Indirect long-term adverse effects to viewsheds from project activities in five locations. Although Visual Quality Objectives would not be met for some salvage harvest and roadside hazard treatments in Retention Visual Quality Objectives areas, Forest Plan consistency will be met (Forest Plan S&G 11-7). “ Greening up” for three years after project completion would reduce visual evidence of fuels, harvest, roadside hazard, and site prep/plant activities to acceptable levels Twenty-nine of the thirty-four viewsheds will meet Visual Quality Objectives. Indirect long-term beneficial effect to scenic character from management treatments would be speeding up recovery of the burn areas to a conifer-dominated character that is more consistent with historic scenery conditions and Desired Scenic Character.
Wild and Scenic Rivers	No effect to Wild and Scenic Rivers or their corridors because no action is taken.	No effect or a low risk to Wild and Scenic Rivers because none of the activities would negatively affect the outstandingly remarkable values (ORVs) of these rivers or their corridors. All ORVs would be protected.	No effect or a low risk to Wild and Scenic Rivers because none of the activities would negatively affect the outstandingly remarkable values (ORVs) of these rivers or their corridors. All ORVs would be protected.	No effect or a low risk to Wild and Scenic Rivers because none of the activities would negatively affect the outstandingly remarkable values (ORVs) of these rivers or their corridors. All ORVs would be protected.	No effect or a low risk to Wild and Scenic Rivers because none of the activities would negatively affect the outstandingly remarkable values (ORVs) of these rivers or their corridors. All ORVs would be protected.	No effect or a low risk to Wild and Scenic Rivers because none of the activities would negatively affect the outstandingly remarkable values (ORVs) of these rivers or their corridors. All ORVs would be protected.	No effect or a low risk to Wild and Scenic Rivers because none of the activities would negatively affect the outstandingly remarkable values (ORVs) of these rivers or their corridors. All ORVs would be protected.
Cultural Resources	There will be no direct effects to historic properties. Short-term indirect effects from no action will be negligible, but long-term will be moderate to major. No direct effects to cultural resources will occur but fire-adapted plants that are important to tribal interests will not be enhanced in the long term without prescribed burning. Long-term indirect effects would be moderate to major.	The effects on historic properties and identified cultural resources are the same as those described for Beaver, with the exception of planting in Karuk aboriginal territory. The Karuk state that planting has direct and indirect effects on their cultural resources in both the short and long-term. These effects are mitigated under the forthcoming project specific programmatic agreement. If these affects cannot be mitigated, the resolution process in the forthcoming programmatic agreement will be followed.	Same as Alternative 2	Same as Alternative 2	Same as Alternative 2	Same as Alternative 2	Same as Alternative 2

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 2 Modified	Alternative 3 Modified
Socio-Economics	Since no actions will occur in this alternative, an unsafe condition will continue to exist in the short term and get worse in the long term unless actions are taken outside this project to improve safety. This alternative is not consistent with the Siskiyou County Land and Resource Management Plan that encourages resource use of the Forest. No economic benefits come from this alternative.	Safer conditions would prevail in the short term with removal of roadside hazard trees along a maximum of 400 miles of roads. In the long term, safer conditions would be provided through 8,790 acres of hazardous fuels treatments. Economic returns from the entire project would include a potential $3 million return to Siskiyou County, labor income of $53 million and 1,236 jobs. This alternative is consistent with local county objectives for resource use of the Forest.	Similar to Alternative 2 except economic returns from the entire project would include a potential $2.5 million with labor income of $46 million and 1,067 jobs.	Similar to Alternative 2 except roadside hazard s would be treated along a maximum of 390 miles and economic returns from the entire project would include a potential $2.4 million with labor income of $47 million and 1,074 jobs.	Similar to Alternative 2 except economic returns from the entire project would include a potential $1.6 million with labor income of $22 million and 549 jobs.	Similar to Alternative 2 except economic returns from the entire project would include a potential $2.7 million with labor income of $46 million and 1,076 jobs.	Similar to Alternative 2 except roadside hazards would be removed along 215 miles of road, 9,740 acres of fuels would be treated, and economic returns from the entire project would include a potential $2.5 million with labor income of $38 million and 887 jobs.
Inventoried Roadless Areas	No effect to the roadless character of inventoried roadless areas because no treatments occur within these areas.	Roadless character will not be negatively affected by 74 acres of roadside hazard treatment, 121 acres of site preparation and reforestation, or 207 acres of hazardous fuels treatments.	Roadless character will not be negatively affected by 74 acres of roadside hazard treatment, 121 acres of site preparation and reforestation, or 207 acres of hazardous fuels treatments.	Roadless character will not be negatively affected by 74 acres of roadside hazard treatment, 121 acres of site preparation and reforestation, or 207 acres of hazardous fuels treatments.	Roadless character will not be negatively affected by 74 acres of roadside hazard treatment, 0 acres of site preparation and reforestation, or 207 acres of hazardous fuels treatments.	Roadless character will not be negatively affected by 74 acres of roadside hazard treatment, 121 acres of site preparation and reforestation, or 207 acres of hazardous fuels treatments.	Roadless character will not be negatively affected by 31 acres of roadside hazard treatment, 120 acres of site preparation and reforestation, or 288 acres of hazardous fuels treatments.

Table 2-40: Comparison of effect of alternative by resources for the Whites Fire area.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 2 Modified	Alternative 3 Modified
Vegetation	Natural regeneration on 10,260 acres of moderate- to high-severity vegetation burn. Regenerates as brush, hardwoods and isolated patches of conifers in the long term; meets the National Forest Management Act (NFMA) requirement by meeting Forest Plan standards	Natural regeneration on about 9,060 acres of moderate- to high-severity vegetation burn; 1,200 acres (12%) of moderate- to high-severity on which conifer regeneration will be accelerated. Treated areas regenerate with mature, mixed conifer stands in long term; meets NFMA and Forest Plan standards	Natural regeneration on about 9,160 acres of moderate- to high-severity vegetation burn; 1,100 acres (11%) of moderate- to high-severity on which conifer regeneration will be accelerated. Treated areas regenerate with mature, mixed conifer stands in long term; meets NFMA and Forest Plan standards	Natural regeneration on about 9,060 acres of moderate- to high-severity vegetation burn; 1,200 acres (12%) of moderate- to high-severity on which conifer regeneration will be accelerated. Treated areas regenerate with mature, mixed conifer stands in long term; meets NFMA and Forest Plan standards	Natural regeneration on about 10,230 acres of moderate- to high-severity vegetation burn; 30 acres (<1%) of moderate- to high-severity on which conifer regeneration will be accelerated. Most of the area regenerates with brush, hardwoods, and isolated conifers in long term; meets NFMA and Forest Plan standards	Natural regeneration on about 9,120 acres of moderate- to high-severity vegetation burn; 1,140 acres (11%) of moderate- to high-severity on which conifer regeneration will be accelerated. Treated areas regenerate with mature, mixed conifer stands in long term; meets NFMA and Forest Plan standards	Natural regeneration on about 9,150 acres of moderate- to high-severity vegetation burn; 1,100 acres (11%) of moderate- to high-severity on which conifer regeneration will be accelerated. Treated areas regenerate with mature, mixed conifer stands in long term; meets NFMA and Forest Plan standards
Fuels	There will be 3,740 acres meeting desired condition for fire and fuels resources.	There will be 12,830 acres meeting desired condition for fire and fuels resources.	There will be 12,670 acres meeting desired condition for fire and fuels resources.	There will be 12,830 acres meeting desired condition for fire and fuels resources.	There will be 11,420 acres meeting desired condition for fire and fuels resources.	There will be 12,720 acres meeting desired condition for fire and fuels resources.	There will be 12,645 acres meeting desired condition for fire and fuels resources.
Wildlife: Northern Spotted Owl	There are eleven and four activity centers that have low and moderate risk to reproduction. 68% of the critical habitat subunit KLW8 in the project area contains suitable habitat.	There are nine and six activity centers with low and moderate risk to reproduction. 68% of the critical habitat subunit KLW8 in the project area contains suitable habitat	The effects are the same as for Alternative 2.	The effects are the same as for Alternative 2.	There are ten and five activity centers with low and moderate risk to reproduction. The percent of suitable habitat in the critical habitat subunit is the same as for Alternative 2.	The effects are the same as for Alternative 2.	The effects are the same as for Alternative 2.
Wildlife: Bald Eagle	There are no known Bald Eagle nest sites in this fire area.	NA	NA	NA	NA	NA	NA
Wildlife: Northern Goshawk	There are three potentially occupied territories. One has a high risk to reproduction and two have a moderate risk to reproduction.	The level of disturbance is low as a result of project design features. The risk to reproduction is the same as for Alternative 1.	Level of disturbance is the same as Alternative 2. The risk to reproduction is the same as for Alternative 1.	Level of disturbance is the same as Alternative 2. The risk to reproduction is the same as for Alternative 1.	Level of disturbance is the same as Alternative 2. The risk to reproduction is the same as for Alternative 1.	Level of disturbance is the same as Alternative 2. The risk to reproduction is the same as for Alternative 1.	Level of disturbance is the same as Alternative 2. The risk to reproduction is the same as for Alternative 1.
Wildlife: Fisher, Marten and Wolverine	There are six, eight and four watersheds with moderate, low and very low connectivity respectively. Fourteen of the twenty-one watersheds meet the home range potential criteria.	There will be six, seven and five watersheds with moderate, low and very low connectivity. Nine of the eighteen watersheds meet the home range potential criteria.	The effects are the same as Alternative 2 for both connectivity and home range potential.	The effects are the same as Alternative 2 for both connectivity and home range potential.	There will be seven, six and five watersheds with moderate, low and very low connectivity. Home range potential is the same as Alternative 2.	The effects are the same as Alternative 2 for both connectivity and home range potential.	The effects are the same as Alternative 2 for both connectivity and home range potential.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 2 Modified	Alternative 3 Modified
Wildlife: Pallid Bat, Townsend Big-eared Bat, Fringed myotis, Willow Flycatcher, Siskiyou Salamander, Tehama Chaparral Snail and Western Bumble Bee (Sensitive Species)	There are no potential hibernacula/ maternities that will be affected. There is no Siskiyou Mountain Salamander habitat in the fire area. There will be no Tehama Chaparral Snail habitat affected. There will be no Western Bumble Bee habitat affected.	There seven, three and three potential hibernacula that have a low, moderate and high risk of disturbance respectively. Twelve watersheds will have a low level of willow flycatcher habitat alteration. The likelihood of dispersal for the Tehama Chaparral Snail is high. One watershed will have a moderate level of disturbance to Western Bumble Bee habitat.	The effects are the same as for Alternative 2.	The effects are the same as for Alternative 2.	There eight, two and three potential hibernacula that have a low, moderate and high risk of disturbance respectively. The effects to Willow Flycatcher, Tehama Chaparral Snail and Western Bumble Bee are the same as for Alternative 2.	The effects are the same as for Alternative 2.	The effects are the same as for Alternative 2.
Wildlife: Management Indicator Species	There are 42,200 acres of snag habitat and 700 acres of hardwood habitat in the fire area.	There will be about 9% of the snag habitat affected and 3% of the hardwood habitat affected.	There will be about 8% of the snag habitat affected and 3% of the hardwood habitat affected.	The effects are the same as for Alternative 2.	The effects are the same as for Alternative 2.	The effects are the same as for Alternative 2.	The effects are the same as for Alternative 3.
Range	There would be no effect on the availability of forage and a neutral effect on rangeland condition.	The availability of forage would increase; there will be a neutral effect on rangeland condition.	Same as Alternative 2.	Same as Alternative 2.	The availability of forage would increase less than with other action alternatives; there will be a neutral effect on rangeland condition.	There would be a small increase in the availability of forage; there will be a neutral effect on rangeland condition.	There would be a small increase in the availability of forage; there will be a neutral effect on rangeland condition.
Botany: Threatened, Endangered, and Proposed or Candidate Species	No likelihood of jeopardizing continued existence	No likelihood of jeopardizing continued existence	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2
Botany: Forest Service Sensitive Species	Static trend, no known populations present	Static trend, no known populations present	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2
Botany: Survey and Manage Species	Compliant	Compliant following implementation of PDF's	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2
Botany: Non-native Invasive Species	High	High	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2
Fish and other Aquatic Species : Indirect Effects- Sediment		There are no near stream temporary road actions in the Whites Fire area under any alternative. Discountable negative effects.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.
Fish and other Aquatic Species : Indirect Effects- Temperature		Shade in RRs protected by avoiding salvage in RRs and PDFs minimize effects of roadside and fuels treatments resulting in discountable negative effects. Sedimentation can affect temps – see above for sediment impacts.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.
Fish and other Aquatic Species : Indirect Effects – Large Wood		Salvage excludes RRs. Project design features ensure retention of large wood within near stream areas for fuels, hazard tree removal and landings. Discountable negative effects.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.	Less potential effect of hazard tree removal where it is reduced in extent.
Fish and other Aquatic Species : Direct effects to Salmon and Steelhead		Direct effects will be minimized through designation of acceptable sites that avoid impacts to thermal refugia and compliance with PDFs including use of NMFS (2001) water drafting specifications in Coho CH. Direct effects would be due to disturbance and likely to be discountable and minor.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 2 Modified	Alternative 3 Modified
Fish and other Aquatic Species : Direct effects to Resident Trout		Direct effects will be minimized through designation of acceptable sites that avoid impacts to thermal refugia and compliance with FS BMPs. Direct effects would be due to disturbance and likely to be discountable and minor.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.
Fish and other Aquatic Species : Direct effects to Other Aquatic Species		Direct effects will be minimized through designation of acceptable sites that avoid impacts to thermal refugia and compliance with FS BMPs. Direct effects would be due to disturbance and likely to be discountable and minor.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.	Same as Alternative 2.
Soils	The erosion hazard ratings remain high on 280 acres in the analysis area which does not meet desired condition for soil stability. There is a high volume of standing dead that will contribute to large woody debris and all acres meet desired condition. Soil organic matter has been affected by the 2014 wildfires on 280 acres. Past timber harvests have resulted in 50 acres not meeting desired condition for soil structure.	Soil stability would be affected on about 519 acres, surface organic matter on12 acres, soil organic matter on376 acres and soil structure on 298 acres. Legacy site treatment will improve soil stability over the long term. Project design features will minimize the effects to soil resources and the Forest Plan standards are met.	Soil stability would be affected on about 514 acres, surface organic matter on 12 acres, soil organic matter on 376 acres and soil structure on 298 acres. Legacy site treatment will improve soil stability over the long term. Project design features will minimize the effects to soil resources and the Forest Plan standards are met.	Soil stability would be affected on about 520 acres, surface organic matter on 12 acres, soil organic matter on 389 acres and soil structure on 305 acres. Legacy site treatment will improve soil stability over the long term. Project design features will minimize the effects to soil resources and the Forest Plan standards are met.	Soil stability would be affected on about 464 acres, surface organic matter on 12 acres, soil organic matter on 326 acres and soil structure on 268 acres. Legacy site treatment will improve soil stability over the long term. Project design features will minimize the effects to soil resources and the Forest Plan standards are met.	Soil stability would be affected on about 519 acres, surface organic matter on 12 acres, soil organic matter on 385 acres and soil structure on 301 acres. Legacy site treatment will improve soil stability over the long term. Project design features will minimize the effects to soil resources and the Forest Plan standards are met.	Soil stability would be affected on about 443 acres, surface organic matter on 12 acres, soil organic matter on 169 acres and soil structure on 285 acres. Legacy site treatment will improve soil stability over the long term. Project design features will minimize the effects to soil resources and the Forest Plan standards are met.
Geology	There is no effect to landslide risk from the alternative. There are 8 watersheds in the project area with duration of elevated landslide risk of greater than 80 years. There will be no effect to cave resources or unique geologic features. There will be no disturbance of ultramafic bedrock.	There is no effect to landslide risk from this alternative. There will be 8 watersheds in the project area with duration of elevated risk of greater than 80 years. There are zero acres of new temporary road on ultramafic rock. There is a very low likelihood of effecting cave resources. There is no effect to unique geologic features.	The effects of the alternative are the same as for Alternative 2.	The effects of the alternative are the same as for Alternative 2.	The effects of the alternative are the same as for Alternative 2.	The effects of the alternative are the same as for Alternative 2.	The effects of the alternative are the same as for Alternative 2.
Air	There will be no nitrogen oxides, carbon dioxide or fugitive dust emissions.	There will be 10 tons per year of nitrogen oxide emission, 27,281 metric tons per year carbon dioxide equivalent emissions and 7 tons per year of fugitive dust from this alternative.	There will be 10 tons per year of nitrogen oxide emission, 27,248 metric tons per year carbon dioxide equivalent emissions and 7 tons per year of fugitive dust from this alternative.	There will be 10 tons per year of nitrogen oxide emission, 27,095 metric tons per year carbon dioxide equivalent emissions and 7 tons per year of fugitive dust from this alternative.	There will be 6.4 tons per year of nitrogen oxide emission, 26,438 metric tons per year carbon dioxide equivalent emissions and 2 tons per year of fugitive dust from this alternative.	There will be 10 tons per year of nitrogen oxide emission, 27,281 metric tons per year carbon dioxide equivalent emissions and 7 tons per year of fugitive dust from this alternative.	There will be 10 tons per year of nitrogen oxide emission, 27,617 metric tons per year carbon dioxide equivalent emissions and 7 tons per year of fugitive dust from this alternative.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 2 Modified	Alternative 3 Modified
Recreation	There would be no short-term adverse effects associated with project implementation. Increased short-term use of burn areas for firewood cutting and deer hunting. Direct long-term adverse effect to dispersed camping and hiking opportunities in burn areas from loss of shade. Increased short-term and long-term safety concerns from fallen snags. Increased maintenance costs for Forest infrastructure. No adverse effects to recreation settings from project implementation.	Recreational use is not expected to increase or decrease. Direct short-term adverse effect from smoke, road closures, or increased traffic during project implementation. Indirect short and long-term beneficial effect to big game hunting opportunities from prescribed fire and replanting. Indirect long-term beneficial effect to developed recreation facilities and dispersed campsites from fuels and roadside hazard treatments. These treatments would protect Forest Service infrastructure and/or increase safety at these sites. No adverse effects to recreation settings from project implementation.	Recreational use is not expected to increase or decrease. Direct short-term adverse effect from smoke, road closures, or increased traffic during project implementation. Indirect short and long-term beneficial effect to big game hunting opportunities from prescribed fire and replanting. Indirect long-term beneficial effect to developed recreation facilities and dispersed campsites from fuels and roadside hazard treatments. These treatments would protect Forest Service infrastructure and/or increase safety at these sites. No adverse effects to recreation settings from project implementation.	Recreational use is not expected to increase or decrease. Direct short-term adverse effect from smoke, road closures, or increased traffic during project implementation. Indirect short and long-term beneficial effect to big game hunting opportunities from prescribed fire and replanting. Indirect long-term beneficial effect to developed recreation facilities and dispersed campsites from fuels and roadside hazard treatments. These treatments would protect Forest Service infrastructure and/or increase safety at these sites. No adverse effects to recreation settings from project implementation.	Recreational use is not expected to increase or decrease. Direct short-term adverse effect from smoke, road closures, or increased traffic during project implementation. Indirect short and long-term beneficial effect to big game hunting opportunities from prescribed fire and replanting. Indirect long-term beneficial effect to developed recreation facilities and dispersed campsites from fuels and roadside hazard treatments. These treatments would protect Forest Service infrastructure and/or increase safety at these sites. No adverse effects to recreation settings from project implementation.	Recreational use is not expected to increase or decrease. Direct short-term adverse effect from smoke, road closures, or increased traffic during project implementation. Indirect short and long-term beneficial effect to big game hunting opportunities from prescribed fire and replanting. Indirect long-term beneficial effect to developed recreation facilities and dispersed campsites from fuels and roadside hazard treatments. These treatments would protect Forest Service infrastructure and/or increase safety at these sites. No adverse effects to recreation settings from project implementation.	Recreational use is not expected to increase or decrease. Direct short-term adverse effect from smoke, road closures, or increased traffic during project implementation. Indirect short and long-term beneficial effect to big game hunting opportunities from prescribed fire and replanting. Indirect long-term beneficial effect to developed recreation facilities and dispersed campsites from fuels and roadside hazard treatments. These treatments would protect Forest Service infrastructure and/or increase safety at these sites. No adverse effects to recreation settings from project implementation.
Scenery	There is no effect to Visual Quality Objectives. Long term adverse effect with permanent vegetation change away from a conifer-dominated vegetation type towards a shrub-dominated ecosystem. Achievement of the desired condition would be set back 50 plus years or more.	Minor localized short-term direct adverse effects to Visual Quality Objectives from management treatments during project implementation with the presence of equipment, smoke, stumps, exposed soils, and cut and/or piled vegetation. "Greening up" for three years after project completion would reduce visual evidence of fuels, harvest, roadside hazard, and site prep/plant activities to acceptable levels. All 19 viewsheds will meet Visual Quality Objectives. Indirect long-term beneficial effect to scenic character from management treatments would be speeding up recovery of the burn areas to a conifer-dominated character that is more consistent with historic scenery conditions and Desired Scenic Character.	Minor localized short-term direct adverse effects to Visual Quality Objectives from management treatments during project implementation with the presence of equipment, smoke, stumps, exposed soils, and cut and/or piled vegetation. "Greening up" for three years after project completion would reduce visual evidence of fuels, harvest, roadside hazard, and site prep/plant activities to acceptable levels. All 19 viewsheds will meet Visual Quality Objectives. Indirect long-term beneficial effect to scenic character from management treatments would be speeding up recovery of the burn areas to a conifer-dominated character that is more consistent with historic scenery conditions and Desired Scenic Character.	Minor localized short-term direct adverse effects to Visual Quality Objectives from management treatments during project implementation with the presence of equipment, smoke, stumps, exposed soils, and cut and/or piled vegetation. "Greening up" for three years after project completion would reduce visual evidence of fuels, harvest, roadside hazard, and site prep/plant activities to acceptable levels. All 19 viewsheds will meet Visual Quality Objectives. Indirect long-term beneficial effect to scenic character from management treatments would be speeding up recovery of the burn areas to a conifer-dominated character that is more consistent with historic scenery conditions and Desired Scenic Character.	Minor localized short-term direct adverse effects to Visual Quality Objectives from management treatments during project implementation with the presence of equipment, smoke, stumps, exposed soils, and cut and/or piled vegetation. "Greening up" for three years after project completion would reduce visual evidence of fuels, harvest, roadside hazard, and site prep/plant activities to acceptable levels. All 19 viewsheds will meet Visual Quality Objectives. Indirect long-term beneficial effect to scenic character from management treatments would be speeding up recovery of the burn areas to a conifer-dominated character that is more consistent with historic scenery conditions and Desired Scenic Character.	Minor localized short-term direct adverse effects to Visual Quality Objectives from management treatments during project implementation with the presence of equipment, smoke, stumps, exposed soils, and cut and/or piled vegetation. "Greening up" for three years after project completion would reduce visual evidence of fuels, harvest, roadside hazard, and site prep/plant activities to acceptable levels. All 19 viewsheds will meet Visual Quality Objectives. Indirect long-term beneficial effect to scenic character from management treatments would be speeding up recovery of the burn areas to a conifer-dominated character that is more consistent with historic scenery conditions and Desired Scenic Character.	Minor localized short-term direct adverse effects to Visual Quality Objectives from management treatments during project implementation with the presence of equipment, smoke, stumps, exposed soils, and cut and/or piled vegetation. "Greening up" for three years after project completion would reduce visual evidence of fuels, harvest, roadside hazard, and site prep/plant activities to acceptable levels. All 19 viewsheds will meet Visual Quality Objectives. Indirect long-term beneficial effect to scenic character from management treatments would be speeding up recovery of the burn areas to a conifer-dominated character that is more consistent with historic scenery conditions and Desired Scenic Character.
Wild and Scenic Rivers	No effect to Wild and Scenic Rivers or their corridors because no action is taken.	No effect or a low risk to Wild and Scenic Rivers because none of the activities would negatively affect the outstandingly remarkable values (ORVs) of these rivers or their corridors. All ORVs would be protected.	No effect or a low risk to Wild and Scenic Rivers because none of the activities would negatively affect the outstandingly remarkable values (ORVs) of these rivers or their corridors. All ORVs would be protected.	No effect or a low risk to Wild and Scenic Rivers because none of the activities would negatively affect the outstandingly remarkable values (ORVs) of these rivers or their corridors. All ORVs would be protected. All ORVs would be protected.	No effect or a low risk to Wild and Scenic Rivers because none of the activities would negatively affect the outstandingly remarkable values (ORVs) of these rivers or their corridors. All ORVs would be protected.	No effect or a low risk to Wild and Scenic Rivers because none of the activities would negatively affect the outstandingly remarkable values (ORVs) of these rivers or their corridors. All ORVs would be protected.	No effect or a low risk to Wild and Scenic Rivers because none of the activities would negatively affect the outstandingly remarkable values (ORVs) of these rivers or their corridors. All ORVs would be protected.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 2 Modified	Alternative 3 Modified
Cultural Resources	There will be no direct effects to historic properties. Short-term indirect effects from no action will be negligible, but long-term will be moderate to major. No direct effects to cultural resources will occur but fire-adapted plants that are important to tribal interests will not be enhanced in the long term without prescribed burning. Long-term indirect effects would be moderate to major.	The effects on historic properties and identified cultural resources are the same as those described for the Happy Camp Complex.	Same as Alternative 2	Same as Alternative 2	Same as Alternative 2	Same as Alternative 2	Same as Alternative 2
Socio-Economics	Since no actions will occur in this alternative, an unsafe condition will continue to exist in the short term and get worse in the long term unless actions are taken outside this project to improve safety. This alternative is not consistent with the Siskiyou County Land and Resource Management Plan that encourages resource use of the Forest. No economic benefits come from this alternative.	Safer conditions would prevail in the short term with removal of roadside hazard trees along a maximum of 80 miles of roads. In the long term, safer conditions would be provided through 11,350 acres of hazardous fuels treatments. Economic returns from the entire project would include a potential $3 million return to Siskiyou County, labor income of $53 million and 1,236 jobs. This alternative is consistent with local county objectives for resource use of the Forest.	Similar to Alternative 2 except economic returns from the entire project would include a potential $2.5 million with labor income of $46 million and 1,067 jobs.	Similar to Alternative 2 except roadside hazard s would be treated along a maximum of 70 miles and economic returns from the entire project would include a potential $2.4 million with labor income of $47 million and 1,074 jobs.	Similar to Alternative 2 except economic returns from the entire project would include a potential $1.6 million with labor income of $22 million and 549 jobs.	Similar to Alternative 2 except economic returns from the entire project would include a potential $2.7 million with labor income of $46 million and 1,076 jobs.	Similar to Alternative 2 except roadside hazards would be removed along 55 miles of road, 11,400 acres of fuels would be treated, and economic returns from the entire project would include a potential $2.5 million with labor income of $38 million and 887 jobs.
Inventoried Roadless Areas	No effect to the roadless character of inventoried roadless areas because no treatments occur within these areas.	Roadless character will not be negatively affected by 36 acres of roadside hazard treatment, 39 acres of site preparation and reforestation, or 5,240 acres of hazardous fuels treatments.	Roadless character will not be negatively affected by 36 acres of roadside hazard treatment, 39 acres of site preparation and reforestation, or 5,240 acres of hazardous fuels treatments.	Roadless character will not be negatively affected by 36 acres of roadside hazard treatment, 39 acres of site preparation and reforestation, or 5,240 acres of hazardous fuels treatments.	Roadless character will not be negatively affected by 36 acres of roadside hazard treatment, 0 acres of site preparation and reforestation, or 5,240 acres of hazardous fuels treatments.	Roadless character will not be negatively affected by 36 acres of roadside hazard treatment, 39 acres of site preparation and reforestation, or 5,240 acres of hazardous fuels treatments.	Roadless character will not be negatively affected by 34 acres of roadside hazard treatment, 39 acres of site preparation and reforestation, or 5,240 acres of hazardous fuels treatments.

Comparison Table of Treatments by Land Allocation

Table 2-41displays the acres of various treatments in each alternative by category of land allocation.

Table 2-41: Comparison treatments by alternative within various land allocations[28]

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 2 Modified	Alternative 3 Modified
Beaver Fire							
Late Successional Reserves	Salvage acres=0 Site Prepare and Reforest=0 Roadside Hazard=0 Fuels Treatment=0	Salvage acres=20 Site Prepare and Reforest=20 Roadside Hazard=130 Fuels Treatment=30	Salvage acres=0 Site Prepare and Reforest=20 Roadside Hazard=130 Fuels Treatment=30	Salvage acres=10 Site Prepare and Reforest=20 Roadside Hazard=120 Fuels Treatment=30	Salvage acres=0 Site Prepare and Reforest=0 Roadside Hazard=130 Fuels Treatment=30	Salvage acres=20 Site Prepare and Reforest=20 Roadside Hazard=130 Fuels Treatment=30	Salvage acres=0 Site Prepare and Reforest=20 Roadside Hazard=100 Fuels Treatment=40
Administratively Designated[29]	Salvage acres=0 Site Prepare and Reforest=0 Roadside Hazard=0 Fuels Treatment=0	Salvage acres=0 Site Prepare and Reforest=380 Roadside Hazard=1,020 Fuels Treatment=470	Salvage acres=0 Site Prepare and Reforest=380 Roadside Hazard=1,020 Fuels Treatment=470	Salvage acres=0 Site Prepare and Reforest=380 Roadside Hazard=930 Fuels Treatment=470	Salvage acres=0 Site Prepare and Reforest=380 Roadside Hazard=1,020 Fuels Treatment=470	Salvage acres=0 Site Prepare and Reforest=380 Roadside Hazard=1,020 Fuels Treatment=480	Salvage acres=0 Site Prepare and Reforest=330 Roadside Hazard=620 Fuels Treatment=650

[28] No treatments will take place in congressionally designated areas (wilderness).
[29] Within the Westside project area, these include special habitat for eagle and falcon; the North Russian Landslide Dam Special Interest area (see the geology section of Chapter 3 for more information), designated or recommended “Wild” rivers for Wild and Scenic River Act designation; and mapped hydrologic Riparian Reserves. Inventoried roadless areas are not included; for more information about treatments in these areas, see the inventoried roadless area section of Chapter 3.

	Alternative 1	Alternative 2	Alternative 3	Alternative 4	Alternative 5	Alternative 2 Modified	Alternative 3 Modified
Matrix[30]	Salvage acres=0 Site Prepare and Reforest=0 Roadside Hazard=0 Fuels Treatment=0	Salvage acres=570 Site Prepare and Reforest=1,380 Roadside Hazard=4,650 Fuels Treatment=1,590	Salvage acres=0 Site Prepare and Reforest=1,380 Roadside Hazard=4,650 Fuels Treatment=1,590	Salvage acres=510 Site Prepare and Reforest=1,380 Roadside Hazard=4,550 Fuels Treatment=1,590	Salvage acres=0 Site Prepare and Reforest=1,390 Roadside Hazard=4.650 Fuels Treatment=2,800	Salvage acres=200 Site Prepare and Reforest=1,380 Roadside Hazard=4,650 Fuels Treatment=1,660	Salvage acres=0 Site Prepare and Reforest=1310 Roadside Hazard=1,470 Fuels Treatment=2,610
Happy Camp Complex							
Late Successional Reserves	Salvage acres=0 Site Prepare and Reforest=0 Roadside Hazard=0 Fuels Treatment=0	Salvage acres=4,880 Site Prepare and Reforest=3,200 Roadside Hazard=7,060 Fuels Treatment=3,570	Salvage acres=4,470 Site Prepare and Reforest=3,200 Roadside Hazard=7,060 Fuels Treatment=3,570	Salvage acres=4,070 Site Prepare and Reforest=3,200 Roadside Hazard=7,010 Fuels Treatment=3,570	Salvage acres=0 Site Prepare and Reforest=0 Roadside Hazard=7,060 Fuels Treatment=3,570	Salvage acres=4,590 Site Prepare and Reforest=3,200 Roadside Hazard=8,090 Fuels Treatment=3,310	Salvage acres=3,370 Site Prepare and Reforest=2,920 Roadside Hazard=6,830 Fuels Treatment=3,860
Administratively Designated	Salvage acres=0 Site Prepare and Reforest=0 Roadside Hazard=0 Fuels Treatment=0	Salvage acres=280 Site Prepare and Reforest=420 Roadside Hazard=950 Fuels Treatment=1,920	Salvage acres=270 Site Prepare and Reforest=420 Roadside Hazard=950 Fuels Treatment=1,920	Salvage acres=200 Site Prepare and Reforest=420 Roadside Hazard=920 Fuels Treatment=1,920	Salvage acres=20 Site Prepare and Reforest=0 Roadside Hazard=950 Fuels Treatment=1,920	Salvage acres=280 Site Prepare and Reforest=420 Roadside Hazard=950 Fuels Treatment=1,920	Salvage acres=420 Site Prepare and Reforest=390 Roadside Hazard=820 Fuels Treatment=2,080
Matrix	Salvage acres=0 Site Prepare and Reforest=0 Roadside Hazard=0 Fuels Treatment=0	Salvage acres=1,630 Site Prepare and Reforest=1,820 Roadside Hazard=5,990 Fuels Treatment=3,300	Salvage acres=1,390 Site Prepare and Reforest=1,820 Roadside Hazard=5,990 Fuels Treatment=3,300	Salvage acres=1,560 Site Prepare and Reforest=1,820 Roadside Hazard=5,670 Fuels Treatment=3,300	Salvage acres=1,730 Site Prepare and Reforest=2,080 Roadside Hazard=5,670 Fuels Treatment=3,300	Salvage acres=1,470 Site Prepare and Reforest=1,820 Roadside Hazard=4,960 Fuels Treatment=3,300	Salvage acres=1,410 Site Prepare and Reforest=1,610 Roadside Hazard=2,080 Fuels Treatment=3,800
Whites Fire							
Late Successional Reserves	Salvage acres=0 Site Prepare and Reforest=0 Roadside Hazard=0 Fuels Treatment=0	Salvage acres=490 Site Prepare and Reforest=640 Roadside Hazard=2,220 Fuels Treatment=6,860	Salvage acres=430 Site Prepare and Reforest=640 Roadside Hazard=2,220 Fuels Treatment=6,860	Salvage acres=490 Site Prepare and Reforest=640 Roadside Hazard=2,190 Fuels Treatment=6,860	Salvage acres=0 Site Prepare and Reforest=0 Roadside Hazard=2,220 Fuels Treatment=6,840	Salvage acres=450 Site Prepare and Reforest=640 Roadside Hazard=2,410 Fuels Treatment=6,860	Salvage acres=500 Site Prepare and Reforest=560 Roadside Hazard=2,160 Fuels Treatment=6,920
Administratively Designated	Salvage acres=0 Site Prepare and Reforest=0 Roadside Hazard=0 Fuels Treatment=0	Salvage acres=0 Site Prepare and Reforest=0 Roadside Hazard=230 Fuels Treatment=1,530	Salvage acres=0 Site Prepare and Reforest=0 Roadside Hazard=230 Fuels Treatment=1,530	Salvage acres=0 Site Prepare and Reforest=0 Roadside Hazard=230 Fuels Treatment=1,530	Salvage acres=0 Site Prepare and Reforest=0 Roadside Hazard=230 Fuels Treatment=1,520	Salvage acres=0 Site Prepare and Reforest=0 Roadside Hazard=230 Fuels Treatment=1,530	Salvage acres=0 Site Prepare and Reforest=0 Roadside Hazard=10 Fuels Treatment=10
Matrix	Salvage acres=0 Site Prepare and Reforest=0 Roadside Hazard=0 Fuels Treatment=0	Salvage acres=70 Site Prepare and Reforest=0 Roadside Hazard=250 Fuels Treatment=2,960	Salvage acres=30 Site Prepare and Reforest=0 Roadside Hazard=250 Fuels Treatment=2,960	Salvage acres=70 Site Prepare and Reforest=0 Roadside Hazard=80 Fuels Treatment=2,960	Salvage acres=30 Site Prepare and Reforest=0 Roadside Hazard=250 Fuels Treatment=2,990	Salvage acres=50 Site Prepare and Reforest=0 Roadside Hazard=60 Fuels Treatment=2,960	Salvage acres=50 Site Prepare and Reforest=0 Roadside Hazard=230 Fuels Treatment=4,470

[30] Within the Westside project area, these include General Forest; designated or recommended "Scenic" or "Recreational" river corridors; Retention; and Partial Retention management areas; for more information on the rivers, and Retention and Partial Retention visual quality, see the Wild and Scenic River and Scenery sections of Chapter 3.

Project Design Features

The Forest developed the following project design features to address project objectives, to minimize resource impacts, and to ensure compliance with the Forest Plan and applicable laws and regulations. Table 2-42 displays the design features developed for this project, along with the applicable units. Project design features will be implemented in all action alternatives unless otherwise designated.

Table 2-42: Westside Fire Recovery Project Design Features and applicable stands and/or alternatives

Project Design Feature	Description	Applicable Alternatives and Units	Rationale OR Applicable Standard and Guideline
Botany - 1	Forest Service botanist will flag for avoidance appropriate populations of federally Threatened and Endangered and Forest Service Sensitive species. Yellow and black striped flagging will be used to delineate population boundaries. Some specific areas may also require a limited operating period (LOP) to minimize impacts to plants.	508-1, F071, F025, F025-1, F026, F106, F106-1, F106-3, P065 LOP: F025, F025-1, F026, F106, F106-1, F106-3	S&G 6-7, 7-4
Botany - 2	Populations protected under Survey and Manage guidelines will be flagged for avoidance. Yellow and black striped flagging will be used to delineate population boundaries.	F078, F162, F032, F068-1, F030, F030-2, F043-5, F146, F027-1, F146-1, F034, F034-1, F035, F035-1, F035-2, F035-3, F077, F077-1, F160-2, F019, F157, F157-2, F020, F091, F044-1, F044-2, F160, F160-2, F109, F151, F078-7	S&G 6-17
Botany - 3	Hazard trees adjacent to flagged populations of Threatened, Endangered, and Sensitive (TES) and Survey and Manage species will be directionally felled away from the flagged area to avoid disturbing the population. Directionally felled trees may only be removed if it causes no ground disturbance within the flagged area. Yellow and black striped flagging will be used to delineate population boundaries.	R136, R045, R101, R131, R127-11, R140, R140-1, R042, R115, R151, R127-4, R119, R128, R040, R093	S&G 6-7, 6-17, 7-4
Botany - 4	Hazard trees located within the flagged population boundary for TES or Survey and Manage species may be felled, but must be left on-site to avoid ground disturbance. Yellow and black striped flagging will be used to delineate population boundaries.	R136, R045, R101, R131, R127-11, R140, R140-1, R042, R115, R151, R127-4, R119, R128, R040, R093	S&G 6-7, 6-17, 7-4
Botany - 5	A Forest Botanist will be consulted prior to conducting Fuels treatments within the Lake Mountain Special Interest Area	F070, F071, F072	S&G 6-7, 7-4
Botany - 6	Cultural botanical resources (fern beds in riparian zones) will be flagged for avoidance. Yellow and black striped flagging will be used to delineate population boundaries.	228, 228-1, 226-1, 226-2, P322, P319 *Units subject to field verification	S&G 6-13, 21-47, 24-24
Botany - 7	Equipment and vehicle travel and/or staging shall be restricted to established road surfaces.	F084-1	S&G 6-7

Project Design Feature	Description	Applicable Alternatives and Units	Rationale OR Applicable Standard and Guideline
NNIS – 1	Equipment and vehicles that leave established road surfaces will be cleaned of soil, seeds, vegetative matter, and other debris that could contain noxious weed seeds prior to entering and before leaving the project area. Areas appropriate for cleaning equipment prior to leaving the project area will be designated as appropriate.	All equipment where applicable	Mandatory C-Provision 6.25
NNIS - 2	Equipment and vehicles will avoid working within flagged noxious weed sites. Orange/black flagging labeled with *INVASIVE SPECIES* will be used to delineate population boundaries.	1151, 1155, 508-5, 508-4, 506, 501, 500, 411, 410407, 62, 23, 005-3, F008, F075, F076, F159, F022, F013, F155, F077, F160, F015, F016, F087, F088, F084, F090, F050, F051, F053, F080, F038, F036, F044, F045, F113, F028, F152, F109, F029, F026, F037, F034, F035, F043, F078, F157, F002, F086, F081, F162, F151, F184, F030, F127, F129, F146, F121, F033, F133, F068, F069, F116, F008, F072, F071, F013, F016, F018, F022, F075, F076, F156, F159, F074, F078, F021, F017, F019, P026, P089, P099, P102, P105, P106, P107, P072, P073, P075, P113, P160, P139, P057, P058, P059, P061, P063, P065, P028, R128, R082, R127-11, R100, R136, R140, R131, R020, R024, R015, R041, R017, R132, R130, R118, R109, R102, R111, R132, R106, R082, R096, R094, R032, R017, R103, R116, R079, R137, R132	FSM 2900, EO 13112
NNIS - 3	If potential landings sites are infested with noxious weeds, consult a Botanist about appropriate methods for containing and/or managing the infestation. Methods may include blading infested soil away from activity zone and covering this soil; or adding a barrier to the landing so seed banks cannot be transported.	All landings where applicable: info to date indicates the following locations: L174, L176, L177, L203, L219, L220, L223, L224, L225, L002, L005, L013, L0134, DZ03, DZ04, DZ17, L006, L007, L044, L261, L269, L048, L064, L066	FSM 2900, EO 13112
NNIS - 4	Any straw or seed placed within the project area must be documented as California certified weed free. Other materials where State inspection protocol does not exist (gravel, wood chips) used as mulch in the project area, should be inspected by a Forest Service representative to determine the potential for spread of noxious weeds.	All materials where applicable	FSM 2900, EO 13112
NNIS - 5	Any facility that provides material such as rock, gravel, or boulders to	All facilities where applicable	FSM 2900, EO 13112

Project Design Feature	Description	Applicable Alternatives and Units	Rationale OR Applicable Standard and Guideline
	be used in the project area should be inspected and determined to have limited potential for the spread of noxious weeds from stored material. Material stockpiles must be noxious weed free.		
Fuels - 1	Site specific burn plan prior to implementation would be completed to identify desired fire behavior and weather conditions to meet prescribed fire and resource objectives along with protection measures to reduce impacts to both cultural and natural resources within the burn area.	All salvage harvest units	This is a requirement prior to implementing prescribed fire.
Fuels - 2	All burning activities would adhere to pertinent air quality regulations. Smoke emissions would be minimized by following Best Available Control Measures (BACM). A smoke permit administered by the local County Air Resource Agency would accompany burn plans.	All units where applicable	This is a requirement prior to implementing prescribed fire.
Fuels - 3	In preparation of prescribed fire activities, perimeter control lines will be constructed to mineral soil. As needed, brush and conifer trees < 12" dbh may be cut along control lines to facilitate holding activities.	All units where applicable	This PDF is in place to describe fireline activities associated with prescribed fire activities in order to disclose potential effects.
Fuels - 4	All fire lines would follow the established guidelines for water bar construction as outlined in the Best Management Practices. Upon completion of burning, the visible character of the firelines would be disguised by spreading pine needles, brush, etc where they intersect roads or trails in order to reduce the likelihood of the firelines becoming unwanted trails.	All units where applicable	This PDF is to mitigate visual and resource effects of fireline.
Fuels - 5	Piles will be covered to keep piles dry for ignition and consumption during wet periods.	All units where applicable	This PDF is to keep piles dry to allow piles with fuel to consume better and reduce smoke emissions.
Fuels - 6	Prior to planting, the project silviculturist will coordinate with the fuels specialist to review planting activities within identified hazardous fuels treatments. Planting utilizing a clumping pattern with variable spacing to minimize surface fuel loadings and break the continuity of the fuel beds to maintain desired low fire hazard conditions.	All units where applicable	This PDF is in place to ensure planting specifications during implementation meet the intended need for both silviculture and fuels resources.
Fuels - 7	Areas proposed for a combination of planting and follow up prescribed fire would be assessed prior to implementation by the silviculturist and fuels specialist to assess fuel conditions and potential mortality of planted trees as a result of planned	Units with ground-based logging system only	This PDF is to reduce mortality of planted trees during prescribed fire implementation.

Project Design Feature	Description	Applicable Alternatives and Units	Rationale OR Applicable Standard and Guideline
	prescribed fire. Should high mortality rates of planted trees be predicted, handline or other control methods would be employed to exclude fire from these areas.		
Heritage - 1	Conduct heritage resource surveys to determine presence of resources within the area of potential effects following the provisions outlined in the Regional and Westside Recovery Programmatic Agreements (PAs).	All units where applicable Alternatives 2-5, Alt 2 Modified, Alt 3 Modified.	Required under Section 106 of the National Historic Preservation Act (NHPA); S&G 24-4; Consistent with requirements set forth in the Regional PA and Westside Fire Recovery (WFR) PA.
Heritage - 2	Complete the Section 106 process, consulting with the State Historic Preservation Officer on potential adverse effects to sites from project activities that cannot be mitigated using Standard Resource Protection Measures (SRPM). If adverse effects cannot be avoided, a Historic Properties Treatment Plan will be developed.	All units where applicable; Alternatives 2-5, Alt 2 Modified, Alt 3 Modified.	Required under Section 106 of the National Historic Preservation Act (NHPA); S&G 24-8; Consistent with requirements set forth in the Regional PA and WFR PA.
Heritage - 3	All sites within the area of potential effects will be clearly delineated prior to implementation. This includes but is not limited to flagging site boundaries.	All units where applicable; Alternatives 2-5, Alt 2 Modified, Alt 3 Modified.	Mitigation to prevent adverse effects to heritage resources pursuant to the Regional PA and the WFR PA.
Heritage - 4	Any project activities within site boundaries will follow approved SRPMs established by PAs and will be approved by the heritage program manager.	All units where applicable; Alternatives 2-5, Alt 2 Modified, Alt 3 Modified.	Mitigation to prevent adverse effects to heritage resources pursuant to the Regional PA and the WFR PA.
Heritage - 5	No skid roads, road improvements, landings or burn pile areas will occur within archeological sites without approval from the district archaeologist and/or heritage program manager.	All units where applicable; Alternatives 2-5, Alt 2 Modified, Alt 3 Modified.	Mitigation to prevent adverse effects to heritage resources pursuant to the Regional PA and the WFR PA.
Heritage - 6	In the event that new heritage resources are discovered during project implementation, the district archaeologist and/or heritage program manager must be notified and all activities in the vicinity (150 feet) of the resource shall cease until consultations are completed.	All units where applicable; Alternatives 2-5, Alt 2 Modified, Alt 3 Modified.	Required under Section 106 of the National Historic Preservation Act (NHPA); Conforms to discovery stipulations set forth in the Regional PA and WFR PA.
Heritage - 7	Heritage personnel will conduct implementation and post-implementation monitoring of project activities within site boundaries.	All units where applicable; Alternatives 2-5, Alt 2 Modified, Alt 3 Modified.	FSM 2360; S&G 24-17; Monitoring requirements pursuant to the Regional PA and the WFR PA.
Heritage-8	Reforestation efforts along the Historic Barton Ditch (and any other historic ditch identified within a reforestation unit) will be implemented	Units P102 & P104; Alternatives 2-5, Alt 2 Modified, Alt 3 Modified. Other locations where	Mitigation to prevent adverse effects to heritage resources pursuant to the

Project Design Feature	Description	Applicable Alternatives and Units	Rationale OR Applicable Standard and Guideline
	with the following conditions: the historic feature will be flagged and avoided by all equipment during site prep and planting activities; no planting will occur within 20 feet on either side of the ditch.	applicable..	Regional PA and the WFR PA.
Heritage-9	Monitoring of at-risk historic properties and/or cultural resources during implementation may be conducted to ensure the effectiveness of resource protection measures pursuant to the Regional PA and/or Westside Fire Recovery PA.		Monitoring requirements pursuant to the Regional PA and the WFR PA
Inventoried Roadless Area - 1	Site preparation and planting within Inventoried Roadless Areas will be by hand and not include ground-based mechanical equipment.	All site preparation and planting units in IRAs	Consistency with the 2001 Roadless Area Conservation Rule.
Range-1	All structural rangeland improvements, such as corrals, cattle guards, and spring developments, will be mapped and protected from disturbance. If damage occurs, improvements will be repaired or replaced in a timely manner.	All units within allotments	
Range-2	Timing of logging operations will be made known to the Rangeland Management Specialist in order to decrease conflicts between cattle and heavy equipment.	All Units within allotments	
Range - 3	Meadows (dry or wet) shall not be used for landings, staging areas, or contractor camping. No planting is proposed in site preparation and planting or salvage units that overlap meadows (dry or wet). Meadows are defined as a non-forested, herbaceous opening, ¼ acre or larger with at least 50 percent herbaceous groundcover and/or riparian shrubs of alder and willow. Openings covered in ferns (*Pteridium spp.*), corn lily (*Veratrum spp.*), marlahan mustard (*Isatis tinctoria*) or other weedy species are exempt. Openings characterized by greater than 50 percent barren ground are also exempt.	1108, 1128, 1128-1, 1137, 1142, F046, F046-2, F047, F047-1, F047-2, F047-3, F048, F048-1, F048-2, F049-1, F050-1, F053, F054, F055, F056, F057, F060, F062, F082, F083, F084, F084-1, F084-3 F085, F085-1, F085-2, F085-3, F086, F087, F087-1, F089, F089-1, F089-2, F090, F095, F095-1, F095-2, F095-3, F096, F096-1, F096-2, F161, F163-1, F169, F175, F176, F178, F180, F182, P073, P083, P084, P085, P087, P088, P090, P092, P093, P094, P098, P100, P103, P110, P111, P113, P115, R001, R002, R005, R006, R007, R010, R011, R013, R015, R017, R019, R023, R025, R026, R027, R028, R030, R033, R034, R039, R040, R041, R045, R049, R050, R051, R054-1, R057, R058, R072, 022, 031, 032, 034, 508_1_1, 508-1, 508-2, 508-4, 508-4-1, 508-5, 508-6, 508-9, 515-1, 518, 528, 528-1-1, 530, 545, 546, F008, F010, F026, F063-4, F063-5, F070, F071, F072, F109, F118, F120, P036, P038, P039, P041, P042,	

Project Design Feature	Description	Applicable Alternatives and Units	Rationale OR Applicable Standard and Guideline
		P044, P049, P050 P052, P056, P058, P059, P060, P062, P064, P065, P066, P067, P068, P069, P070, P071, R079, R082, R111, R118, R119, R127-11, R127-9, R128, 426, F073-1, F076-6, F077-1, L019, L024, L001, L003, L013, L266, DZ21	
Recreation and Scenery-1	Protect and maintain recreational features and recreational settings along roads, trails, and trailheads identified as visually sensitive.	All Alternatives: All units where applicable	To minimize resource impacts, and to ensure compliance with the Forest Plan and applicable laws and regulations.
Recreation and Scenery-2	Repair or replace recreational signing or other facilities and trail settings if damaged during project implementation.	All Alternatives: All units where applicable	Ensure compliance with the Forest Plan S & G 12-3.
Recreation and Scenery-3	Provide visitor information about area/road/trail closures, or other recreation setting changes, in news releases, on-site, and on the Forest website.	All Alternatives: All units where applicable	Ensure compliance with the Forest Plan S & G 12-3.
Recreation and Scenery-4	Minimize scenery contrasts within foreground distances (50 feet) such as stumps, landings, skid patterns, temporary roads, and burn piles in sensitive trailside and roadside to meet assigned VQOs.	All Alternatives: Bear Creek Trail - Roadside hazard for road 15N06, Lake Mt Trail – roadside hazard for road 45N65, Units 508-1, 508-1-1, 508-4-1, 508-5, 508-6-1, F071	To minimize resource impacts, and to ensure compliance with the Forest Plan S & G 15-1.
Recreation and Scenery-5	No visible tree mark paint on trees after implementation in Retention VQO areas as seen from high sensitivity viewpoints.	All Alternatives: All units visible from: Cold Spring Trailhead, Pacific Crest Trail, Grider Creek Campground, Grider Creek Road, Klamath Wild and Scenic River, Highway 96, Scott River Road, Tyler Meadows Trailhead	To minimize resource impacts, and to ensure compliance with the Forest Plan and applicable laws and regulations
Recreation and Scenery-6	Provide safety signing along trails, rivers, or roads or temporary road or trail closures in active project areas to provide for public safety.	Modified Alternatives 2 & 3: 058, 058-1,058-3, 058-6, 058-7, 61, 62, 62-1, 224, 228-3, 508-1, 508-1-1, 508-4-1, 508-5, 508-6-1, F071	Response to public comment, and to ensure compliance with applicable laws and regulations.
Recreation and Scenery-7	Cut stumps 6” or lower within 100 feet of dispersed campsites listed below and displayed on Motor Vehicle Use Map (in addition campsite on road 45N72X). 51D015, 51D018, 51D019, 51D020, 51D021, 51D022, 52D013, 52D015, 52D016, 52D017, 54D001, 54D011, 55D001, 55D002C, 55D003, 55D004, 55D005, 55D006, 55D007, 55D008, 55D009, 55D010	Modified Alternatives 2 & 3: All units, fuels, and roadside hazard treatments where applicable	To minimize resource impacts.
Recreation and Scenery-8	Cut stumps 6” or lower if possible away and angle-cut stumps away from Pacific Crest, Bear Creek, and Lake Mountain Trails up to 50 feet each side of trail.	Modified Alternatives 2 & 3: Units 224, 228-3, P321, 508-1, roadside hazard on Forest roads 45N72X, 45N78, 45N78A	Response to public comment, to minimize resource impacts.

Project Design Feature	Description	Applicable Alternatives and Units	Rationale OR Applicable Standard and Guideline
Recreation and Scenery-9	Hand piling of purchaser created slash to be piled at least 30 feet from Pacific Crest, Bear Creek, and Lake Mountain Trails.	Modified Alternatives 2 & 3: Units 224, 228-3, P321, 508-1	Response to public comment, to minimize resource impacts.
Recreation and Scenery-10	Protect trail tread from log skidding and machine access. The Cold Springs Trailhead parking area (north of road #45N78) will not be used for log storage, equipment storage, truck turnaround, or crew vehicle parking.	Modified Alternatives 2 & 3:	Response to public comment, to minimize resource impacts.
Recreation/Scenery – 11	No hazard tree removal within 15 feet of the PCT except tail hold trees needed for unit 224. Tail hold trees will be flush cut upon project completion.	Modified Alternatives 2 & 3: Roadside Hazard for road 45N78A at Cold Springs Trailhead	Response to public comment, to minimize resource impacts.
Recreation/Scenery – 12	No salvage harvest within 50 feet of the PCT.	Modified Alternatives 2 & 3: Unit 224, 229-2	Response to public comment, to minimize resource impacts.
Roads - 1	Forest Road 12 will be signed from the intersection with Highway 96 to 3/8 mile past Walker Bridge; the sign will request log truck drivers to not use their “Jake Brakes” along this section of road.	Forest Road 12	
Soils-1	For any tractor harvest unit that do not meet the soil cover standards in table 4-2 of the Forest Plan upon completion of treatments, areas where soil cover is deficient will be mulched so that soil cover standards are met.	All ground based units	Meet table 4-2 of Forest Plan S&G 3-2
Watershed - 1	All ground disturbing activities within or outside of the normal operating season (NOS) between May 1 to October 31 will be implemented according to the Forest’s Wet Weather Operation Standards (Klamath National Forest, 2002). Wet weather operations in riparian reserves outside of the NOS will be limited to landings, existing roads, fuels units, roadside hazard units, and site prep and planting.	All units where applicable	BMP 1.5
Watershed - 2	Areas where soil has been disturbed by project activities within Riparian Reserves must be stabilized prior to the end of the normal operating season, prior to sunset if the National Weather Service forecast is a “chance” (30%) of rain within the next 24 hours, or at the conclusion of the operations, whichever is sooner. This includes skid trails that cross swales (i.e. linear depressions perpendicular to the slope contour that do not meet definition for designation as a Riparian Reserve). Restoration generally consists of removing excess sediment, reshaping and waterbarring former approaches, and spreading slash on the former crossing.	All units where applicable	Waiver of Waste Discharge Requirements for Non-point source Discharges Related to Certain Federal Land Management Activities on National Forest Lands (Water Board Waiver) Order No. R1-2010-0029.

Project Design Feature	Description	Applicable Alternatives and Units	Rationale OR Applicable Standard and Guideline
Watershed - 3	Project Riparian Reserves are established in the following manner per the Forest Plan (site tree for Salmon and Happy Camp districts is 170 feet, site tree for Scott and Oak Knoll districts is 150 feet): For fish-bearing streams, it is the area on each side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to a distance equal to the height of two site-potential trees, or 300 feet slope distance (600 feet total, including both sides of the stream), whichever is greatest. For Salmon and Happy Camp ranger districts, this will be 340 feet (680 feet total). For permanently flowing non-fish-bearing streams, it is the area on each side of the stream extending from the edges of the active stream channel to the top of the inner gorge, or to the outer edges of the 100-year floodplain, or to a distance equal to the height of one site-potential tree, or 150 feet slope distance (300 feet total, including both sides of the stream), whichever is greatest. For Salmon and Happy Camp ranger districts, this will be 170 feet (340 feet total) and 150 feet for the Oak Knoll and Scott River Ranger District. For intermittent streams, the stream channel and extending to the top of the inner gorge, or extension from the edges of the stream channel to a distance equal to the height of one site potential tree, or 100 feet slope distance, whichever is greatest. For unstable lands, it is the extent of unstable and potentially unstable areas. Consistent with Forest Plan direction, riparian reserves for wetlands and springs will be defined by the edge of the feature out to a distance equal to 1 site potential tree. These riparian reserves will be flagged and avoided during salvage harvest.	All units where applicable	S&G MA10-2
Watershed - 4	Tractors and mechanical harvesters will be excluded from all riparian reserves associated with stream channels, active landslides, inner gorges, and toe zones of dormant landslide deposits. In Roadside hazard tree units the equipment will be restricted to the road surface. Equipment will be excluded from wetlands or wet meadows (excluding small springs and seeps). To limit slope disturbance, inner gorge terrain (> 65% slope) that	All units where applicable	Unstable Lands: S&G MA10-7, BMP 1.6, BMP 1.18 and BMP 1.19

Project Design Feature	Description	Applicable Alternatives and Units	Rationale OR Applicable Standard and Guideline
	extends beyond riparian reserves will be buffered by 20-foot slope distance and excluded from mechanical equipment activities. In areas where treatments may conflict, a hydrologist will be consulted.		
Watershed - 5	New temporary roads or landings will not be constructed in any riparian reserve associated with stream channels, on toe zones of landslides, active landslides or inner gorges. Exceptions for this project design feature: Landings # DZ03, DZ10, DZ23, L043, L044, and L090. New landings in stream-course Riparian Reserves will not involve removing stream shade over perennial stream channels. For the six new landings in Riparian Reserve approved for use in this project, Forest Service watershed specialists will be involved in site specific decisions related to vegetation removal, drainage and erosion control, and hydrologic stabilization.	All units where applicable	Restriction on unstable lands is intended to not prevent attainment of ACS objectives and to meet BMP 1.6.
Watershed - 6	There will be no salvage logging on active landslides except for units 5, 23, 32, 39, 55, 56, 57, 59, 64, 226, 268, 406, 520, 524, 525, and 530 which have been field reviewed by the Forest Geologist (see Geology amendment for details on criteria for exceptions).	1128, 228, 3, 65, 225, 500, 532,	S&G MA10-7 and BMP 1.6 Exceptions are intended to meet S&G 2-1 (manage vegetation on unstable lands to maintain or enhance slope stability).
Watershed - 7	Limit equipment disturbance within 20 feet on either side of swales by minimizing equipment crossings and avoiding running trails up the axis of swales, except at designated crossings.	All units where applicable	
Watershed - 8	In salvage units and subsequent site preparation, skidding equipment will be restricted to slopes less than 35 percent. Skid trails that connect benches in dormant landslide terrain can have minor portions of the skid trails on slopes greater than 35 percent. Ground-based equipment can travel up to 100 feet on slopes 35 to 45 percent.	All salvage units.	Soil types with granitic or schist parent material are most susceptible to rutting and displacement of soil organic matter. See S&G 3-3.
Watershed-9	In site preparation units (where no salvage will occur) skidding equipment will be restricted to slopes less than 35% on granitic and schist soil types, and up to 45% on all other soil types. Site preparation treatments in Riparian Reserves will be by hand only.	The following site prep and planting units have granitic or schist soil and slopes greater than 35 percent: P031_1, P039, P051, P051-1, P160, P172, P180, P189, P191, P194, and P201.	Soil types with granitic or schist parent material are most susceptible to rutting and displacement of soil organic matter. See S&G 3-3.
Watershed - 10	During site preparation, material greater than 8'' inches in diameter would not be removed unless needed to reduce 1,000 hour fuel loading to seven tons per acre, retain as close to	All units where applicable	S&G 3-6

Project Design Feature	Description	Applicable Alternatives and Units	Rationale OR Applicable Standard and Guideline
	seven tons per acre as possible.		
Watershed - 11	Site preparation treatments would be designed to meet soils management direction in the Forest Plan. Site preparation will be used to reduce fuels where the sum of one-hour, ten-hour, and 100-hour fuels exceeds 7 tons per acre.	All units where applicable	
Watershed - 12	All hazard trees cut within 25 feet of a stream channel or spring will be left on site unless it continues to pose a threat to safety or accessibility (see watershed-4 for equipment exclusion restrictions). Along all stream channels (perennial and intermittent), all hazard trees 26 inches in diameter at breast height and greater within the first site tree (150-170 feet) will be left on site unless after felling, it continues to pose a threat to safety, infrastructure, forest road drainage system integrity or accessibility. Any hazard tree (equal or greater than 26 inches) below a road that would contact a fish bearing stream channel if felled that direction will be retained on site.	All units where applicable	S&G MA10-56, MA10-58, MA10-53.
Watershed - 13	Live trees directly rooted into the banks or otherwise integral to the stability of the channel bank will not be felled unless they pose an overhead hazard and, if felled, will be left on site unless this poses a hazard on the ground per Forest Service safety requirements.	All units where applicable	S&G MA10-58, MA10-55, MA-10-56.
Watershed - 14	Directional felling will be used to protect streambanks where hazard trees need to be mitigated for public or employee safety.	All units where applicable	S&G MA10-61, MA10-59.
Watershed - 15	Improvements to existing system roads in the project area will avoid over-steepened road cuts where possible, minimize sidecasting, and maintain ditches, cross drains, and any outsloped road segments.	All units where applicable	S&G MA10-42, MA10-45, MA10-48.
Watershed - 16	Roads will be watered as appropriate to maintain road fines on site. Other materials may be used for dust abatement as approved by the Forest Service.	All units where applicable	S&G MA10-45, MA10-48.
Watershed - 17	Upgrades or improvements to stream crossings will be built to Forest Plan standards.	All units where applicable	S&G MA10-44.
Watershed - 18	Activities which require culvert replacement or removal will occur during the least critical periods for water and aquatic resources: when streams are dry or during low-water conditions; and in compliance with spawning and breeding season	All units where applicable	S&G MA10-44.

Project Design Feature	Description	Applicable Alternatives and Units	Rationale OR Applicable Standard and Guideline
	restrictions.		
Watershed - 19	Legacy sediment site treatments within or adjacent to streams will have erosion-prevention techniques applied such as silt fences, straw waddles, or mulch to minimize the risk of discharge.	All units where applicable	S&G MA10-42, MA10-45, MA10-48.
Watershed - 20	All project-related temporary structures, materials and project-related debris will not be stored for any length of time on active landslides and will be removed from riparian areas and stream channels prior to winter shutdown.	All units where applicable	BMP 1.6
Watershed - 21	For legacy sediment site repairs, fill materials generated will be reincorporated back into subgrade to the extent possible; all excess fill materials will be spoiled at a site reviewed and approved by Forest Service botanist, watershed, and heritage specialists.	All legacy site repair where applicable	S&G MA10-42, MA10-45, MA10-48.
Watershed - 22	Following harvest activities achieve at least 50 percent effective soil cover on new temporary roads (if it's available on site). Achieve 80% soil cover on hydrologically connected temporary roads and re-opened decommissioned roads within riparian reserves at the end of season of use. Block temporary roads after the harvest season (prior to the first winter after use). Depending on soil texture and slope, new temporary roads will also be sub-soiled, tilled (or tilled, or roughed up) after use. All temporary roads (new, existing or re-opened decommissioned roads) will have the takeoffs from system road obliterated or blocked to avoid unauthorized use. All temporary roads will be hydrologically stabilized including removal of culverts and fills at stream crossings, out-sloping of road surfaces, and proper construction of water bars. Erosion and sedimentation control structures (water bars) will be maintained and repaired per the guidance in the Forest Service Handbook 2409.15 R5 Supplement.	All new temp roads	S&G 3-4, BMP 2.1
Watershed - 23	Existing landings will be used to the extent possible. Existing landings in stream-course riparian reserves will not be expanded towards stream channels, or on to active landslides, or where vegetation that provides shade to a stream would need to be cut. Existing landings in riparian reserves will be shaped and treated for erosion control at the end of each season of use, and hydrologically restored at project completion	All units where applicable	S&G MA10-42, MA10-51.

Project Design Feature	Description	Applicable Alternatives and Units	Rationale OR Applicable Standard and Guideline
	(including subsoiling and covering with slash/mulch as needed). Reused landings in riparian reserves will have site specific erosion control measures to reduce risk of sediment delivery into streams. During opening or construction of any landings, material will not be sidecast into intermittent or perennial stream channels. At project conclusion, landings will be configured for long-term drainage and stability by reestablishing natural runoff patterns. All landings within riparian reserves will be covered with at least 80 percent effective soil cover at the end of season use. Use of certified weed free materials including straw, wood chips, or mulch may be used where on-site material is insufficient.		
Watershed - 24	Refueling will not take place within Riparian Reserves except at designated landings in locations where most disconnected from water resources. A spill containment kit will be in place where refueling and servicing take place. Helicopter refueling will not occur within Riparian Reserves. Equipment used for refueling will not exceed 150 gallons.	All units where applicable	BMP 2.11
Watershed - 25	Skid trail erosion control work will be kept current during implementation. Erosion control and drainage of skid trails will be complete prior to shutting down operations due to wet weather or at project completion.	All units where applicable	BMP 1.17
Watershed - 26	Use existing skid trails instead of building new skid trails unless using existing skid trails will have greater negative effects. Space skid trails at least 75 feet apart, except near landings and where trails converge. Use no skid trails in areas in which ground-based mechanical equipment is excluded. Designation of new skid trails will be approved by a Timber Sale Administrator. Erosion and sedimentation control structure will be maintained and repaired per the guidance in the Forest Service Handbook 2409.15 R5 Supplement.	All units where applicable	BMP 1.17
Watershed - 27	No full bench skid trails will be constructed. Full bench skid trails have the entire skid trail cut into the hillslope.	All units where applicable	BMP 2.2
Watershed - 28	Locations where skid trails intersect roads will be obliterated or effectively blocked to vehicle access.	All units where applicable	
Watershed - 29	Skyline corridors will be placed on the landscape as to minimize disturbance to active landslides, inner gorges and	All units where applicable	For Unstable Lands: BMP 1.6

Project Design Feature	Description	Applicable Alternatives and Units	Rationale OR Applicable Standard and Guideline
	toe zones of dormant landslide deposits. All skyline and ground-based yarding will require one-end suspension in corridors and on skid trails. Corridors for skyline yarding that are parallel to the stream channel will be placed outside of the riparian reserve. The corridor may cross the stream channel with full suspension of logs within 30 feet from the stream bank. Apply erosion control measures as necessary in skyline corridors to control erosion and runoff. This could include hand construction of water bars and /or spreading slash from adjacent areas.		
Watershed - 30	Where skidding occurs through units with less than 50 percent soil cover, mulch skid trails of greater than 15 percent slope, to achieve at least 50 percent effective soil cover on skid trails (approximately 40 acres across the project area may require this). Effective soil cover could include plant litter, woody material in contact with the soil, living vegetation, and rock fragments with a diameter of ½ to 3 inches. Use of certified weed free materials including straw, wood chips, or mulch may be used where on-site material is insufficient.	Based on soil burn severity data, these units are most likely to require this: 225, 264, 402, 525, 528, 540, 1109, 1129, 1136, 1140, 1142, 1151, and 1155.260.1, 521, 408.41, 262, 517, 508.9, 580.4, 263, 20, 33, and 213	S&G 3-4
Watershed - 31	Prescribed fire effects in riparian reserves will mimic a low intensity backing fire, except for handpiles where higher intensity may occur to consume pile material. Ignition of underburns will generally not occur in riparian reserves. Approval by the District Fish Biologist is needed for underburn riparian reserve ignitions.	All units where applicable	MA10-65, MA10-68.
Watershed - 32	Handpiles and windrows in riparian reserves will be placed in a checkerboard pattern whenever possible (not piled directly above another). Handpiles will be less than six feet in diameter. Hand piles will be more than 30 feet away from intermittent streams and 70 feet away from perennial streams except in wildland urban interface areas where piles shall be more than 30 feet from perennial streams. No more than 30 percent or any riparian reserve acre, or other contiguous riparian reserve area which is less than one acre, can have burn scars at any time which do not have organic mulch or vegetative recovery (i.e. not invasive weeds). Consider raking burn scars to restore ground cover and facilitate vegetative recovery as soon as the burn is completely extinguished.	All units where applicable	MA10-65, MA10-68.

Project Design Feature	Description	Applicable Alternatives and Units	Rationale OR Applicable Standard and Guideline
Watershed - 33	For underburning, hand-line construction in riparian vegetation shall be avoided and in general should be farther than 25 feet from stream channels. Handlines will be mitigated (waterbarred and covered with organic material) immediately following prescribed burning, when safe to do so.	All units where applicable	MA10-65, MA10-68.
Watershed - 34	Draft water only at sites designated by the Forest Service. Decisions related to where water drafting occurs will be coordinated with a Forest Service fisheries biologist so that potential impacts to anadromous fish, and the thermal refugia they rely upon, are sufficiently minimized. Sites that are not likely to have rearing Coho salmon present will be prioritized for use, such as mainstem sites on the Klamath, Scott, and Salmon rivers. Priority will also be given to sites that involve drafting relatively warmer waters in mainstem rivers; drafting from tributaries and colder water sources, especially in their lower reaches, will be avoided particularly during late summer and early fall (when fish survival is dependent upon thermal refugia). Water storage facilities such as foldable tanks are encouraged and will be assessed for sites with moderate flows that simultaneously support rearing SONCC coho salmon, and may be subject to high drafting use (e. g., Walker Creek). Project-related water drafting will be monitored, and shifted away from streams if their baseflows will no longer sustain drafting-related water withdrawal consistent with PDFs. The following creeks will be avoided, due to their small size, small summer base flows, and consistent presence of rearing SONCC Coho salmon - Tom Martin Cr, O'Neil Cr, Little Horse Cr, and China Cr. When drafting from waters designated as coho salmon Critical Habitat: NOAA Fisheries Water Drafting Specifications (2001) apply 1. Intakes will be screened with 3/32" mesh for rounded or square openings, or 1/16" mesh for slotted openings. When in habitat potentially occupied by steelhead trout, intakes will be screened with 1/8" mesh size. Wetted surface area of the screen or fish-exclusion device shall be proportional to the pump rate to ensure that water velocity at the screen surface does not exceed 0.33 feet/second.	All units where applicable	Designed to prevent adverse effects to ESA-listed fish, and consistent with BMP 2.5.

Project Design Feature	Description	Applicable Alternatives and Units	Rationale OR Applicable Standard and Guideline
	a. Use of a NOAA approved fish screen will ensure the above specifications are met. 2. Fish screen will be placed parallel to flow. 3. Pumping rate will not exceed 350 gallons-per-minute or 10% of the flow of the anadromous stream drafted from. 4. Pumping will be terminated when tank is full. Additional applicable specifications: • There will be no modification/improvement of drafting sites in Coho Critical Habitat. Water drafting by more than one truck shall not occur simultaneously. When drafting from waters that are not Coho Salmon critical habitat: Forest Service Best Management Practices (BMP) Handbook direction applies (BMP 2.5) 1. For fish-bearing streams, the water drafting rate should not exceed 350 gallons per minute for streamflow greater than or equal to 4.0 cubic feet per second (cfs). 2. Below 4.0 cfs, drafting rates should not exceed 20 percent of surface flows. 3. Water drafting should cease when bypass surface flows drop below 1.5 cfs. 4. Intakes, for trucks and tanks, shall be placed parallel to the flow of water and screened, with opening size consistent with the protection of aquatic species of interest. 5.Fish-bearing streams that are temporarily dammed to create a drafting pool shall provide fish passage for all life stages of fish. When drafting from non-fish-bearing waters: Forest Service BMP Handbook direction applies (BMP 2.5) • Drafting rate should not exceed 350 gallons per minute for stream flow greater than or equal to 2.0 cubic feet/second. • Drafting rate should not exceed 50 percent of surface flow. • Drafting should cease when bypass surface flow drops below ten gallons per minute. • Drafting by more than one truck shall not occur simultaneously.		
Watershed - 35	Rock and gravel will be applied to drafting sites if it is needed to prevent stream sedimentation.	All units where applicable	BMP 2.5

Project Design Feature	Description	Applicable Alternatives and Units	Rationale OR Applicable Standard and Guideline
	Water drafting sites located outside of Coho salmon Critical Habitat only may include minor instream modification, such as fine sediment removal and building of board/plastic dams. All boards and plastic will be removed after use.		
Watershed - 36	Maintain 5 to 20 pieces of CWD per acre with a target size of 20 inches in diameter (or larger) and about 40 cubic feet in volume when they are available. The minimum piece size to count toward these objectives is > 15 inches diameter and 10 feet long. On upper slopes and south and west aspects, ~5 pieces > 15 inches diameter and 10 feet long would be retained. On north and east aspects and on lower slopes, up to 20 pieces >15 inches diameter and 10 feet long will be retained. Individual snags, clumps of snags, existing logs on the ground and green trees within units may count towards these targets. All Alternatives/All Treatments	All units where applicable	Forest-wide S&G 6-16
Wildlife – 1	A survey strategy has been developed in coordination with Fish and Wildlife Service for northern spotted owl (NSO) surveys. Three NSO surveys will be completed each year prior to project implementation, except for roads identified as major ingress/egress access roads that do not occur within occupied core areas (see Ingress/Egress roads discussion below). If surveys result in a positive detection of NSO, then: No treatment will occur within occupied core areas from February 1 to July 9 unless nesting is confirmed or suspected, then no treatment within the core area until after September 15. No treatment will occur within 0.25 miles of unsurveyed suitable NSO nesting/roosting or foraging habitat (as identified by the project biologist and FWS consultation) prior to July 9, except for the following areas: Units 005-9-1, 22, 23, 23-15, 23-16, 23-17, 23-18, 23-19, 23-30, 51, 52, 56-1-1, 56-2, 58, 059, 520, 523, 524, 525-1, and 525-2 INGRESS/EGRESS ROADS with Roadside Hazard Treatment: Limited Operating Periods will <u>not</u> apply to ingress/egress roadside hazard treatments occurring <u>*outside*</u> occupied core areas (as determined by the most recent surveys). Limited Operating Periods will apply to ingress/egress roadside hazard treatments occurring <u>*within*</u> occupied core areas (as determined by the	All Alternatives All units where applicable	Resulted from consultation with FWS.

Project Design Feature	Description	Applicable Alternatives and Units	Rationale OR Applicable Standard and Guideline
	most recent surveys); so treatments will not occur until after July 9. Unless nesting is suspected or confirmed then treatments will not occur within the occupied core area until after Sept. 15. Six NSO surveys will be completed along ingress/egress roads, though 3 surveys may or may not be completed prior to implementation.		
Wildlife – 2	No more than 50 percent of the suitable nesting/roosting, and foraging habitat within an occupied NSO core area and no more than 50 percent of the nesting/roosting, and foraging suitable habitat within an occupied NSO home range will be underburned annually. Underburning will not occur within occupied core areas between February 1 to September15.	All Alternatives All units where applicable	Resulted from consultation with FWS.
Wildlife – 3	No prescribed fire (e.g. underburning and pile burning) within 0.5 mile of an eagle nest from January 1 to August 31. No prescribed fire (e.g. underburning and pile burning) will be implemented within bald eagle winter roost areas from November 1 to March 31. If a survey determines that a winter roost or nest site is not active, no seasonal restrictions are required for the year.	ALL ALTERNATIVES All units where applicable	Bald and Golden eagle Protection Act; Bald eagle Management Guidelines and LRMP Standards and Guidelines..
Wildlife – 4	No helicopter activity within 0.5 mile of a bald eagle roost or nest or within all of Caroline Creek (7th field watershed) from January 1 to August 31. If surveys determine that a roost or nest is not active, no seasonal restrictions are required for the year. Landings L259 and L270 (in Caroline Creek) are not subject to this LOP.	All Alternatives All units where applicable Landings DZ03, DZ04, DZ05, DZ10, L040 Units 037, 038, and 039	Bald and Golden eagle Protection Act; Bald eagle Management Guidelines and LRMP Standards and Guidelines.
Wildlife – 5	No project activities creating noise above ambient levels (including mechanical thinning, yarding, chainsaw use, and hauling) or habitat modification within 0.25 mile of a bald eagle roost or nest from January 1 to August 31. If surveys determine that a roost or nest is not active, no seasonal restrictions are required for the year.	All Alternatives Units: F147, F152, F149, F152-1, F147-2, F098, F098-1, R126, R129, R132, and R102.	Bald and Golden eagle Protection Act; Bald eagle Management Guidelines and LRMP Standards and Guidelines.
Wildlife – 6	Goshawk surveys will be conducted prior to project implementation. If survey results locate a nesting pair, project activities will not occur within .25 miles of this site location from (March 1- August 31). If pre-implementation surveys determine no nesting activity, then seasonal restrictions may be lifted for the year.	All Alternatives All units where applicable	LRMP
Wildlife – 7	No roadside treatment between March 1 and June 15 to avoid	All Alternatives	Resulted from

Project Design Feature	Description	Applicable Alternatives and Units	Rationale OR Applicable Standard and Guideline
	disturbance of denning fisher.	ML1 roads	consultation with FWS.
Wildlife – 8	No treatment, salvage harvest, or ground disturbing activity during any time of the year in areas within units that are flagged for avoidance; as these areas contain either known sites, occupied talus habitat, or potentially occupied talus habitat for the Scott Bar Salamander and Siskiyou Mountain Salamander. Sites will be flagged on the ground by the project wildlife biologist.	All Alternatives Applies to all or parts of units 517, 518, 508-8, 508-4, 508-4-1, 508-9, 508, 508-3, 508-2, 508-1, 501, 503, 506, 505, 515-1, 515-1-2, 516, 523-1, 523, and 528.	Survey and Manage Rules
Wildlife – 9	Do not place skyline corridors on known sites, occupied talus habitat, or potentially occupied talus habitat for the Scott Bar Salamander and Siskiyou Mt Salamander during anytime of the year. This will apply to skyline units within the range of the Scott Bar and Siskiyou Mt Salamander that have talus habitat.	All Alternatives Applies to units 508, 508-3, 508-2, 508-1, 501, 503, 506, 505, 515-1, 515-1-2, 516, 523-1, 523, and 528.	Survey and Manage Rules
Wildlife – 10	Avoid ground disturbance to known Survey and Manage mollusk and salamander sites during roadside hazard tree removal activities.	All Alternatives – All roadside hazard units where applicable	Survey and Manage Rules
Wildlife – 11	Legacy Components Retention for Late Successional Habitat Retain legacy component trees and snags in treatment units. These legacy components will be identified using physical characteristics. Legacy trees or snag size will vary depending on site condition, but are usually disproportionately large diameter trees that are often remnants of the previous stand on a given site. They are old standing trees that have persisted on the landscape after man-made and natural disturbances. For example, large trees containing one or more of the following characteristics: split or broken tops, heavy decadent branching, large mistletoe brooms, otherwise damaged to the degree that a cavity may form such as basal fire or lightning scars, or other features that indicate decay or defect. If the legacy component tree or snag must be felled for safety reasons, retain the log whole in the unit.	All Alternatives All units where applicable	Northwest Forest Plan Standards and Guidelines; LRMP; and NSO Recovery Plan Recovery Action 12.
Wildlife – 12	Snags or dying trees that contain cat faces, broken or forked tops, hollows or cavities, burned out cavities, or those that are otherwise damaged to the degree that a cavity may form will be favored for retention. Retain all large hardwood snags or live trees where practicable, particularly those with cavities, broken or split tops, or large broken branches.	All Alternatives All units where applicable	MIS habitat management recommendations and future stand development.

Project Design Feature	Description	Applicable Alternatives and Units	Rationale OR Applicable Standard and Guideline
Wildlife – 13	Retain pre-existing (existing prior to the wildfire) conifer and hardwood snags (greater than 14 inches in diameter at breast height) and pre-existing coarse woody debris in the salvage units. If any pre-existing snags must be felled for safety reasons, these pre-existing snags will be left on landscape whole as coarse wood.	All Alternatives All units where applicable	Resulted from consultation with FWS.; MIS habitat management recommendations; LRMP
Wildlife – 14	Avoid placing skyline corridors through retention patches or any actions that would potentially damage retention areas whenever possible.	All ALTERNATIVES	Resulted from consultation with FWS and interdisciplinary coordination
Wildlife – 15	Leave cull trees (greater than or equal to 20inches in diameter) in roadside units where possible . Leave as whole logs where practicable.	ALL ALTERNATIVES All units where applicable	LRMP
Wildlife - 16	Avoid all salvage harvest within delineated retention patches.	ALL ALTERNATIVES All units where applicable	Resulted from consultation with FWS and interdisciplinary coordination
Wildlife – 17	No management activities will occur within at least 0.25 mile (up to 1.0 mile) of peregrine falcon nest location from March 1 to August 31 if the nest is active. If a survey determines that a nest site is not active, no seasonal restrictions are required for the year.	ALL ALTERNATIVES Units:213 and F038,	LRMP
Wildlife – 18	No helicopter flight paths within 0.5 mile (up to 1 mile) from a peregrine falcon nest location from March 1 to August 31. If a survey determines that a nest site is not active, no seasonal restrictions are required.	ALL ALTERNATIVES Units:214 and L237	LRMP
Wildlife—19	Green Trees without fire damage will not be removed from within roadside hazard tree units unless they are an immediate hazard.	All Alternatives	Resulted from consultation with FWS.

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Alternative Developed as a Result of Tribal Consultation with the Karuk Tribe (Karuk Alternative)[31]

As a result of government-to-government consultation between the Karuk Tribe and the Forest, the Karuk Tribe provided an alternative that is responsive to the Tribe's management vision of restoring fire to its rightful place on the landscape where it will serve to protect river communities and cultural resources. Using the Karuk Tribe Department of Natural Resources Eco-Cultural Resources Management Plan, and concepts of the Western Klamath Restoration Partnership for which the Karuk serve as co-lead, specific treatments are proposed in areas of the Happy Camp Complex and Whites fires. The Karuk Tribe does not agree that salvage harvest as proposed in the existing alternatives of the Westside Fire Recovery Project is in the best interest of communities. The Karuk Tribe's management vision, as outlined in the Eco-Cultural Resource Management Plan, supports some level of salvage harvest based on what is best for resources and not driven by economics but the level of salvage proposed in the Westside Project is contrary to the Karuk Tribe's management vision. Therefore, an alternative without the level of salvage harvest in the alternatives presented in the draft EIS is proposed.

The Karuk Alternative focuses on getting fire back on the landscape and on the cost savings of doing this gained by reduced fire suppression expenditures over time. By creating fuelbreaks around communities and implementing strategic prescribed burns in the Wildland Urban Interface, wildfires burning late in the fire season can be allowed to burn and achieve resource benefits while reducing fire suppression costs. The Karuk Alternative still provides a substantial portion of merchantable timber for area mills (roughly 35 percent of the preferred alternative from the draft EIS), while minimizing the impacts of these harvest activities by concentrating them along key access routes and ridgetop fuelbreaks.

The Karuk Alternative allows for roadside hazard treatments along maintenance level 3, 4 and 5 roads that are well-traveled and serve as important access/egress routes, particularly in an emergency, and those maintenance level 1 and 2 roads that are needed for strategic fuels reduction projects to be used in the reintroduction of fire on the landscape. No site preparation and planting units are proposed. Several fuels units are added to those proposed in other alternatives; some are linear treatments for protection of private property, some are additional ridgetop treatments for reintroduction of landscape-scale fire, and others are larger underburn treatment units to allow for managing wildfire for resource benefits where it poses little threat to communities. This alternative was received in time for inclusion in Appendix G of the draft EIS with a request for public comment but not in time for detailed study before the draft EIS was published. The following is a numerical description of this alternative as provided by initial analysis of the maps that display proposed treatments and data made available by the Karuk Tribe.

Salvage Harvest (about 2,930 acres of salvage harvest within about 3,410 acres of units):

[31] The Karuk Tribe is a federally-recognized Indian Tribe (73 Fed. Reg. 18,535, 18, 544 (April 4, 2008)); the Tribe's aboriginal land is along the middle course of the Klamath and Salmon Rivers in Northern California. The Tribe's mapped Aboriginal Territory, an estimated 1.38 million acres within the Klamath River Basin, includes 85,800 acres of the Happy Camp Complex fire-related area (almost 75 percent) and 9,080 acres of the Whites fire area (27 percent). Some areas on the aboriginal territory map are also considered as part of the ancestral territory of other tribes.

This alternative proposes salvage logging treatments on about 2,930 acres within 3,410 acres of salvage units on Forest lands in the Happy Camp and Whites fire areas. This difference between acres of salvage units and harvested acres is a result of subtracting out the riparian reserve acres within each unit.

Table 2-43: Acres of treatment proposed in the Karuk Alternative by logging systems

Logging System	Happy Camp Complex Treatment Acres (and acres within salvage units)	Whites Fire Treatment Acres (and acres within salvage units)	Grand Total Salvage Treatment Acres (and acres within salvage harvest units)
Ground-based	170 (285)	9 (15)	179 (299)
Skyline	1,095 (1,825)	102 (170)	1,197 (1,995)
Helicopter	727 (1,211)	34 (57)	761 (1,268)
Total Treatment Acres (and acres within units)	2,756 (3,165)	173 (242)	2,930 (3,407)

Roadside Hazard Treatments (along about 221 miles within the Happy Camp fire area and 44 miles within the Whites fire area):

This alternative includes roadside hazard treatments, especially on maintenance level 3, 4 and 5 roads but also on some maintenance level 1 and 2 roads within the Happy Camp complex and Whites fire-identified project areas. Acres evaluated for these treatments are estimated to be a maximum of 11,683 acres (9,728 acres in the Happy Camp complex area and 1,955 acres in the Whites fire area).

Hazardous Fuels Treatments: (about 41,660 acres)

Project-related hazardous fuels treatments will take place on about 23,580 acres in the Happy Camp fire area and 18,080 acres in the Whites fire area for a total of 41,660 acres of treatments in the Karuk Alternative. Underburning (understory prescribed fire) acres in this alternative include about 29,220 acres (13,330 acres in the Happy Camp fire area and 15,890 acres in the Whites fire area). Fuel management zones include about 4,250 acres in the Happy Camp Complex fire area and 920 acres in the Whites fire area for a total of about 5,170 acres. In the Happy Camp Complex area, fuels will be treated on the roadsides on about 4,700 acres and on about 810 acres in the Whites fire area for a total of 5,510 acres. About 1,300 acres in the Happy Camp fire area and 470 acres in the Whites fire area will be treated in the Wildland Urban Interface (WUI) for a total of 1,770 acres of fuel reduction in WUI. In addition to project-related fuel reduction treatments, the Karuk Alternative proposes that future wildfires shall be managed for resource benefits on about 132,830 acres in the Happy Camp complex and 32,880 acres in the Whites fire area for a total of 165,700 acres.

Table 2-44: Karuk Alternative fuel treatment acres by treatment type

Treatment Type	Happy Camp Complex	Whites Fire	Grand Total
Wildland Urban Interface	1,300	470	1,770
Fuels Management Zones	4,250	920	5,160
Roadside Fuels Treatments	4,700	810	5,510
Prescribed Burn (underburn)	13,330	15,890	29,220
Grand Total	23,580	18,080	41,660

Site Preparation, Planting, and Release:

No site preparation, planting or release is proposed for Happy Camp and Whites fire areas in this alternative.

Connected Actions

Road Access

As with other alternatives, project access will require the use of Forest System roads and county roads. There will be no roads proposed to be added to the Forest System as a result of this project in the Karuk Alternative. No new temporary roads are proposed to be constructed, and no miles of temporary roads on existing roadbeds or on reopened decommissioned roads are proposed to be used for project access.

Table 2-45: Miles of road access for the Karuk Alternative

Type of Road Access in Miles	Happy Camp Complex	Whites Fire	Grand Total
Forest System, County, and State	353	63	416
New Temporary	0	0	0
Temporary Roads on Existing Roadbeds or Routes	0	0	0
Temporary Road on Existing Roadbeds	0	0	0
Temporary Roads on Re-opened Decommissioned Roads	0	0	0
Grand Total	353	63	416

Landings

Eighty-seven landings are proposed in the Karuk Alternative, 79 in the Happy Camp Complex and eight in the Whites fire area, to facilitate implementation of treatments. Thirty-two of these are existing landings, 30 in the Happy Camp Complex and two in the Whites fire area; 55 are new landings (49 for Happy Camp Complex area and six for the Whites fire area). Of the existing landings, 12 are to facilitate ground-based yarding (all in the Happy Camp Complex area) and 20 are for helicopters (18 in the Happy Camp Complex area and two for the Whites fire area). Of the new landings, six are for ground-based yarding (five in the Happy Camp Complex area and one in the Whites fire area). Twenty-nine new landings (all in the Happy Camp Complex area) are for helicopters. Twenty new landings are for skyline yarding; 15 of these are in the Happy Camp Complex area and five are in the Whites fire area.

In response to recommendations in the Karuk Alternative, the Forest included a number of treatments into the Happy Camp and Whites fire areas in Alternative 3 Modified as displayed in Table 2-46.

Table 2-46: Karuk Alternative Comparison to Alternative 3 Modified

Happy Camp and Whites Project Areas (acres of treatment)	Karuk Alternative	Alternative 3 Modified	Acres of Karuk Alternative in Alternative 3 Modified	Percent of Karuk Actions in Alternative 3 Modified
Risk Reduction Salvage Harvest Units (gross)	3,410	6,890	2,310	68
Risk Reduction Salvage Proposed[1]	2,930	5,750	1,995	68

Happy Camp and Whites Project Areas (acres of treatment)	Karuk Alternative	Alternative 3 Modified	Acres of Karuk Alternative in Alternative 3 Modified	Percent of Karuk Actions in Alternative 3 Modified
Roadside Hazard Evaluated	11,680	12,130	8,759	75
Estimated Roadside Hazard Treatments [2]	781	974	539	69
Fuels				
Fuels Management Zone (Ridgetop Fuel Breaks)	5,165	3,300	3470	67
Roadside Fuels Treatments	5,509	4,010	3,986	72
Understory Prescribed Fire [3]	29,221	10,730	10,738	37
WUI Fuel Reduction	1,768	2,010	1,682	95
Total Fuels Acres	**41,662**	**21,140**	**19,876**	**48**
Wildland Fire Use [4]	165,704	165,704	165,704	100
Site Preparation And Planting (Plantations and Natural Stands)	0	5,480	0	0

[1] Net acreage reduction is due to excluding riparian reserves and snag retention areas from the gross acreage.

[2] Estimated roadside hazard treatments include areas which burned at moderate and high severity where trees greater than ten inches in diameter occur, outside of salvage units.

[3] Estimated roadside hazard treatments include areas which burned at moderate and high severity where trees greater than ten inches in diameter occur, outside of salvage units.

[4] The Klamath National Forest Land and Resource Management Plan allows for wildland fire use on the entire Forest.

All action alternatives proposed by the Forest in this final EIS also strive to minimize the negative effects of harvest activities while providing merchantable timber. When and where possible, these activities are concentrated along key access routes and ridgetop fuelbreaks, taking into account effects of these actions on other resources.

The Forest supports the use of unplanned wildfire to achieve resource benefits as directed by the Forest Plan and national guidance for implementation of federal wildland fire management policy. None of the actions proposed by the Forest in the Westside Fire Recovery Project will limit the ability of the Forest to use this guidance to use unplanned wildlife to achieve resource benefits.

Alternative 3 Modified (the preferred alternative in the final EIS) emphasizes roadside hazard treatments along well-traveled roads that provide access and egress and those roads that are needed for fuel reduction. In the final EIS, the number of acres on which roadside hazards will be treated has been clarified as noted in Table 2-30 of this chapter. In Alternative 3 Modified, a total of 12,130 acres were evaluated along 270 miles of road in the Happy Camp Complex and Whites fire areas; on about 970 acres, hazard trees greater than10 inches in diameter that burned at moderate or high severity will be removed.

The effects of no site preparation and planting, as recommended in the Karuk Alternative, are analyzed in the effects of Alternative 1 in which no site preparation and planting will occur. As noted in the vegetation section of Chapter 3 of the final EIS, site preparation and planting have been included in action alternatives because they are important activities in accelerating regeneration of the Forest. Planting conifers in strategic locations that are unlikely to provide seed sources and conditions for conifer regeneration

help foster long-term habitat for wildlife species that depend on late-successional forests and to stabilize soils that are likely to landslide without tree roots. Planting, as proposed, is needed to meet the purpose and need of this project. Unlike in the past, planting will not result in row-crop plantations. Hardwood regeneration will be fostered in areas where hardwoods are present. Prescribed burning will not be halted or hindered by the presence of planted conifers. As noted in the vegetation section of Chapter 3 of the final EIS, in the preferred alternative (Alternative 3 modified) about 75 percent of the area that burned at moderate or high severity (about 70 percent of the Happy Camp fire area and almost 90 percent of the Whites fire area that burned at moderate or high severity) will regenerate naturally. About 25 percent of the area that burned at high or moderate severity (about 30 percent of the Happy Camp fire area and about 11 percent of the Whites fire area that burned at moderate or high severity) will be treated to accelerate regeneration.

Opportunities for increased underburning treatments that are recommended by the Karuk Tribe were analyzed. Some of the locations of suggested underburning were already included in projects that are either currently being analyzed or for which decisions were made before the 2014 fires (see Footnote 3 of Table 2-46). Other proposed locations for underburning in the Karuk Alternative burned severely in the 2014 fires and are not likely to be ready for prescribed burning within the eight years anticipated for the implementation of the Westside Fire Recovery Project. These underburns proposed by the Karuk Tribe will be analyzed when they are ready for potential treatment.

Alternatives Considered but Eliminated from Detailed Study

Federal agencies are required to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Public comments received in response to the proposed action provided suggestions for alternative methods for achieving the purpose and need. Some of these alternatives may have been outside the scope of the need for the proposal, duplicative of the alternatives considered in detail, or determined to be components that would cause unnecessary environmental harm. Therefore, a number of alternatives were considered, but eliminated from detailed consideration for reasons summarized below.

Alternative A

This alternative was developed in response to a report that offers “a scientific framework of principles and practices that are provided to guide development of federal policy concerning wildfire and salvage logging and other post-fire treatments” (Beschta 1995) and includes recommendations on post-fire practices. The recommendations and how they are addressed are displayed in Table 2-47.

Table 2-47: Recommendations of the 1995 Beschta report and how each is addressed by alternatives in the Westside Fire Recovery project

Recommendations:		Addressed by:
Prohibiting salvage logging in sensitive areas (as defined by (a) through (f)	a) severely burned areas (soil burn severity)	Alternative 1 will not salvage in severely burned areas. Action alternatives (2 through 5) minimize negative effects of salvage through implementation of watershed project design features. See also response to relevant issue #1. Alternative 4 responds to this issue.

Recommendations:		Addressed by:
	b) erosive soils and any site where accelerated erosion is possible (soils with very high erosion hazard ratings)	Alternative 1 will not salvage on erosive soils or sites where accelerated erosion is possible. Action alternatives (2 through 5) minimize negative effects of salvage through implementation of watershed project design features. See also response to relevant issue #1. Alternative 4 responds to this issue.
	c) fragile soils (those that have physical, chemical, or biological limitations that reduce ability to recover after disturbance: schist, granitic, and serpentine)	Alternative 1 will not salvage on fragile soils. Action alternatives (2 through 5) minimize negative effects of salvage through implementation of watershed project design features. See also response to relevant issue #1. Alternative 4 responds to this issue.
	d) roadless areas	None of the alternatives propose salvage harvest within inventoried roadless areas so all alternatives meet the Beschta recommendations. See also response to relevant issue #3. Alternative 5 responds specifically to this issue.
	e) riparian areas	No salvage harvest is proposed for hydrologic (stream-side) riparian areas (reserves) as delineated in watershed project design features. No salvage is proposed for geologic riparian reserves in Alternative 1. Action alternatives (2 through 5) minimize negative effects of salvage through implementation of watershed project design features. See also response to relevant issues #1 and #3. Alternatives 4 and 5 respond to these issues as does the refined Alternative 2.
	f) steep slopes	Alternative 1 will not salvage on steep slopes. Action alternatives (2 through 5) minimize negative effects of salvage through implementation of watershed project design features that limit the slopes on which salvage will occur. See also response to relevant issue #1. Alternative 4 responds to this issue.
Limitations aimed at maintaining species and natural recovery processes should apply to areas suitable for salvage	Leave at least 50 percent of standing dead trees in each diameter class leave all trees greater than 20 inches diameter at breast height or older than 150 years Generally, leave all live trees	Alternative 1 maintains natural recovery process in 100 percent of the project area. Action alternatives (2 through 5) maintain natural recovery on from 88 percent of the project areas (Alternative 2) and 89 percent (Alternatives 3 and 4) to 96 percent (Alternative 5). Action alternatives generally retain all live trees (with 70 percent or greater chance of living) in salvage units. Removal of snags is governed by project design features; all action alternatives minimize negative effects of salvage on maintaining species through implementation of wildlife project design features. See also response to relevant issue #2. Alternative 3 responds to this issue.
Prohibit new road building in the burned landscape.		Alternative 1 does not propose building any new roads. Action alternatives (2 through 5) do not build any new National Forest Transportation System (permanent) roads. New temporary roads are proposed from 23 miles (Alternative 2) to 4 miles (Alternative 4) Alternative 4 limits new temporary roads. All action alternatives minimize negative effects of new temporary roads through implementation of project design features. See also response to relevant issue #1. Alternative 4 responds to this issue.

Recommendations:	Addressed by:
Limit active reseeding and planting.	None of the alternatives include active reseeding of grasses or use of pesticides, herbicides or fertilizers. Alternative 1 proposes no planting. Action alternatives (2 through 5) propose planting of native tree seedlings where viable seed sources are lacking on from 12 percent of the project areas (Alternative 2) to 4 percent (Alternative 5). All action alternatives minimize negative effects of planting through planting specifics (diversity of species to be planted, spacing, trees per acre, etc.) and by implementation of project design features. See also response to relevant issue #2. Alternative 3 responds specifically to this issue. Alternative 5 addresses this recommendation by limiting planting to matrix lands.
Discourage structural post-fire restoration	None of the alternatives include “hard” structures such as sediment traps, fish habitat alterations or bank stabilization. Alternative 1 proposes only natural post-fire restoration. Action alternatives (2 through 5) include repair of legacy sites such as too small culverts in areas agreed-upon with the State of California Water Board. Project design features for action alternatives include provision of large woody debris. All action alternatives minimize negative effects through implementation of project design features.
Support research efforts needed to address ecological and operational issues	This recommendation is beyond the scope of this project. The effects of both fine and large fuels on the probability of re-burn, and relevant scientific literature concerning this topic, are addressed for all action alternatives in Chapter 3 and the related Fire and Fuels resource report.
Educate the public regarding natural fires and post-burn landscapes	This recommendation is beyond the scope of this project. Chapter 3 compares the effects of allowing natural regeneration of the project area (Alternative 1) to the effects of active regeneration alternatives (2 through 5) and makes this comparison available to the public.

The comment letter on which this alternative is based seeks an alternative that includes all of the above recommendations.

Specifically prohibiting salvage logging in all areas defined by Beschta as sensitive will limit the Forest Service’s ability to meet the purpose and need for action. Other alternatives respond to the exclusion of salvage in one or more sensitive areas. The refined proposed action (Alternative 2) and alternatives to the proposed action respond to recommendations 2 through 8 that are within the scope of the project. All action alternatives include implementation of project design features to minimize negative impacts, making it redundant to analyze this alternative in detail so it was eliminated from detailed study.

Alternative B

This alternative was developed to respond to a request for specific treatments, and limitation on other treatments, and additional or modified project design features to minimize or eliminate negative effects as noted and addressed in Table 2-48.

Table 2-48: Recommendations on specific treatments and how each is addressed by alternatives in the Westside Fire Recovery project

Recommendation:	Addressed by:
No timber harvest from Scenic River viewsheds unless there is an overlap with WUI or within ¼ mile of private property	Alternative 1 proposes no treatment in Scenic River corridors. Alternatives 2 through 5 propose no salvage harvest units within a Scenic River corridor. All action alternatives minimize negative effects of treatments through implementation of project design features. Alternatives 1 through 5 respond to this issue.
Re-plant with a mix of conifer species suitable the area to increase vegetative diversity	Alternative 1 does not propose any planting. Action alternatives (2 through 5) propose replanting with a mix of conifer species suitable to the area to increase vegetative diversity, and encourage the natural regeneration of hardwoods where they exist, as specified in Chapter 2 (see also the response to item #4 under alternative A). All action alternatives minimize negative effects through implementation of project design features. See also response to issue D. Alternatives 2 through 5 respond to this issue.
Analyze the entire project area for prescribed burning opportunities	Alternative 1 proposes no prescribed burning. Action alternatives (2 through 5) analyzed opportunities for prescribed burning on the entire project area and proposed such treatments on up to 11,400 acres. All action alternatives minimize negative effects by implementation of project design features. Alternatives 2 through 5 respond to this issue.
Schedule future prescribed burns in strategic fire-control areas every 3-5 years	Alternative 1 does not include prescribed burns. Scheduling future prescribed burns in strategic fire-control areas every three to five years is beyond the scope of this project. Action alternatives (2 through 5) schedule prescribed burns in strategic fire-control areas five to seven years after implementation of the project begins.
Establish long-term management plans for plants important to the Karuk tribe	Long-term management plans are beyond the scope of this project. Culturally-important plants within the spatial and temporary boundaries of the project area are addressed in Alternative F. Effects of alternatives on these plants are disclosed for all action alternatives in Chapter 3 and through implementation of heritage project design features.
Use contour felling of snags to reduce sedimentation of important anadromous fish streams	Alternative 1 does not propose felling any snags. Action Alternatives 2 through 5 include measures to reduce sedimentation in important anadromous fish streams, including contour felling, through the implementation of watershed project design features. See also response to relevant issue #1. Alternative 4 responds specifically to this issue.
Incorporate large woody debris into stream channels	Alternative 1 will provide large woody debris in stream channels as dead and dying snags fall. Action Alternatives 2 through 5 incorporate large woody debris into stream channels through implementation of watershed project design features. See also response to relevant issue #1. Alternative 4 responds specifically to relevant issue #1.
In areas with highly erosive soils, plant on the bottom 1/3 of the slope	Alternative 1 does not propose planting in any areas. Action Alternatives 2 through 5 minimize negative impacts to highly erosive soils through implementation of watershed project design features. Specific information on planting on erosive soils is provided in Chapter 2.
Design sediment catchment ponds so they do not retain water in the summer months	This recommendation is beyond the scope of this project. No catchment ponds are included as part of this project.
Maintain and/or construct shaded fuel breaks along strategic ridgelines and roads;	Alternative 1 does not propose constructing or maintaining shaded fuel breaks. Action alternatives include constructing or maintaining fuel breaks along strategic ridgelines and roads as described in Chapter 2.
Manage ridge lines for fire-resilient and less flammable botanical communities	Alternative 1 does not propose managing ridge lines for fire-resilient botanical communities. Action alternatives include planting a variety of species in a mosaic to foster less flammable botanical communities on areas proposed for planting as described in Chapter 2. Strategic ridgelines will be managed as open, shaded fuel breaks as described in Chapter 2.

Recommendation:	Addressed by:
Collaborate with adjacent private landowners prior to deciding on recovery activities	Collaboration with adjacent landowners is an important part of this project. The refined proposed action (Alternative 2) and alternatives to the proposed action are based on collaboration with adjacent landowners as described in Chapter 1.
Collaborate on site-specific prescriptions in the WUI	Collaboration on site-specific prescriptions in the WUI is part of this project. The refined proposed action (Alternative 2) and alternatives to the proposed action are based on collaboration with residents in the WUI and the Community Wildfire Protection Plans of communities within the project area as described in Chapter 1.
Promote principles of Adaptive Ecosystem Management and collaborate on studies of different recovery activities	Promoting adaptive ecosystem management and collaborating on studies of different recovery activities are beyond the scope of this project but can be considered as part of future projects or programs on the Forest. The draft EIS includes different recovery actions in different alternatives; the effects of these actions are disclosed in Chapter 3.

The comment letter on which this alternative is based seeks an alternative that includes all or most of the above recommendations. Many of these recommendations are consistent with the refined proposed action (Alternative 2) and with other action alternatives.

Since recommendations that can be addressed (are not beyond the scope of this project) are either consistent with the refined proposed action or an action alternative, developing an alternative to meet all of these recommendations would be redundant. For these reasons, this alternative is eliminated from detailed study.

Alternative C

This comprehensive alternative was developed to respond to recommendations for specific treatments to reduce environmental impacts, especially in specific locations, that are listed and addressed in Table 2-49.

Table 2-49: Recommendations on specific treatments and locations, and how each is addressed by alternatives in the Westside Fire Recovery project

Recommendation:	Addressed by:
Only fell roadside hazard trees that are 100 percent dead and less than 45 inches DBH	Confirming that trees are 100 percent dead is only possible if the trees have fallen to the ground; waiting for this to happen will not meet the safety-related purpose and need for the project. Safety is the major reason on which the 60 percent certainty of mortality for roadside hazard trees is chosen, as disclosed in Chapter 2. Few of any of the roadside hazard trees are greater than 45 inches DBH; if trees of this diameter are safety hazards, they will not be left standing in any action alternative. Alternative 1 will not cut and fell any trees.
No green-tree removal in recovery prescriptions	None of the alternatives in this project propose green-tree removal. Green trees are defined as those with a 70 percent or better chance of surviving as discussed earlier in Chapter 2. Some of the trees to be removed in all action alternatives include some green needles or leaves; however, the trees have a 70 percent or greater chance of dying and becoming part of the fuel accumulation on the ground in the short term.
Increase funding for fuels reduction and prescribed fire within the CWPP and WUI areas	This recommendation is beyond the scope of this project.

Recommendation:	Addressed by:
Post fire management in the Grider Creek Watershed should protect and promote critical wildlife and fisheries habitat	All alternatives protect and promote critical wildlife and fisheries habitat by implementation of wildlife and watershed project design features. See also relevant issues #1, #2 and #3, Alternatives 3 and 4 respond specifically to these issues.
Severely burned plantations should be reviewed for best management and suitability for future planting	Severely burned plantations were reviewed for best management and suitability for planting in all action alternatives as described earlier in Chapter 2.
Jobs associated with these efforts should be prioritized to regional contractors and laborers when feasible	This recommendation is beyond the scope of this project, and contrary to law, policy and regulation.
Use strategic fuels reduction and prescribed fire in order to return to fire-adapted and ecologically resilient landscapes	Alternative 1 does not propose any fuels reduction. Action Alternatives 2 through 5 all propose strategic fuel breaks and prescribed fire as well as other fuel reduction practices as described earlier in Chapter 2. Implementation of project design features will minimize potential negative effects.

The comment letter on which this alternative is based seeks an alternative that includes all of the above recommendations. Many of these recommendations are consistent with the refined proposed action (Alternative 2) and with other action alternatives.

Reasons are provided above as to why following the first recommendation is not practicable. Since recommendations that can be addressed (are not beyond the scope of this project) are either consistent with the refined proposed action or an action alternative, developing an alternative to meet all of these recommendations would be redundant. For these reasons, this alternative is eliminated from detailed study.

Alternative D

This alternative was developed in response to comment letters which request specific project design features be implemented to minimize negative impacts. Recommended project design features and the way they are addressed are displayed in Table 2-50.

Table 2-50: Recommendations on additional project design features and how each is addressed by alternatives in the Westside Fire Recovery project

Recommendations:	Addressed by:
No new roads, permanent or temporary	None of the alternatives in the project propose new permanent (system) roads. Alternative 1 proposes no new temporary roads. Action alternatives implement project design features to minimize potential negative impacts of new temporary roads. Action alternatives differ in the number and location of new temporary roads. In response to relevant issue #1, Alternative 4 limits the number and location of temporary roads to further reduce impacts.
No tree planting units, allow for natural reseeding	Alternative 1 does not propose any tree planting. Action Alternatives 2 through 5 allow for natural reseeding where seed sources are available, and propose tree planting in other areas, as described earllier in Chapter 2. The effects all alternatives are summarized in Chapter 2, and disclosed and compared in Chapter 3 of this document. Implementation of project design features minimizes negative impacts of planting. See relevant issue #3 for further suggestions on limiting planting; Alternative 5 responds specifically to this issue.
No helicopter units	Alternative 1 does not propose any helicopter units. Action Alternatives 2 through 5 include different numbers of helicopter units as discussed earlier in Chapter 2. The effects of various numbers of helicopter units are disclosed in Chapter 3.

Recommendations:	Addressed by:
No logging in stands that sustained less than 70 percent mortality	The reasons for using the 50 percent mortality of a stand before it will be considered for harvest, and the analysis on which this percentage is selected, are provided earlier in Chapter 2. Changing the percentage of mortality used to determine if logging can take place will have little effect on determining which units can be logged. Relevant issue #2 expresses disagreement about the effects of the proposed action on wildlife habitat and connectivity. Alternative 3 addresses this issue specifically; in doing so, the mortality of stands is included in reasons for proposing elimination of stands from salvage logging as described earlier in Chapter 2.
No salvage logging at elevations above 6,000 feet	Alternative 1 proposes no salvage logging. Action alternatives use different criteria for determining which units are proposed for salvage logging, but the specific criteria of elevation is not included. Implementation of other criteria restricts the amount of salvage proposed above 6,000 feet. Implementation of project design features minimizes negative impacts of salvage logging at all elevations.
No salvage units on slopes exceeding 60 percent	Alternative 1 does not propose any salvage units. Action Alternatives 2 through 5 minimize negative effects of salvage through implementation of watershed project design features which include those that limit equipment use of slopes over 35 to 45 percent.
Burn all activity generated slash	Treating activity slash for action alternatives (2 through 5) is discussed earlier in Chapter 2. Treatments proposed for activity slash include burning and other treatments as noted in project design features.
Retain biological legacies such as large live trees, large snags, coarse woody debris and intact thickets of unburned vegetation in falling and yarding operations	Alternative 1 will retain all biological legacies. Action Alternatives 2 through 5 will retain large live trees and intact thickets of unburned vegetation. Snags and coarse woody debris will be retained to meet Forest Plan standards in all action alternatives through implementing project design features. Relevant issue #2 is based on public comments on retention of these legacies. Alternative 3 responds specifically to this issue.
Retain adequate large downed wood for slope stability and regeneration	Alternative 1 retains all downed wood. Action Alternatives 2 through 5 retain downed wood as specified earlier in Chapter 2 and through implementing project design features. See also relevant issue #2 and Alternative 3.
Leave a minimum of 70 percent of coarse woody debris parallel to topographical lines to abate water run-off and erosion	Alternative 1 retains all coarse woody debris. Action Alternatives 2 through 5 retain coarse woody debris as specified earlier in Chapter 2 and through implementing project design features. See also relevant issue #1 and Alternative 4.
Leave up to 25 snags per acre, especially those with broken or forked tops, complex branching patterns, cat faces or fire damage that provide cavity nesting habitat. Consider the retention of snags in aggregates	Alternative 1 retains all snags. Action Alternatives 2 through 5 retain snags in clumps as required by the Forest Plan and specified earlier in Chapter 2 and through implementing project design features. See also relevant issue #2 and Alternative 3 for additional retention of snags.
Retain the largest live trees and snags in all salvage units	All alternatives retain all live trees in salvage units as discussed earlier in Chapter 2 and in response to item 2 in Alternative C (Table 2-49). Alternative 1 retains all trees and snags. Action Alternatives 2 through 5 retain snags as required by the Forest Plan and specified earlier in Chapter 2; snags are retained through implementing project design features. See also relevant issue #2 and Alternative 3 for additional retention of large snags.

Recommendations:	Addressed by:
Retain all trees with green foliage	All alternatives retain all live trees (those with more than a 60 percent of surviving (for roadside hazard) and 70 percent chance of surviving (for salvage) as discussed earlier in Chapter 2. Alternative 1 retains all trees with green foliage. Action Alternatives 2 through 5 retain trees as specified earlier in Chapter 2 and through implementing project design features. See also relevant issue #2 and Alternative 3 for additional retention of trees with green foliage.

The comment letters on which this alternative is based seek an alternative that includes all of the above recommendations. Some of these recommendations are consistent with the refined proposed action and alternatives. For those recommendations, this alternative is redundant because other alternatives address the recommendations. Some of the recommendations do not help achieve the purpose of the project; therefore, this alternative is not considered in detail as a whole because it will not meet all of the purpose and need for the project.

Alternative E

This alternative was developed in response to comments that request the exclusion of specific areas or habitats from mechanical treatment. Recommended exclusions are listed and addressed in Table 2-51.

Table 2-51: Recommendations for the exclusion of specific areas and how each is addressed by alternatives in the Westside Fire Recovery project

Recommendations:	Addressed by:
No salvage logging or planting in inventoried roadless areas (IRAs), including the Grider, Tom Martin, Russian, Snoozer, Kelsey, or Johnson Roadless Areas	None of the alternatives propose salvage logging in inventoried roadless areas. Alternatives 1 and 5 do not include planting in IRAs. Alternatives 2 through 4 include about 490 acres of site preparation and planting in IRAs; both will be accomplished by hand and no ground-disturbing mechanical equipment will be used. An IRA project design feature minimizes negative impacts of planting on roadless characteristics.
No salvage logging on sensitive soils, active landslides, earthflows and other erosive soil types	Alternative 1 does not propose salvage logging in any area. Action Alternatives 2 through 5 implement watershed project design features to minimize or eliminate negative impacts from salvage logging. Relevant issue #1 is based on comments concerning effects of salvage logging on watershed health; Alternative 4 responds specifically to this issue.
No salvage units on decomposed granite	Alternative 1 does not propose salvage logging in any area. Action Alternatives 2 through 5 implement watershed project design features to minimize or eliminate negative impacts from salvage logging. Relevant issue #1 is based on comments concerning effects of salvage logging on watershed health (including soils); Alternative 4 responds specifically to this issue.
No salvage units in Riparian Reserves	None of the alternatives propose salvage units in hydrologic riparian reserves (reserves defined by proximity to water). Alternative 1 does not proposed any salvage. Action Alternatives 2 through 5 propose various acreages of salvage on geologic riparian reserves (reserves defined by active landslides, inner gorges and toe zones of dormant landslides). These action alternatives implement watershed project design features to minimize or eliminate negative impacts from salvage logging on geologic riparian reserves. Relevant issue #1 is based on comments concerning effects of salvage logging on watershed health (including riparian reserves); Alternative 4 responds specifically to this issue.

Recommendations:	Addressed by:
No salvage in Special Habitat designations including: goshawk territories; northern spotted owl activity centers Bald Eagle and Peregrine falcon management areas; and critical habitats	Alternative 1 does not propose salvage logging in any area. Action Alternatives 2 through 5 implement wildlife project design features to minimize or eliminate negative impacts from salvage logging. Relevant issue #2 is based on comments concerning effects of salvage logging on wildlife; Alternative 3 responds specifically to this issue.
No salvage in designated or recommended Wild and Scenic River corridors	Alternative 1 does not propose salvage logging in any area. None of the alternatives propose salvage logging in designated or recommended Wild River corridors or Scenic River corridors. Action Alternatives 2 through 5 implement project design features to minimize or eliminate negative impacts from salvage logging in Recreational River corridors.
No Salvage in endemic conifer stands composed of foxtail pine, Baker's cypress, or Brewer spruce	Alternative 1 does not propose salvage logging in any area. Action Alternatives 2 through 5 include prescriptions for the choice of salvage units as discussed earlier in Chapter 2.

The comment letters on which this alternative is based seek an alternative that includes all of the above recommendations. Although these recommendations are for "no salvage" in many areas, the revised proposed action (Alternative 2) and alternatives include more project design features to minimize negative effects of salvage than the proposed action as scoped included. Proposing "no salvage" will not meet the purpose and need of the project. The recommendation for no salvage in inventoried roadless areas and in hydrologic riparian reserves is met by other alternatives (and thus is redundant). Therefore, this alternative will be eliminated from detailed study.

Alternative F

This alternative was developed in response to recommendations to meet historic and pre-European settlement conditions in the project area and respond to tribal concerns. Recommendations and the way they are addressed are displayed in Table 2-52.

Table 2-52: Recommendations to meet tribal concerns and how each is addressed by alternatives in the Westside Fire Recovery project

Recommended:	Addressed by:
Consider all vegetation cover in stocking estimates including: grass, shrubs, other herbaceous plants, and hardwood tree species	Alternative 1 does not propose any actions that will affect stocking estimates. Action alternatives (2 through 5) propose replanting with a mix of conifer species suitable to the area to increase vegetative diversity, and encourage the natural regeneration of hardwoods where they exist, as specified earlier in Chapter 2 (see also the response to item #4 under alternative A). Stocking estimates will include hardwood tree species where they exist. Alternatives 2 through 5 respond to this issue.
Plant conifers only where there is a historical basis for establishing a forested landscape	Alternative 1 does not propose any planting. Action alternatives (2 through 5) propose replanting with a mix of conifer species suitable to the area to increase vegetative diversity; the species mix is based on historic conditions and suitability as specified earlier in Chapter 2 (see also the response to item #4 in alternative A). Alternatives 2 through 5 respond to this issue.

Recommended:	Addressed by:
Encourage natural regeneration and succession whenever possible	Alternative 1 maintains natural recovery regeneration and succession in all areas. Action alternatives (2 through 5) maintain natural regeneration and succession on from 88 percent of the project areas (Alternative 2) to 96 percent (Alternative 5). All action alternatives mimic natural regeneration by planting species suitable to specific areas as described earlier in Chapter 2 and by encouraging the growth of species such as hardwoods where they exist. Planting prescriptions are based on historic unit conditions, projected unit composition, and the likelihood of long-term survivability of project units within a fire ecosystem. Overall, species considered for planting in the project area include Douglas-fir, sugar pine, ponderosa pine, incense cedar, white fir, and red fir. A mosaic distribution will be achieved over time due to the spatial variability achieved by micro-site selection for planting. Conifers will not be planted next to green hardwoods; these hardwoods will be included in average spacing. Seedlings will be widely spaced on poorer sites including southerly aspects and/or rocky soils. Trees will be planted in clusters to achieve groups of conifers throughout the landscape to mimic natural units. Seedling survival rates and competition from brush species will create a natural mosaic of species and stocking densities. In order to effectively reforest these units, an average of 130 to 300 trees per acre will be planted to achieve acceptable levels of stocking, depending on site conditions. Initial planting spacing recommendations considered Forest Plan land management objectives for projected stocking needs, and the likelihood of achieving those objectives, for each unit evaluated for reforestation. Planting conifers in historically forested areas does promote faster reforestation (see the Vegetation section of this document for information on the scientific evidence that supports this conclusion). Areas were considered for site preparation, planting and release if they met the conditions listed earlier in Chapter 2 for site preparation and planting.
Count natural hardwood regeneration in stocking requirement goals	Action alternatives (2 through 5) include hardwoods in stocking requirement goals where they exist as specified earlier in Chapter 2 (see also the response to recommendation #1 above). Alternatives 2 through 5 respond to this issue.
Review 1944 aerial photos and Wieslander maps to ascertain historic vegetation to shape desired condition	The available 1944 aerial photographs and Wieslander maps for portions of the project were used to help ascertain historic vegetation as described earlier in Chapter 2.
Minimize the connectivity of fuels throughout the development of the planted stand	Alternative 1 does not include any actions to minimize the connectivity of fuels. Action Alternatives 2 through 5 propose activities for reduction of fuels connectivity as described earlier in Chapter 2.
Facilitate the application and restoration of cultural burning practices and establish areas available for managing fires for resource benefits	Alternative 1 does not include any actions to facilitate the restoration of cultural burning practices or establish areas available for managing fires for resource benefits. Action Alternatives 2 through 5 propose activities, such as fuel break construction and maintenance, that will help to make areas available for managing fires for resource benefits and prescribed burning to emphasize the restoration of culturally important plants as described earlier in Chapter 2.
Protection of infrastructures to a 500 foot radius	Alternative 1 does not include any actions to protect infrastructure. Action Alternatives 2 through 5 propose activities to protect infrastructure as described earlier in Chapter 2. As described, a 200- to 250-foot radius around infrastructure is proposed for fuel reduction treatments in all action alternatives.
Roadside hazard tree treatment with a 150-300 foot buffer	Alternative 1 does not include any roadside hazard treatment. Action Alternatives 2 through 5 propose roadside hazard treatment of trees that fit the “hazard tree” definition as described earlier in Chapter 2. A 200-foot buffer on either side of the road is used to estimate acreage being treated but the actual distance from the road will vary based on regional hazard tree guidelines (Angwin et al. 2012).

Recommended:	Addressed by:
Protection of private property	Alternative 1 does not include any treatments to protect private property. Action Alternatives 2 through 5 propose fuel reduction actions within 1/4 mile of private property as described earlier in Chapter 2. Alternative 5 includes more fuels reduction units than other action alternatives to protect private property.
Support and foster early seral conditions	Most of the project area will not be salvaged; none of the action alternatives include more than 11,700 acres of salvage units and only 6,800 acres of these will be salvage logged because salvage units include areas that will continue to be in early seral conditions (such as Riparian Reserves, clumps of snags that will be left for wildlife habitat, and areas of trees that have a 70 percent chance or better of surviving). Overall, more than 85 percent of the project area will be allowed to regenerate naturally; much of this will remain in early seral conditions.
No ground-disturbing activities should be planned in inner gorges, previously active landslides and older landslide deposits.	There are about 3,900 acres of salvage units proposed on steep, weathered granitic lands (geologic Riparian Reserves) in the proposed action as scoped; in refined Alternative 2, salvage is proposed on geologic Riparian Reserves on about 2,000 of the 3,900 acres of salvage units and other action alternative propose the same amount or less. No salvage will occur on inner gorges, active landslides or toe zones of dormant landslides through implementing project design features displayed in Chapter 2 of this DEIS. About 960 acres of site preparation and planting, up to 4,400 acres of roadside hazard tree removal, and 3,900 acres of fuel hazard treatments are proposed on unstable lands considered to be geologic Riparian Reserves. The landslide risk does not increase in any action alternative from the current situation.
Concern about the amount of roadside hazard, especially around management level 1 and 2 roads, and impacts to fisheries.	Alternative 4 is designed to reduce watershed disturbance and impacts of water quality and fisheries relatively to the proposed action as scoped. Alternative 4 will reduce or eliminate temporary road actions, especially within key watersheds as identified by the Forest Plan. The most sensitive 7th field watersheds to further ground disturbance are identified, based on existing watershed condition and the distribution of federally-listed (as threatened or endangered) and Forest Service sensitive species of fish. Within these most sensitive watersheds, restrictions or mitigations to minimize negative impacts are proposed as project design features. Due to the implementation of project design features and relevant Best Management Practices, negative effects to special status aquatic species, including fisheries, will be minimized. More information on the specifics of this alternative are displayed earlier in Chapter 2.
Emphasize fuels treatments over salvage.	There is a need for the project to include receipts from treatments to be economically viable and help pay for fuels treatments. Strategic fuels treatments are proposed in all action alternatives, and salvage logging helps treat fuels on the acres on which it is implemented. Treatments specifically to treat hazardous fuels are proposed on almost twice as many acres as are in salvage logging units and almost four times as many acres as will be salvage logged in any action alternative.
Find ways to not exclude future prescribed burning in the plantations.	Prescribed burning will be included where possible in plantations, preferably when trees are a size to survive prescribed fire.
The project should include a research component.	The project is based on the results of research but meeting the purpose and need of the project does not include research.

Recommended:	Addressed by:
Enhance hydrologic function.	Legacy sediment site treatments are included in action alternatives that will ensure that temporary access will be hydrologically restored; Alternative 4 proposes additional treatment modifications to address this concern. All temporary roads will be closed and hydrologically stabilized according the project design features in Table 2-42. Both new and existing landings will be hydrologically stabilized after use. All landings will be located according the project design features. The portion of Elk Creek within the project area contains almost 150 legacy sites. Most of the legacy sites are located on or adjacent to the Forest transportation system roads. The other legacy sites are located on existing landings or roadbeds (historic roads, abandoned temporary roads, or decommissioned roads). Temporary road and landing construction, and to a lesser degree salvage harvest and associated mechanical yarding resulting from the proposed action as scoped, have potential to further increase runoff in the project area. However, modelled results of the effects of action alternatives do not show any additional disturbance beyond 2014 fire effects for broad-scale 5th field watersheds and add only minor incremental increases to risk at small scales (7th field watersheds). Any project action alternative that includes ground-disturbing activities in the above-listed watersheds will ensure that project design features and watershed restorative actions are adequate to mitigate potential erosion and sedimentation and resulting impacts to water quality and beneficial uses. Additionally the restorative activities of legacy sediment site repairs, planting and fuels reductions will help to balance the activities that may have a negative impact to water.
No new roads, including temporary roads	No new system roads are proposed in any alternative. Action alternatives propose different mileage of temporary roads to meet the objectives of each alternative.
Retain/plant drought-resistant trees suitable for climate change	Trees are selected for planting that are likely to survive if climate change predictions are fulfilled.
Retain all green trees at harvest	Green trees are retained in the action alternatives; green trees will not be removed unless their removal is needed for safe implementation of the project (for instance, placement of cable lines for skyline harvest).
Prescribed burning plans with existing control lines and features	The primary locations of fuels management zones are strategic ridge systems used to contain the 2014 fires as well as being historic fire lines from previous large fires within the project area. The treatments aim to maintain existing control lines by removing all dead vegetation and live understory vegetation along with live conifer trees less than 12 inches in diameter at breast height.
No planting within low or moderate burned severity	Planting within salvage units will only be in areas that burned with moderate to high severity and vegetation mortality (greater than 50 percent of the trees are fire-killed on a unit level, based on Rapid Assessment of Vegetation Condition after Wildfire (RAVG) information). Site preparation, planting and release of areas outside salvage units will be focused in areas of high and moderate vegetation morality where overhead hazards can be mitigated without allowing mechanized equipment into Riparian Reserves.
Set aside areas that are un-salvaged	Many areas are set aside and not salvaged. More than 85 percent of the project area is not within any salvage or roadside hazard removal unit, and more than 90 percent will not be salvaged. Roadside hazard removal will take place along 640 miles of road in most action alternatives (610 miles in Alternative 4) but only a small fraction of the roadside acreage will have hazard trees removed. Only the trees that meet hazard tree guidelines will be cut and felled.
Do not salvage where rare habitat has been burned.	Rare habitats are identified in the Forest Plan as either Research Natural Areas of Special Interest Areas. No salvage will occur in these areas in any alternative.
Leave sufficient coarse woody debris (CWD) and snags	Project design features provide for sufficient coarse woody debris and snags.

Recommended:	Addressed by:
Avoid treatment in Riparian Reserves; promote large wood recruitment	No salvage logging will take place in hydrologic Riparian Reserves. Where hazard trees are felled in hydrologic Riparian Reserves for safety, they will be left for large woody debris recruitment. Watershed project design features that address this concern.
Delay salving to allow post-burn ecological values to persist	Ecological values of natural recovery of forests will occur on more than 85 percent of the project area. Delaying salvage treatments will reduce the economic value of the project, producing less revenue for fuels treatments, and will not meet at least one part of the purpose and need for the project.
Salvage only areas with 90 percent or greater mortality	Areas considered for salvage treatment have 50 percent of more mortality within stands. Trees that will be cut have at least a 70 percent likelihood of dying. Most of the acres in which salvage logging will take place have 80 percent to 90 percent mortality.
Don't salvage where fires were ignited from the bottom or suppression	Mapping has been completed for areas where fires were ignited by suppression forces. These maps will be compared with salvage treatment units.
In Riparian Reserves, fall trees on the contour to reduce erosion	Contour felling is addressed in watershed project design features.
Retain all tress 30 inches in diameter at breast height – living or dead	Project design features address the retention of trees greater than 40 inches in diameter at breast height for legacy components.

The comments on which this alternative is based seek an alternative that includes all of the above recommendations. Comments were considered in developing alternatives considered in detail and, as discussed above, in many areas the revised proposed action (Alternative 2) and alternatives include project design features to address these recommendations. The recommendations that are within the scope of the project are met by other alternatives, making an alternative specifically to address these recommendations redundant. Therefore, this alternative will be eliminated from detailed study. However, consultation to address tribal concerns will continue. Also see the previous section in chapter 2,

Alternative G

This alternative was developed in response to public requests to minimize or eliminate negative effects to watershed conditions from new or reopened roads and landings. Recommendations are listed and addressed in Table 2-53.

Table 2-53: Recommendations for no new infrastructure and how each is addressed by alternatives in the Westside Fire Recovery project

Recommendations:	Addressed by:
No construction of new roads, permanent or temporary	None of the alternatives in the project propose new permanent (system) roads. Alternative 1 proposes no new temporary roads. Action alternatives implement project design features to minimize potential negative impacts of new temporary roads on watershed conditions. Action alternatives differ in the number and location of new temporary roads. In response to relevant issue #1, Alternative 4 limits the number and location of temporary roads to further reduce impacts.

Recommendations:	Addressed by:
No opening of NEPA decommissioned roads	Alternative 1 proposes no opening of NEPA decommissioned roads. Action alternatives implement watershed project design features to minimize potential negative impacts on watershed conditions of using decommissioned roads as temporary roads. Action alternatives differ in the number and location of decommissioned roads being proposed as temporary roads. In response to relevant issue #1, Alternative 4 limits the number and location of temporary roads on decommissioned roads in sensitive watersheds to further reduce impacts.
No opening of self-decommissioned M1 and M2 level roads	Alternative 1 proposes no opening of "self-decommissioned" roads (roads where trees have grown into the roadway). Action alternatives implement watershed project design features to minimize potential negative impacts of opening "self-decommissioned" roads on watershed conditions. Action alternatives differ in the number and location of self-decommissioned roads proposed for opening and use. In response to relevant issue #1, Alternative 4 limits the number and location of self-decommissioned roads that are proposed for use to further reduce impacts.
No construction of new landings	Alternative 1 proposes no new landings. Action alternatives implement watershed project design features conditions to minimize potential negative impacts of new landings on watershed. Action alternatives differ in the number and location of new landings proposed. In response to relevant issue #1, Alternative 4 limits the number and location of new landings to further reduce impacts.
Use of existing landings only if no earthwork is required	Alternative 1 proposes no use of existing landings. Action alternatives implement watershed project design features conditions to minimize potential negative impacts of using existing landings on watershed. Action alternatives differ in the number and location of existing landings proposed for use.

An alternative that addresses all of these recommendations will not meet all of the project's purpose and need. Refinements to the proposed action (Alternative 2) and the development of Alternative 4 to minimize negative effects of new infrastructure to watersheds address the intent of this alternative while meeting the purpose and need of the project. Therefore, this alternative is eliminated from detailed study.

Alternative H

This alternative was developed in response to a number of comments recommending increased treatments within the project area to address the high number of fire-killed trees present on the landscape. Recommendations are listed and addressed in Table 2-54.

Table 2-54: Recommendations for increased salvage opportunities and how each is addressed by alternatives in the Westside Fire Recovery project

Recommendations:	Addressed By:
Salvage logging of all fire-killed trees in the project area	All fire-killed trees were considered for salvage logging before the proposed action as scoped was developed. Based on economic and logistic feasibility, and the need to meet Forest Plan standards, a smaller number of units were proposed for treatment in the proposed action as scoped. Based on scoping comments, the interdisciplinary team looked at all opportunities to expand the number of acres that can be salvage logged. In order to meet all laws, regulations, and policy, as well as meeting standards in the Forest Plan, salvage on most of these opportunity areas is not feasible.
Fuels treatments of all salvage-created slash	For action alternatives (2 through 5), treating activity slash, including slash created by salvage, is discussed earlier in Chapter 2. Treatments proposed for salvage-created slash include those described in project design features.

Recommendations:	Addressed By:
Extension of operating periods	Most operating periods are limited by the need to be consistent with laws, regulation, policy, and Forest Plan standards as displayed in project design features. In circumstances noted in the project design features, these limits can be modified.
No restrictions on size limit for roadside hazard trees	Criteria for roadside hazard trees are discussed earlier in Chapter 2. Size limitations are based on fuels to be removed.
Planting in all salvage areas	Alternative 1 will not propose any planting. Action Alternatives 2 through 5 include planting in all salvage areas.

Although this alternative will meet parts of the purpose and need of the project, following some of the recommendations will not meet current law, regulation, policy and the related Forest Plan standards. The proposed action has been refined as Alternative 2 to meet this direction. Therefore, developing an alternative around all of these recommendations would be redundant and this alternative is eliminated from detailed study.

Alternative I

This alternative was developed in response to a concern that the cumulative effects from private and Forest Service salvage treatments will affect habitat connectivity if salvage logging occurs in the Beaver Fire area. This recommendation is listed and addressed in Table 2-55.

Table 2-55: Recommendations to remove the Beaver Fire from the project and how this is addressed by alternatives in the Westside Fire Recovery project

Recommendations:	Addressed By:
Remove the Beaver Fire area from the project because cumulative effects from private and Forest Service salvage will affect habitat connectivity	Chapter 3 discloses the cumulative effects of salvage proposed in action alternatives added to the effects of salvage on private lands within the spatial and temporal bounds of the analysis area for each resource including habitat connectivity. See specifically the Terrestrial Wildlife section of Chapter 3.

An alternative that addresses this recommendation will not meet all of the project's purpose and need. Refinements to the proposed action (Alternative 2), including implementation of wildlife project design features to minimize negative impacts, and the development of Alternative 3 to further address habitat connectivity in the Beaver Fire area. Alternative 3 addresses the intent of alternative I while meeting the purpose and need of the project. Therefore, considering alternative I in detail is redundant and the alternative is eliminated from detailed study.

Alternative J

This alternative was developed in response to concerns about the effects of salvage harvest on many resources and the overall efficacy of this treatment. This alternative is also reflective of many of the public concerns regarding fire safety and the need for reduction of fuels. All salvage harvest units throughout the project area would be eliminated and all hazardous fuels and roadside hazard treatments would be included as described in the refined proposed action. This recommendation is listed and addressed in Table 2-56.

Table 2-56: Recommendations for a no-salvage, safety-focused alternative and how this is addressed by alternatives in the Westside Fire Recovery project

Recommendations:	Addressed By:
No Salvage—Fire Safety-focused alternative (eliminate salvage but include all hazardous fuels and roadside hazard treatments	Alternative 1 proposes no salvage within the project area. The effects of this alternative on achieving the purpose and need for the project are disclosed in Chapter 3. The effects of implementing hazardous fuels and roadside hazard treatments are displayed primarily on one of the three elements of the purpose and need (safety). Action Alternatives 2 through 5 include different levels of salvage and the effects of these treatments on safety are disclosed in Chapter 3.

This alternative will meet one part of the purpose and need for this project (to reduce safety hazards to adjacent landowners, the public and forest workers) by including hazardous fuels and roadside hazard treatments. However, it does not meet another part of the purpose and need of the project which is to obtain the maximum economic commodity and value from burned timber. It also will not meet the need to increase the likelihood and speed by which burned forested areas are restored. Refinements to the proposed action (Alternative 2), including refined project design features, and the development of Alternative 5 to limit salvage harvest to matrix lands while retaining fuels and roadside hazard treatments, address part of the intent of Alternative J while meeting the purpose and need of the project. Therefore, Alternative J is redundant and eliminated from detailed study.

Chapter 3 Affected Environment and Environmental Consequences

This chapter summarizes the biological, physical, and socioeconomic environments that may be affected by the Project and the potential changes to those environments due to implementation of the alternatives. It also presents the scientific and analytical basis for comparison of alternatives presented in Chapter 2.

This chapter is organized by resource area. Following each resource description is a summary of the potential effects (environmental consequences) to the resource associated with the implementation of each alternative. The direct, indirect, and cumulative effects of the alternatives are disclosed. Effects are quantified where possible and qualitative discussions are included where quantification is not possible. Consequences relative to significance determinations are also disclosed.

This EIS incorporates the Klamath National Forest Land and Resources Management Plan (1995, as amended) (Forest Plan) by reference and tiers to the Forest Plan EIS. The discussions of resources and potential effects use existing information included in the Forest Plan and other sources as indicated. Where applicable, such information is briefly summarized and referenced to minimize duplication. The planning record includes all Project-specific information such as resource reports, ecosystem analyses, and other results of field investigations. The supporting resource specialist reports are available on the Project website http://www.fs.fed.us/nepa/nepa_project_exp.php?project=45579.

Analyzing Environmental Consequences

Environmental consequences are the effects on the biological, physical, economic, and social environment of implementing an alternative. The Council on Environmental Quality regulations implementing the National Environmental Policy Act (NEPA) includes a number of specific categories to use for the analysis of environmental consequences. Several of these regulations form the basis of much of the analysis that follows. They are explained briefly below.

Direct, Indirect, and Cumulative Effects

Direct environmental effects are those occurring at the same time and place as the initial cause or action. Indirect effects are those that occur later in time or are spatially removed from the activity, but will occur in the foreseeable future. The Project is expected to be fully implemented within eight years after a decision. Cumulative effects result when the incremental effects of actions are added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such actions. Cumulative effects can result from individually minor, but collectively significant, actions taking place over a period of time. Past activities contributed to the existing condition and are considered in the affected environment for the Project. Present and reasonably foreseeable future actions are assessed along with the effects of the proposed action to determine whether significant cumulative effects may occur. This analysis is consistent with the Council on Environmental Quality's memo from James L. Connaughton titled “Guidance on the Consideration of Past Actions in Cumulative Effects Analysis” dated June 24, 2005, incorporated by reference.

In order to understand the contribution of past actions to the cumulative effects of the proposed action and alternatives, this analysis relies on current environmental conditions as a proxy for the impacts of past actions. This is because existing conditions reflect the aggregate impact of all prior human actions and natural events that have affected the environment and might contribute to cumulative effects.

This cumulative effects analysis does not attempt to quantify the effects of past human actions by adding up all prior actions on an action-by-action basis. There are several reasons for not taking this approach. First, a catalog and analysis of all past actions would be impractical to compile and unduly costly to obtain. Current conditions have been impacted by innumerable actions over the last century (and beyond), and trying to isolate the individual actions that continue to have residual impacts would be nearly impossible. Second, providing the details of past actions on an individual basis would not be useful to predict the cumulative effects of the proposed action or alternatives. In fact, focusing on individual actions would be less accurate than looking at existing conditions, because there is limited information on the environmental impacts of individual past actions, and one cannot reasonably identify each and every action over the last century that has contributed to current conditions.

Thirdly, the important residual effects of past natural events may contribute to cumulative effects just as much as human actions. By looking at current conditions, we are sure to capture all the residual effects of past human actions and natural events, regardless of which particular action or event contributed those effects. Public scoping for this Project did not identify any public interest or need for detailed information on individual past actions. Finally, the Council on Environmental Quality interpretive memorandum cited above states, “agencies can conduct an adequate cumulative effects analysis by focusing on the current aggregate effects of past actions without delving into the historical details of individual past actions.” The cumulative effects analysis in this EIS is also consistent with Forest Service Regulations for implementing NEPA (36 CFR 220.4(f)).

The Forest Schedule of Proposed Actions was reviewed to identify which current and reasonably foreseeable future actions on the Forest may be considered for cumulative effects analysis. Appendix C provides a list of these actions. A search of proposed timber harvest plans for future actions on private land with potential cumulative effects are noted in Appendix C.

Analysis areas vary by resource, so some ongoing or future actions are included in the cumulative effects analysis of some resources and not of others. Cumulative effects may include estimated effects from present logging (timber harvest, fuels treatments, road and landing construction and maintenance) and wildfire activities (e.g. suppression activities and the affected burn areas). Other actions may include but are not limited to fuels reduction and/or forest health projects in the vicinity.

Responsible Opposing Views and Agency’s Responses

In the following section, we disclose and discuss the substance of the dissenting views of responsible scientists from whom we received comments specific to the Westside Fire Recovery Project on the DEIS (40 CFR 1502.9(b); 1503.4(a)). Although many of the opposing viewpoints raised in comments are discussed in the effects analysis in this EIS and Response to Comments in the Appendix, here we discuss several important opinions concerning elements of the Westside Fire Recovery Project provided by Dr. Jerry

Franklin, a respected forest ecologist, educator and scientist, Monica Bonds who has published research on post fire foraging habitat and use of severely burned areas by California spotted owls, and Dr. Chad Hanson, an ecologist who has published papers on use of burned habitats by birds and mammals in the Sierra Nevada Mountains. We also consider recently received comments from the National Marine Fisheries Service on landslide risk.

While the No Action Alternative is fully considered in the Draft, and would be responsive to many of these comments, we address comments here in the context of the action alternatives that include salvage and reforestation in Late Successional Reserves (LSRs).[32] These opposing views, (with the exception of comments by National Marine Fisheries Service) are based on the contention that post-fire recovery is a natural process and is adequate to restore forest ecosystems after a high severity fire event. For Late Successional reserves, comments are built on the premise that the network of reserves was established to accommodate large intense natural disturbances and the natural recovery process that were expected to follow those disturbances (FEMAT 1993).

We agree that fire recovery would occur over time because fire, and the subsequent ecosystem response are natural processes. That is not at issue. As noted in the following discussion, the extent and severity of the 2014 Westside Fires is not characteristic of the Klamath Province in California (Skinner et al. 2006). In our response to the 2014 Westside Fire, we consider many other factors in addition to natural recovery. All of our actions are based on management direction found in the Forest Plan of the Klamath National Forest.

The following responsible opposing points of view received on the draft EIS were raised:

1. Whether the high severity fires experienced on the Klamath in 2014 are typical for the fire regime of the Project area.

Comments assert stand replacement or mixed severity fire regimes dominate the Project Area. The comments state that large pulses of coarse woody debris and snags created by these fires are characteristic for this environment and are essential for ecosystem functions and that most of the salvage proposed in the LSRs is on Plant Association Groups where large volumes of snags and logs following wildfire are characteristic.

Agency Response: We agree with the importance of an appropriate level of snags and coarse woody debris in the post fire landscape; however we disagree that the amounts of snags and coarse woody debris resulting from the Westside Fires are “characteristic” of the historical fire regime of the Klamath Province. We also disagree that all of that material must be retained for ecosystem function. Retention of all of the fire killed trees would result in fuel loads that are in excess of that which is characteristic of the Klamath Province and would create a substantial risk of future high severity fire (final EIS Chapter 3 – Fuels) which would frustrate the purposes for which the Late Successional Reserves were established.

[32] Numbers in this section for effects in LSRs are from Alternative 3 Modified, which was the basis for Section 7 consultation with the U. S. Fish and Wildlife Service, National Marine Fisheries Service and review of activities in LSRs by the Regional Ecosystem Office of the Forest Service. See Appendix E.

Most of the area of the Northwest Forest Plan lies in the Oregon and Washington Cascades and Coast Ranges. This comment equates the Mediterranean climate dry forests of the Klamath Province in northern California with the mesic forests of western Oregon and Washington. There is often a presumption that the conditions described for those forests apply to forests of the Klamath Province as well. Key old-growth structural attributes of the Coast Range and Oregon and Washington Cascades include large live old trees, a large number of snags-of various ages, a multilayered canopy, and moderate to high accumulations of logs or coarse woody debris on the forest floor (Franklin, 1981).

The fire regime of old-growth Douglas fir dominated forests of the Klamath Mountains differs from the more mesic old-growth Douglas fir forests of Oregon and Washington (described in Franklin et al. (1981) in fire frequency, fire severity, and structural attributes such as amount and persistence of coarse woody debris (Taylor and Skinner 1997). The Klamath Province also differs from the "dry forests" east of the Cascades. The Recovery Plan for the Northern Spotted Owl (USDI 2011) noted these differences observing: *"Some areas, such as dry portions of the Klamath Province, have a different fire ecology than areas in the East Cascades and may not be subject to the same generalizations (Odion et al. 2004, 2010, Skinner et al.2006, Hanson et al. 2009, 2010); this should be evaluated at a finer scale by recovery implementation teams and interested land managers."* (III-21).

The characteristic fire regime of the Klamath Mountains is actually one of frequent low to moderate intensity fire with low to moderate severity effects (Skinner et al. 2006), not "stand-replacement or mixed", as stated in the comments received. In a study from a late successional reserve just north of the Happy Camp Complex, Taylor and Skinner (1998) reported fires prior to EuroAmerican settlement burned on average every 14.5 years. Fire return intervals were shorter on south and west facing aspects than on north and east facing aspects, but the average was 16.5 years or less on all aspects. Wills and Stuart (1994) reported pre-settlement fire to occur every 10 to 17 years in the Hotelling Ridge area (14 miles southwest of the Whites Fire), and wrote that fire return intervals in the southern portion of the range of Douglas fir are considerably shorter than those found in southern or west-central Oregon. In the southern-most portion of the Klamath Mountains, fire return intervals (fires scarring two or more trees over the study area) as short as four to seven years have been reported (Fry and Stephens, 2006). With frequent fire, surface fuels are maintained at low levels – too low for intensity sufficient to produce much stand-replacement fire, except under unusual circumstances.

Even though fire suppression has since altered the fire regime and produced an unnatural accumulation of surface fuels in many areas, fire in the Klamath Mountains still generally burns with predominantly low to moderate severity effects today. Odion et al. reported that only 12 percent of their study area within the 1987 fires burned at high severity, with 59 percent of the area burning at low severity and 29 percent burning at moderate severity. Using somewhat different fire severity categories for remotely sensed satellite data for all fires from 1987 to 2008 and constraining the data to only forested areas, Miller et al. (2012) reported an average of 15.8 percent high severity, with the remainder burning at low to moderate severity. The reason for predominantly low to moderate severity effects can be explained by the topographic complexity of this landscape. With mountains and deep river canyons, smoke from large fire events tends to become trapped under inversions when atmospheric conditions are stable, leading to conditions that cause

fires to burn at low intensity despite the steep slopes and added fuels of the fire suppression period (Skinner et al. 2006, Miller et al. 2012).

The current elevated fuel conditions do sometimes lead to fires of higher intensity and severity. Such fires most frequently occur on upper slopes above where such inversions set up, but also occur at lower elevations when inversions break and the atmosphere destabilizes, or can be caused by a wind event (Skinner et al. 2006). As stated in Skinner et al. (2006), *"the extent of recent high-severity burns appears to be different than historic burning patterns. More area is burning at higher intensity, and this is related, in part, to higher quantities and more homogeneous fuels caused by accumulation during the fire-suppression period."* The percentage of historical high severity is not known, but the lower fuel loading and continuity in times of frequent fire likely led to an amount of high severity fire considerably less than the contemporary percentage of 15.8 percent reported by Miller et al. 2012. For comparison, the high severity percentage of the 2014 Westside fires was 25-35 percent, which is well outside of the predominant natural fire regime. This amount of high severity fire was likely a function of fuel accumulation from fire suppression exacerbated by extreme fire weather and drought rather than an expression of the natural fire regime.

In a fire regime dominated by low to moderate severity effects, tree mortality with wildfire is by definition generally low. In the Klamath Mountains, patches of moderate to high severity fire, when they did occur historically, were more likely on upper slope positions and on south and west-facing aspects (Skinner et al. 2006). Patches of high severity would produce a pulse of snags and then eventually down logs, until those logs were consumed by subsequent fires. Because frequent low-moderate severity fires consume wood, it is unlikely that coarse woody debris accumulated to levels seen in more mesic old-growth Douglas fir forests of Oregon and Washington (Taylor and Skinner 1997). In the Klamath Mountains snags and logs were likely clustered in time and space, with long intervals and large areas where dead wood was sparse (Skinner 2002).

The large areas of nearly continuous fire-killed trees in the Westside Fire Recovery Project are not characteristic of the Klamath Province. The Project area also is not a “stand-replacement or mixed fire regime” where large fuel loads would have been typically experienced in past post-fire environments.

2. Whether there is “excess material” that can be removed.

Comments assert that all of the fire-killed trees must be retained for current ecological processes, and that this is also necessary to maintain essential structure provided by snags and down wood until the next stand is capable of producing large wood. None of this wood legacy can be demonstrated as being in excess to ecological needs.

Agency Response: We agree that retention of large structures is beneficial for NSOs and many other species, and that any material over time would serve an ecological function for the simple reason that there is no “excess” in nature. We also agree that we should strive to maintain large structures that would persist until the next stand is capable of producing large material. That is a requirement of the Klamath National Forest Land and Resource Management Plan (Forest Plan, 4-87; MA 5-30). Retention however, of all of the dead wood now present on the landscape from the 2014 Westside Fires would create an undesirable risk of future high severity fire that is not consistent with the historical fire

regime of the Klamath Province (see previous discussion), the goals of the Forest Plan or development of desired late successional stand conditions in the current LSR land allocation (EIS Chapter 3 – Fuels; Appendix E). We do not agree that all fire killed trees, or all large fire killed trees must be retained because this would create conditions that conflict with the forest wide goals (which includes LSRs) of the Forest Plan for fire management (4-8) which state: "*Reduce unacceptable fuel buildups and potential acreage of future high intensity wildfires.*" As noted previously, and in EIS Chapter 3 fuels, retention of all of dead trees now on the landscape would create fuel conditions that would likely cause more uncharacteristic high severity fire in the future that would actually consume snags and down logs, place additional late successional forest at risk from large stand replacement fire and delay reestablishment of late successional stand conditions (EIS Chapter 3 – Fuels and Appendix E). This conflicts with the management goals for Late Successional Reserves (4-83) which state; "*The objective of LSRs is to protect and enhance conditions of late successional and old-growth forest ecosystems*."

Over the next 10-30 years, most of the fire killed trees from the 2014 fires will break off or fall and become ground fuels. In a recent study in Black's Experimental Forest on the Lassen National Forest, eight years after the Cone Fire, most of the ponderosa pine snags had fallen. Only 16 percent of pine snags between 30 and 45 cm and 41 percent greater than 45 cm were still at least partially intact (Ritchie et al, 2012). In their snag fall model, Harrod et al. choose 45 years as the time when all snags have fallen, which they term as "generous". The literature summarized by Harrod et al. 1998 shows most snags don't last more than 20-25 years. Occasionally, very large snags in sheltered locations may persist until the next stand is producing large material, but this is likely rare in the frequent fire environment of the Klamath.

To determine how much dead wood should be retained on the landscape, we use the Guidelines provided by the Forest Plan for snags (4-30, Table 4-4) and coarse woody debris (4-23). The LSR Assessment (1-5, Table 1-1) also provided metrics for snags and coarse woody debris that closely match the metrics in the Forest Plan. See Appendix E.

These metrics were developed from studies of late successional and old-growth forests. Since the Forest Plan was developed in 1995, new research has shown that even the amounts of snags and coarse wood debris noted in the Forest Plan may be excessive for the Klamath Province when compared to historical norms. Skinner et al. (2006) observed that: *"Quantities of large woody material for standards and guidelines were developed from contemporary old-growth forests that had experienced many decades of fire suppression. These quantities of woody material were probably unusually high compared to typical pre- fire suppression values. Consequently, a management emphasis on meeting or exceeding standards and guidelines for dead woody material has and will increase fire hazard over time and threatens the very habitat the standards and guidelines were designed to improve."*

This suggests that even the levels of snag and coarse woody debris retention described in the Forest Plan, which are far lower than the post-fire conditions of current landscape, could increase the risk of future stand replacement fire above historical levels. Nevertheless, we are retaining these levels as required by the forest plan, and have designed their retention to reflect current science about the area's fire regime as reflected in the Skinner article quoted above.

Every stand cannot and should not attempt to meet some target for snags and down wood Stephens (2004). Homogenous or "average" conditions on every acre would not occur naturally in the frequent fire environment of the Klamath. Average snag counts on a per-acre basis provide one measure of snag density, but as noted by Zack et al. (2002), a "snags per acre" prescription is inadequate, as tree size, rate of snag generation, and mode of tree death have been disrupted this past century. Heterogeneity (i.e. concentrations of dead wood) in some areas with other areas where dead wood was sparse as described by Skinner (2002) would be an indicator of a healthy ecosystem (Knapp 2015). We address this by varying retention of snags and down wood by position on the landscape with relatively fewer snags and pieces of woody debris on fire-prone south and west facing aspects and upper slopes, and relatively more on north and east facing slopes and lower slope positions that typically experience lower fire severity. Unit design reflects this pattern. Within units we retain snags in hydrologic Riparian Reserves and designated snag retention areas that are primarily on lower slopes. Many hundreds of acres of snags, particularly in Walker Creek and Grider Creek were deleted from units on lower slope positions on north and east facing slopes during the evolution of the project to provide for the needs of snag-dependent species.

Generally, the largest trees occur within hydrologic Riparian Reserves, which are retained. By varying retention according to slope and aspect, we expect to more closely approximate the landscape patterns of snags and down wood described by Taylor and Skinner (1998), Skinner (2002) and Taylor and Skinner (2003) where snags and down wood are concentrated in time and space, with intervening large areas and periods of time where snags and down wood are sparse.

As previously noted, retaining all of the fire-killed trees is likely to create fuel loading that would actually increase the probability of future high severity fire that would consume snags and down wood (Skinner et al. 2006; EIS Chapter 3 – fuels; Appendix E Figure 7). Because of fire frequency in the Klamath Province it is unlikely that any but the most isolated pockets of dead wood on lower slopes could persist for 80-100 years until the next stand is capable of producing large wood (Taylor and Skinner 1998; Skinner 2002) without effective reduction of the amount and continuity of surface fuels. Even with fuel reduction from salvage and activity fuel treatment, it is possible that much of the dead wood retained to meet Project Standards and Guidelines may be consumed by future fire (EIS Chapter 3 – Fuels; Skinner et al. 2006).

Within salvage units the Westside Fire Recovery Project seeks to meet the objective of retaining large material until the next stand is capable of producing such material by:

- Retaining large "legacy" green trees wherever they occur. By virtue of their location and / or inherent resistance to fire, large green trees are more likely to persist until the next stand can develop large structures than snags. We are also marking dead legacy trees for retention however it is not likely that many of these dead trees will persist for 80-100 years (Harrod et al. 1998) because of fire history, however we acknowledge the contribution these trees make while they are on the landscape.
- Retaining snags in Riparian areas. This has the effect of retaining the larger trees, on average on the landscape, in locations that historically burned with less intensity. Large snags are more likely to persist than small snags.
- Designating additional snag retention areas in Alternative 3 Modified in association with Riparian Reserves (Appendix A, maps) or in pockets of larger trees. Emphasis for additional

snag retention areas was placed on lower slopes that historically have burned with lower intensity.

- Reducing fuels around Riparian Reserves and snag retention areas by salvage harvest and follow-up activity fuel treatment. By reducing surface fuels and fuel continuity, the risk of future high severity fire affecting remaining snags and down wood is reduced (Appendix E, Figure 7).
- Treating small fuels in Riparian Reserves and snag retention areas by allowing fire to back into these areas at the time that activity fuels are burned. This reduces the small surface fuels that readily ignite and carry fire but is unlikely to harm larger snags because they would not yet have developed the partially decomposed surface that is receptive to embers.

Peterson et al. (2015) observed that: *"post-fire logging can serve as an effective tool for managing fuel loadings in forests regenerating after high severity wildfires. By strategically applying and varying post-fire logging treatments within landscapes, post-fire logging could reduce woody fuels and help reduce threats to human health, property, and ecosystem services from unacceptable future wildfire behavior and effects. If applied using best management practices and with consideration for possible environmental impacts and meeting other management objectives, post-fire logging could serve as an effective option – along with mechanical thinning, prescribed fire, and managed low to mixed severity wildfires – for reducing fuels and restoring low and mixed severity fire regimes in dry coniferous forests of western North America and other fire-prone forest types."* The Klamath Province in northern California is, as noted previously, historically a low severity fire regime.

Thompson et al. (2007), in an important study of reburns in the Biscuit fire in southwest Oregon concluded that: *"reducing connectivity of surface fuels at landscape scales is likely the only way to decrease the size and severity of reburns until vertical diversification and fire resistance is achieved."* That is precisely the objective of the salvage units in the Westside Fire Recovery Project, and the reason that leaving all of the dead wood now present on the landscape would not meet the Project objectives.

Leaving all of the dead wood created by the 2014 Westside fires would:

- Result in amounts of dead wood in excess of what is typically found in the Klamath Province (see response to responsible opposing viewpoint no. 1 above),
- Create unacceptable fuel loads in the future that would likely contribute to high severity fire, and
- Result in amounts of dead wood in excess of amounts required in the Forest Plan.

The Westside Fire Recovery Project has a higher probability of retaining large structures until the next stand is capable of producing them than no action because salvage of fire-killed trees reduces continuity of surface fuels and the severity of future fires that would likely kill surviving green trees and consume snags and down wood present on the landscape (EIS Chapter 3 Fuels, Vegetation, Appendix E).

3. Whether salvage of fire-killed trees is permitted within an LSR.

Comments received on the draft EIS assert that the Forest Ecosystem Management Assessment Team (FEMAT) Report, on which the Northwest Forest Plan was based, severely limits salvage in LSRs. Comments assert that only smaller material in limited amounts may be removed for ecological objectives and that economic considerations should not be a factor in projects within the LSR. Dissenting comments assert that

salvage proposed within LSRs as part of the Westside Fire Recovery Project is inconsistent with the goals and principles of LSR management specifically noting that salvage, and removal of large trees should be limited.

Agency Response: We agree that the Westside Fire Recovery project, and specifically, proposed salvage, must be consistent with the goals and principles of LSR management. Those goals and principles are provided in the Forest Plan for the Klamath National Forest, not the report of the FEMAT. The FEMAT report was used as a foundation for the Northwest Forest Plan, which was later adopted and made part of the Klamath's Forest Plan. In this comment selected phrases from the FEMAT report are cited with the suggestion that those citations show the proposed Westside Recovery Project is inconsistent with the goals and principles of LSR management. The commenter however did not include other FEMAT citations that are specific to risk reduction and salvage and also did not note that the Forest Plan of the Klamath National Forest, not FEMAT, is the source of management direction for projects on the Klamath National Forest. We do not agree with the statement that the Westside Recovery Project is inconsistent with the goals and principles of LSR management described in the Forest Plan of the Klamath National Forest.

FEMAT was based on information available in 1993. Since FEMAT was written, several scientific papers on fire and fuels have been published that describe a fire environment and late successional stand structures in the Klamath Province in California that are substantially different than those found in the more mesic forests of the western Oregon Cascades and Coast Ranges. (See previous comments on characteristic fire regimes). Thus FEMAT while still relevant may not represent the current best available science on fire and fuels in the Klamath Province.

While the FEMAT report does not provide management direction and does not include recent research specific to the Klamath Province, it is useful for this discussion to clarify the intent of the FEMAT report and its subsequent incorporation into the Northwest Forest Plan. FEMAT considered salvage with 3 different prescriptions, ranging from no salvage, to salvage with minimum guidelines. Prescription 2, (FEMAT II-18) limited salvage in LSRs stated "*Valuable trees that are dead can be used for commercial purposes with the attendant employment and economic benefits. ...Increased fire danger or risk to insect and disease resulting from large accumulations of dead trees can be reduced in an economically feasible fashion. Avoided are the perceptions of economic waste if patches of dead trees are not salvaged.*"

Guidelines for salvage in LSRs were developed in the FEMAT Report to implement Prescription 2 (FEMAT III-36). These Guidelines were carried forward to the Northwest Forest Plan Record of Decision (ROD) Standards and Guidelines (C-14) and subsequently to the Forest Plan of the Klamath National Forest (4-87). It is clear that the FEMAT report anticipated that salvage would need to be considered and that those Guidelines were incorporated into the Forest Plan of the Klamath National Forest. The Secretaries of Interior and Agriculture, the decision makers who approved the Northwest Forest Plan noted their logic for salvage in LSRs in the Response to Comments in the ROD for the Northwest Forest Plan (ROD, Page 66): *"Salvage is not required to be beneficial, but is designed to permit recovery of a timber volume in those instances where catastrophic events clearly kill more trees (resulting in more snags and down logs in the short and long term) than are needed to maintain late successional conditions."*

The question of considering economics comes up in many comments. In a legal challenge of salvage in LSRs, the 9th Circuit Court of Appeals determined that, *"the Forest Service may consider economic interests in choosing how it will conduct LSR salvage operations; that it may do so is not only a matter of common sense, but it is also something explicitly contemplated by the Northwest Forest Plan (C-13-14; [M]anagement planning for Late-Successional Reserves must acknowledge the considerable value of retaining dead and dying trees in the forest as well as the benefits from salvage activities."). However, the Northwest Forest Plan does not permit a salvage project in an LSR for the purpose of recovering the economic value of timber without at least explaining—in the administrative record—how such action is compatible with the NFP's direction to protect and enhance late-successional ecosystems."*[33] The direction to "*protect and enhance late successional ecosystems*" is found in the Klamath Forest Plan on page 4-83.

The National Forest Management Act requires that projects or activities be consistent with the management direction of the national forest where the project or activity occurs. While the FEMAT report is important, it is the Forest Plan of the Klamath National Forest that provides management direction for the Westside Recovery Project, not the FEMAT report or the Northwest Forest Plan. The Forest Plan of the Klamath National Forest clearly anticipated that risk reduction salvage may be necessary and provided project Guidelines for both risk reduction in LSRs (Forest Plan 4-86; MA5-27 to 29) and for salvage (Forest Plan 4-87, MA 30-1 to MA 30-11) to ensure that the objectives of the Forest Plan were achieved. The Forest Plan of the Klamath National Forest also required completion of an LSR Assessment to guide LSR management. The LSR Assessment included the guidelines for salvage found in the Forest Plan of the Klamath National Forest.

The Regional Ecosystem Office, a coordinating body for implementation of the Northwest Forest Plan reviewed the Klamath National Forest LSR Assessment in 1999 and found that it provided sufficient framework and context for future projects and activities within the LSRs, including salvage (See Regional Ecosystem Office Correspondence, Klamath National Forest LSR Assessment). Management actions consistent with the recommendations of the LSR Assessment and the Forest Plan of the Klamath National Forest, including timber salvage, were exempted from further Regional Ecosystem Office Review. In response to comments on the DEIS concerning salvage in the LSR, the Forest conducted an extensive review of actions proposed in the LSR that is documented in Appendix E. That review found the Project as proposed was consistent with the LSR Assessment and the Forest Plan. At the request of the Klamath National Forest, the Regional Ecosystem Office reviewed the proposed salvage in the Westside Fire Recovery Project. The Regional Ecosystem Office concurred with the Forest assessment documented in Appendix E that the Project was consistent with the Forest Plan and LSR Assessment (Appendix E).

The comment notes that salvage in LSRs and in particular removal of large trees should be limited. A complete discussion of impacts in LSRs is found in Appendix E. While the Westside Fire Recovery Project appears to be large, in fact, it affects a small proportion of the LSR that experienced stand replacement fire in 2014.

[33] ONRC v. Brong (No. 05-35063; D.C. No.CV-04-00693-AA)

Of the 28,700 acres of LSR that burned at moderate to high intensity (all diameter classes, more than 50 percent of the trees killed) about 3,900 acres or less than 15 percent is proposed for salvage in LSRs (Appendix E, Figure 10). An additional 800 acres of concentrated roadside hazard removal or about 3percent of moderate or severely burned areas within the LSR is proposed (Appendix E, Table 3). Combined an estimated 4,700 acres or about 17 percent of moderate or severely burned areas would be removed between salvage harvest and concentrated roadside hazard removal. That means more than 80 percent of the stands with moderate or severe fire damage are retained. Concentrated roadside hazard and salvage harvest combined would remove about 6 percent of the 81,200 acres of LSR in all burn severities affected by the Westside Fires.

Comments also state that removal of large trees should be limited. When the Eddy Gulch and Seiad LSRs are stratified by stand size using the California Wildlife Habitat Relationship data, there are 29,600 acres of stands with a quadratic mean diameter (QMD) greater than 24 inches in all burn severities in the Eddy Gulch and Seiad LSRs (Appendix E). Of these stands, 8,650 acres of are moderately to severely burned. Using California Wildlife Habitat Relationship data (Appendix E, figure 12) shows that within the Eddy Gulch and Seiad LSRs:

- Of the 29,600 acres of stands with a quadratic mean diameter (QMD) greater than 24 inches, in all burn severities, 1,750 acres (6 percent of the size class) would be removed by the Westside Fire Recovery project in salvage harvest units. An estimated additional 240 acres of stands greater than 24 inches QMD would be removed in roadside hazard cleanup (Appendix E, Table 3) in moderate – high severity burn areas.
- With salvage units and roadside hazard combined, approximately 2,000 acres of stands with a QMD greater than 24 inches would be removed within the Eddy Gulch and Seiad LSRs from moderate – high severity burn areas.
- Of stands with a QMD greater than 24 inches, this represents about 23 percent of the 8,650 acres of moderate - high severity burn acres and about 7 percent of the medium / large tree diameter class (29,600 acres) in all burn severities in the LSRs.
- Of the stands where the QMD is greater than 24 inches that are in moderate to high severity burn patches, an estimated 77 percent would be retained. Overall, in all burn severities, over 90 percent of the stands with a QMD greater than 24 inches in the Seiad and Eddy Gulch LSRs would be retained.

From this, we conclude that salvage in the LSRs and removal of large trees is indeed limited, when considered in the context of the scale of the Westside Fires

Based on these evaluations and reviews, we believe the Westside Fire Recovery project is consistent with the goals and principles for LSR management laid out in the Forest Plan of the Klamath National Forest. We also conclude, as provided by the Forest Plan, that economic factors may be considered, but those considerations must be balanced with the need to protect and enhance late successional forests. The Westside Fire Recovery Project protects and enhances late successional forests by reducing the probability of future stand-replacement fire and accelerating the development of late successional stand conditions (See EIS Chapter 3, Vegetation; Fuels, Appendix E.).

4. Whether or not reforestation is appropriate within burn areas in Late Successional Reserves.

Comments received on the draft EIS assert that a long natural regeneration period would benefit many species including NSOs and that uniform tree planting over large areas is

inappropriate in LSRs even at low densities. Comments also assert that reforestation is not necessary and may be counterproductive to recovery objectives. A major reason for doing this was the FEMAT planners' belief that natural recovery processes could and should be accommodated following major disturbances to LSRs. Hence, guidelines for salvage included statements such as: "Management objectives [following natural disturbances in Late Successional Reserves] should focus on either simulating natural succession or allowing it to occur unimpeded."

Agency Response: We agree that a long regeneration period can benefit certain species including spotted owls and that uniform tree planting over large areas is counterproductive to recovery objectives of the LSR in the high fire frequency environment of the Klamath National Forest. We do not agree, however, that tree planting *as proposed in the Westside Fire Recovery Project* is counterproductive to recovery objectives.

Approximately 28,700 acres of the LSR land allocation burned with moderate or high severity where most of the trees (all diameter classes) were killed (Appendix E, Figure 10. Because of ongoing secondary mortality many of these areas now exhibit essentially 100 percent mortality. Within LSRs, reforestation is proposed in approximately 3, 480 acres of severely burned plantations and 3,900 acres of proposed risk-reduction salvage units in Alternative 3 Modified (Appendix E, Table 3). Combined, this represents 7,380 acres or about 30 percent of the LSR land allocation that was moderately or severely burned. That means about 21,300 acres or about70 percent of the moderate or severely burned areas within the LSR would not be site prepped or planted and would go unimpeded through the long early seral plant community described by the commenter. This includes all forested high mortality burn patches that are less than 20 acres in size except a few areas adjacent to private property or fuel breaks and all areas that are less than 50 percent mortality. This maintains the complex fire mosaic pattern created by the Westside Fires and heterogeneity that benefits NSOs described by Franklin (2002). Areas that would not be planted also include multiple large patches ranging in size from a few hundred acres to well in excess of 1,000 acres of fire-killed older trees in the Grider Creek Inventoried Roadless Area. Thus all patch sizes from very small to very large are represented in areas where no salvage harvest or site preparation and planting occurs. This contributes to the heterogeneity described by Franklin et al. (2000).

Across the total Westside Fire area considering all land allocations, approximately 10,800 acres of existing plantations, natural stands and proposed salvage units would be site-prepped and planted (final EIS Chapter 2, Table 2-30). This represents about 21 percent of the estimated 52,000 acres of moderate to high severity fire; over 40,000 acres or nearly 80 percent of moderate and high severity fire in all land allocation would not be planted and would experience the long early seral plant succession cycle described by the commenter.

In the future, as snags fall and become surface fuels in areas that are not site prepped and planted, it is probable that many of these areas will reburn multiple times because of high surface fuel loads and fuel continuity Chapter 3-Fuels; Appendix E, Figure 7). As a result, large areas that are not site prepped and planted may remain in an early seral plant community dominated by brushfields for multiple decades (EIS Chapter 3 – Vegetation). The probability of reestablishing late successional coniferous forests on these landscapes

will remain low until surface fuels created by the 2014 fires have been reduced in amount and continuity by subsequent reburns (EIS Chapter 3 – Fuels).

Because Late-Successional Reserves have been established to provide high quality habitat for species associated with late-successional forest conditions, management following a stand-replacing event should be designed to accelerate or not impede the development of those conditions (Northwest Forest Plan C-14; LSR Assessment 1-24). Site preparation and planting is intended to increase the likelihood and speed by which burned forested areas are restored to coniferous forest and late successional habitat. The Forest Plan and LSR Assessment both identify coniferous forests with large trees as the desired condition for the LSR (Forest Plan 4-83; LSR Assessment Chapter 3). Forest Vegetation Simulation modeling shows that reforestation will establish forested conditions more rapidly by treating surface fuels and planting trees than by natural succession (EIS Chapter 3, Vegetation, Appendix E, Figure FVS-1). If surface fuels are treated and the continuity of fuels reduced the size and severity of future fires may be reduced (Thompson et al. 2007). Weatherspoon and Skinner (1995) concluded reduction surface fuels reduced damage to plantations and increased tree survival. This increases the probability that planted trees would persist into the future.

Comments note that "*planting should not be done following traditional approaches, which are directed to establishing uniformly stocked forest stands over large areas. Extensive, uniform plantings - even at the relatively low density proposed for some areas (200 trees per acre) – will not simulate the spatially heterogeneous pattern of natural seedling establishment.*"

We agree that extensive, uniform planting would not create the diversity and heterogeneity that we seek to reestablish on the landscape; trees will not be planted uniformly as the comment suggests. The reforestation stocking objective five years after planting in the Westside Fire Recovery Project is a stand of 75 to 225 variably spaced young trees with treated, discontinuous activity fuels, not densely stocked regularly spaced plantations that form continuous fuel beds. Stand density would vary with slope position and aspect with lower stocking on upper slopes and south and west aspects and higher stocking on north and east aspects that would form a closed canopy on lower slopes. Hardwoods would be included in the target stocking levels so the number of conifers would be less where hardwoods occur. We also anticipate there would losses from future fires that would further reduce stand density. Our long term objective is 30-50 large, variably spaced, fire resilient trees per acre with openings as and stand density that vary with slope position and aspect as described by Taylor and Skinner (1998). In response to comments received, text has been added to silvicultural prescriptions for the Project to make this stand objective clear. Criteria for selecting areas to plant are in the final EIS (Chapter 2 – Vegetation).

As noted earlier, about 70 percent of the moderately and severely burned areas would not be planted. Reforestation is expected to provide a measure of vegetative diversity that would not otherwise be present on the landscape. These planted stands have a much higher probability of achieving the desired late successional stand condition for the LSR than unplanted areas. Comments note the Franklin et al. (2000) report "*that in northwestern California, the highest habitat fitness for NSO is found in landscapes that are a mixture of mature and old forest with open vegetation types, such as brush fields and young forest, and not in landscapes dominated by old forests. The fact that an early*

successional species - the dusky-footed woodrat - is the primary prey for NSO in this region may be part of the reason that owls prefer a mixed landscape. In any case, the fact that habitat fitness for the owl is favored by a heterogeneous landscape mosaic should be factored into decisions regarding establishment of conifer plantations, both within and outside of LSRs." That approximates the landscape we expect to develop by reforestation of approximately 30 percent of the moderate and high severity burn areas within LSRs in the 2014 Westside Fires. Overall, in all land allocations, reforestation is proposed on about 20 percent of the moderately and severely burned areas creating the mixed landscape over time described in the comment.

For these reasons, we do not believe that reforestation of selected areas is counterproductive to achieving the desired condition described in the Forest Plan for LSRs.

5. Whether all habitat that was suitable before the fires occurred is still used by spotted owls for nesting, roosting and foraging regardless of fire severity.

Comments assert that spotted owls would use severely burned areas for all habitat needs; and therefore, all severely burned areas should be retained and that the analysis of post-fire habitat use was incomplete.

Agency Response: The agency recognizes the importance of suitable spotted owl habitat to support spotted owl recovery, but also recognizes the research is not conclusive in determining the extent and value severely burned habitat may provide spotted owls.

Spotted owl habitat is generally described as older, dense forests that provide opportunities for nesting, roosting, and foraging. Nesting/roosting habitat is generally described as a multilayered, multi-species canopy with large overstory trees with various deformities (large cavities, broken tops, mistletoe infections, and other decadence); large snags; large woody debris resulting from fallen trees; and sufficient open space below the canopy for spotted owl flight. Foraging habitat generally has attributes similar to those of nesting/roosting habitat but contains less canopy cover, forest structure complexity, and large trees (Franklin 2000). However, recent research has found that spotted owls are using previously suitable habitat that burned at low to moderate fire severity, as well as areas with mixed-severity that includes some proportion of high-severity fire (e.g. Bond et al. 2002, Clark 2007, Bond et al. 2009), but spotted owl use of these areas is likely complex.

Current research offers differing perspectives in regards to the use of severely burned coniferous forests by spotted owls (Elliot 1985, Gaines 1997, Bond et al. 2002, Bond et al. 2009, Clark 2007, Clark et al. 2012, Comfort 2013, Eyes 2014, Lee and Bond 2015). Some studies have shown owls to exhibit site fidelity, mate fidelity, and reproductive success after fires have burned a portion of their territories at varying severity levels, including high severity (Bond et al. 2002, Lee et al. 2012). Others studies have shown owls to move completely away from previously occupied areas after high severity burns (Elliot 1985, Gaines 1997) particularly when burns occurred within core areas of resident birds. Bond (2010) reported 30 percent of California spotted owls' nonbreeding-season roost locations were within the fire's perimeter. In another study, radio-telemetry locations demonstrated that the owls selected low-severity burned forests for roosting during the breeding season, and selected low, medium, and high-severity burned forests

for foraging within 1.5 km of the nest or roost site (Bond et al. 2009). Irwin et al. (2012) found that NSO in the Klamath region would often forage within more open stands that contained brush or a low basal area of conifer trees, and that the presence of a few scattered trees or snags likely facilitated hunting for prey such as woodrats, citing a particular telemetered pair that made extensive use of a burned area with manzanita shrubs and scattered live trees. This would indicate that, at least under certain circumstances, NSO will venture into more open habitats, such as areas burned at high and moderate severity, when enough structure is present to offer perching or a certain degree of cover, though the exact level of cover is unknown.

While severely burned coniferous forest is not considered suitable nesting or roosting habitat for NSO (USDI 2011), Clark (2007) study included telemetry detections of NSOs in Oregon within some areas that were burned with high and moderate severity. The condition of the burned stands in Clark's study area, such as the percentage of overstory mortality, the presence or absence of green trees, the ratio of high, moderate and low burn severities, and the juxtaposition of suitable NSO habitat in relation to severely burned areas wasn't reported. While in Clark's study owls were present within severely burned areas, it was not concluded that these areas were suitable habitat for nesting, roosting or long-term occupation by spotted owls. The burned areas may have contained individual features that were providing a short term structure for either roosting or foraging but were not suitable for long-term sustainability of a given owl or owl pair.

It is the spatial context of the overall habitat available for use by spotted owls that is critical for an analysis of habitat suitability. The proportion and arrangement of unburned or low burn severity suitable habitat in relationship to moderate- or high-severity burn areas within an NSO home range is one of the key factors in determining the likelihood of use by NSOs (USDI 2014, USDI 2011). This relationship is important because NSOs may focus their use of burned areas for foraging in areas with adjacent cover. This distance to cover is a key factor influencing use of burned areas (Comfort 2013). Because habitat selection by NSO is strongly influenced by abiotic features such as distance to water, proximity to nest, slope position, and elevation, it is possible that use of the burned habitats by NSO as described by Clark et al. (2013) or Bond et al. (2009) may occur due to the juxtaposition of the burned areas in relation to some other feature, such as a pre-fire nest location or water, rather than based on the "suitability" of the area, particularly if the owls were accustomed to using the area prior to the fire. Factors involved in the NSO's periodic selection of burned areas for foraging are not known at this time, and further research is needed to account for the many other aspects of a burned landscape that would factor into the NSO selection process.

Owl use of burned areas is well documented but links between owl use, fire severity, and intensity of salvage are not clear. Researchers were typically unable to separate effects of pre-fire timber harvest, wildfire, and post-fire salvage harvest. Research results are highly variable, depending on methods, burn severities, and proximity of NSO to fire and spatial arrangement of habitat. Research of NSO use of burned areas has also been confounded by small sample sizes. In addition, general terms used in the literature including "moderate severity" and "salvage logging" make comparison to specific conditions found within the proposed project area difficult. Most references to "salvage logging" in the literature refer to clear-cut logging, and do not factor in design features used by the Forest

Service such as leave tree groups, legacy tree retention, core area avoidance or even limited operating periods.

Studies noting changes in owl behavior or habitat selection after wildfire and/or salvage harvest have been largely unsuccessful in assigning causal factors. Clark (2007) was unable to separate the potential effects of pre-fire land management, high-severity fire and salvage harvest on NSO. Lee et al. (2012) and Clark et al. (2013) were also unable to distinguish the effects of salvage harvest in comparison to, or in combination with, other variables studied.

Overall, the research is inconclusive on the extent and value of severely burned forests that may provide towards the recovery of the Northern Spotted owl. On the other hand, there is scientific consensus regarding the features of high quality nesting roosting habitat, and that the Recovery Plan stresses the threat that fire poses to NSO habitat. The research has provided several examples of spotted owl use of low to moderate fire severity burn areas, mixed severity burned areas and sometimes high severity burn area. The research however lacks conclusive studies of long-term persistence of spotted occupancy and reproductive success at burned sites. The large patches of high severity fire that were experienced within the Westside Fire Recovery Project greatly changed the current habitat condition for several spotted owl sites. Whether these sites provide for spotted owls occupancy and reproduction over the long-term is still a lingering question, but surveys in the project area this year (the year following the fire) have not detected reproduction for sites that experienced large proportions of high severity fire in the core and home range.

Comments on the draft asserted that our analysis of post-fire habitat use by NSO was incomplete. In our analysis, the Westside Fire Recovery Project used the available research in the northern spotted owl analysis in the final EIS to address the following habitat components.

Activity Centers Analyzed: The project area has been surveyed intermittently since the 1990s but some spotted owl detections were reported in the 1980s or earlier. Using these spotted owl survey data that recorded occupancy (i.e. single or pair) and reproduction status, activity centers were placed on the central location of spotted owl activity, but over time, some of these activity centers appeared to change location. In some situations, a nest was found outside the core of a known activity center but close enough where occupancy of both cores by separate pairs is unlikely due to the territorial behavior of spotted owls. Other activity centers have experienced past wildfire that resulted in most of the core being burned severely and consequently, the core currently lacks visible nesting structures plus spotted owl surveys have not resulted in any detection for these particular activity centers thus further reducing the likelihood of occupancy. Finally, the project area contains drainages that don’t provide the distribution and quantity of habitat that is commonly associated with occupied activity centers yet there are multiple activity centers identified in the drainage which suggests that particular drainages may actually support fewer activity centers than the number identified. Despite this evidence and professional judgement that could lead to removing particular activity centers that are not likely to be occupied currently or in the near future from the analysis, the Forest chose to retain all the activity centers for analysis even though conventional wisdom could strongly argue that there is a strong likelihood that the analysis is overestimating potential effects. This is the most conservative approach to analysis the Forest could have taken.

Analysis of Habitat Fitness Potential: Comments received asserted that all activity centers were equally important. We don't agree with that point. The amount, distribution, and quality of habitat can aid in measuring the potential occupancy of an activity center now or into the near future. Using the interim guidance in the Recovery Plan for Recovery Action 10, we identified the Activity Center that were most likely to contribute to recovery. Activity centers that contain contiguous, abundant suitable habitat that contains patches of high quality habitat is more likely to be occupied by spotted owls and possibly reproduce than activity centers that have few acres of suitable habitat that are distantly distributed within the home range. This basic principle was used to identify the activity centers that are most likely to be occupied and reproduce as recommended in Recovery Action 10 of the Revised Recovery Plan for the northern spotted owl (2011). This analysis consequently resulted in adjusting project activities and meets the intent of Recovery Action 10 throughout the development of the project.

The fitness potential identified the activity centers with low, moderate, and high habitat fitness potential rankings. Ideally, all the activity centers would have high habitat fitness potential which would signify that these activity centers have a substantial amount of suitable habitat that is likely to provide resources to support spotted owls and reproduction. Activity centers with moderate fitness potential have lower suitable habitat levels with Post-Fire Forage and Fire Affected Nesting/Roosting inter-mixed which may provide foraging opportunity. Finally, the activity centers with low fitness potential are generally made up of activity centers with low amounts of habitat prior to the 2014 fires and consequently, the few acres of suitable habitat mostly became Post-Fire Forage or Fire Affected Nesting/Roosting. Consistent with the intent of the Recovery Plan for NSO, this ranking identified the sites that were most likely to contribute to recovery (i.e. survival and reproductive success) and hence where it was most important to minimize impacts.

Analysis of Fire Affected Habitat: Comments received asserted that the Forest did not consider fire affected habitat in its analysis. The final EIS identifies and describes fire affected habitat in response to the growing amount of literature on this topic. The available literature generally describes the burned areas used by spotted owls as suitable habitat that burned at low, moderate, and high fire severity. The final EIS describes suitable habitat (no fire or low fire severity) and suitable habitat that burned at moderate and high fire severity as Post-Fire Forage areas and Fire Affected Nesting/Roosting areas. Even though, the final EIS clearly recognizes the available literature's evidence of spotted owl use of Post-Fire Forage and Fire Affected Nesting/Roosting, the final EIS also recognizes that the research is unclear on the length of time these areas may be used by spotted owls; consequently, Post-Fire Forage and Fire Affected Nesting/Roosting are identified as short-term use areas that could be used by spotted owls as long as snags remain standing.

For the Westside Fire Recovery Project, Post-Fire Forage and Fire Affected Nesting/Roosting were specifically identified to display the potential effects of the proposed activities on all areas that may be used by spotted owls even though these habitats are not identified as "suitable" in the NSO Recovery Plan. Again, because of scale of effects from the fires themselves, and the proposed recovery actions, we believed it prudent address potential uses and Project impacts on these habitats. Suitable habitat is still more important and essential towards the recovery of the northern spotted owl. Post-

Fire Forage or Fire Affected Nesting/Roosting is in no way a substitute or equivalent to nesting/roosting or foraging habitat as described in the Revised Recovery Plan for the northern spotted owl (2011).

In addition, Post-Fire Forage and Fire Affected Nesting/Roosting were also identified in the northern spotted owl critical habitat analysis even though Post-Fire Forage and Fire Affected Nesting/Roosting don't fit well within the described Primary Constituent Elements as defined in the Revised Critical Habitat for the northern spotted owl: Final Rule (2012). The U.S. Fish and Wildlife Service did not find critical habitat affected by moderate and high fire severity to meet the essential aspect of critical habitat per the section called "Changes from the Proposed Rule" in the Final Rule (page 71889) "We [U.S. Fish and Wildlife Service] identified and removed lands … did not meet the definition of critical habitat. In general, lands removed from critical habitat designation had recently lost their ability to function as NSO habitat either through stand-replacing wildfire or through timber harvest conducted after 2006 (the date of our most recent comprehensive vegetation layer). When such lands were identified, we removed them from critical habitat because they were unlikely to support NSOs, and did not contain the Primary Constituent Elements or could not be otherwise considered essential." Even though the Critical Habitat rule did not count these areas as contributing to habitat needs, the body of research suggested that to be possible, so we included these areas in our analysis.

The available research still proclaims the importance of legacy features that take a long time to develop such as disproportionately large trees or large coarse woody debris. These legacy features can aid in producing high quality spotted owl habitat sooner, if these features persist till the forest regenerates and creates a closed tree canopy. Legacy features can be found almost anywhere on the forest, but these features tend to be more commonly found in areas identified as suitable spotted owl habitat. These legacy features also tend to remain mostly intact after a fire which would also improve the chances of those features to remain standing for at least a few years, but even as coarse woody debris, these legacy features still provide structure. Legacy features, to the degree they occur, have been retained in the Westside Fire Recovery Project.

Until spotted owl habitat regenerates, these legacy features in combination with the early seral vegetation can provide spotted owl prey species habitat. Whether or not spotted owls may use these areas, prey from this regenerating habitat may venture into adjacent suitable spotted owl habitat that would provide spotted owl foraging opportunity. Therefore, the final EIS analysis included Post-Fire Forage and Fire Affected Nesting/Roosting as Fire Affected Critical Habitat which represents areas that are more likely to contribute toward future critical habitat and possibly enhance current critical habitat with a possible increase in prey.

We believe the approach described above provided a reasonable analysis of the post-fire NSO habitat impacts of the Project and is responsive to concerns that post-fire habitats have not been adequately analyzed.

6. Whether salvage logging as proposed would harm Pacific fisher

Comments assert that moderate and high severity fire affected areas are used by fisher, especially burned mature/old growth forest. Maintaining "complex early seral forest" will

provide structure for current and future fisher use. The comment recommends the project be scaled back.

Agency Response: The value of snags and downed logs for many species of wildlife including Pacific fisher is discussed in the final EIS Chapter 3, the Wildlife Biological Assessment Appendix, Evaluation, and Wildlife Reports.

We agree that early seral plant communities can benefit many species however as noted earlier, the retention of all of the dead material now on the landscape would create an unacceptable risk of high severity fire in the future as those trees break and fall to the ground (EIS Chapter 3-Fuels). See the previous discussion of excess material under responsible opposing viewpoint no. 2 and early seral plant communities in responsible opposing viewpoint no. 4 above. Summarizing that discussion, in moderately and severely burned stands that are now in a post-fire early seral stage, about 21,300 acres or 70 percent of the LSR area and 40,000 acres or 80 percent of the entire fire area in all land allocations would proceed unimpeded through natural succession processes as recommended by the comment. Of the stands in the LSR where the Quadratic Mean Diameter (QMD) is greater than 24 inches that are in moderate to high severity burn patches, 77 percent would be retained. Overall, in all burn severities, over 90 percent of the stands with a QMD greater than 24 inches in the Seiad and Eddy Gulch LSRs would be retained (Appendix E). As a practical matter, brush species reoccupy burned sites rapidly in the Klamath Province. Typically, most of the project area will have brush at least four feet high providing fisher overhead cover within a few years. Additionally, where salvage does occur, Forest Plan standards for snag retention and coarse woody debris must be met.

Areas where salvage harvest would not occur includes all forested high mortality burn patches that are less than 20 acres in size except a few areas adjacent to private property or fuel breaks and all areas that are less than 50 percent mortality. Retaining these areas maintains the complex fire mosaic pattern created by the Westside Fires and heterogeneity more closely resembles the habitat needs of NSOs species described by Franklin et al. (2000) and other species. Areas that would not be planted also include multiple large patches ranging in size from a few hundred acres to well in excess of 1000 acres of fire-killed older trees in the Grider Creek Inventoried Roadless Area. Thus all patch sizes from very small to very large are represented in areas where no salvage harvest or site preparation and planting occurs. This contributes to the heterogeneity described by Franklin et al. (2000). The combined effect of these snag retention and recruitment measures will result in a mosaic of areas with low to high densities of snags, consisting of a variety of sizes, and occupying the project area both in the present and future.

Any decision to scale back the project would be made by the Forest Supervisor in the context of the project objectives. As noted by Thompson et al. (2007) “The decision to salvage-log and plant, or not, after fire depends on a number of management considerations including risk of future high-severity fire, reducing hazards to fire fighters, timber revenue, and conservation of biodiversity.” These factors were among the management considerations in the development of the Westside Fire Recovery Project (Chapter 1, Purpose and Need).

7. Whether landslide risk is increased in units 23, 32, 39, 55, 56, 57, 59, 64, 226, 228, 406, 520, 524, 525 and 530.

Comments received from National Marine Fisheries Service in response to the aquatic Biological Assessment dated April 16, 2015 disagreed with findings of the Forest Service related to landslide risk and / or debris flows. The National Marine Fisheries Service stated that units 5, 23, 32, 39, 55, 56, 57, 59, 64, 226, 228, 406, 520, 524, 525 and 530 may contribute to the risk of landslides and debris flows.

Agency Response: These areas are portions of the described units that add up to about 30 acres in total. There are no roads or landings in the areas of concern. Landslide risk was evaluated on-site in the field by a Forest Service geologist. The Forest Service determined that the areas in question had a risk of landslide and / or debris flows whether they were harvested or not. We disagree that the project would exacerbate landslide risk in these areas. The Forest Service determined that salvage harvest would not increase landslide risk because the salvage harvest activity did not affect landslide processes (final EIS Chapter 3 – Geology). The Forest Service concluded reforestation of these areas would reduce the period of elevated landslide risk from 80 years to 30 years when compared to no action. Consultation with National Marine Fisheries Service is ongoing.

Vegetation

The purpose of this section is to assess the fire impacts to vegetation on the landscape and determine what effects actions will have on increasing the likelihood and speed by which burned forested areas are regenerated. This section also assesses the consequences of not taking any action to accelerate the establishment of conifers on the landscape. Discussion of relevant scientific literature is incorporated to support the evaluation of effects from the stands to be treated by either salvage harvesting, site preparation and planting, or some combination of each.

Methodology

Site visits performed by foresters and a silviculturist to the Project area were conducted between October and December 2014. Remotely sensed data on vegetation burn severity were field-validated and potential treatment areas were identified by specialists. Stand data were collected using ocular estimates and plot data collection, as needed.

Observations included the following:

- Pre-fire stand condition of vegetation (growth, species composition);
- Post-fire stand condition of vegetation;
- Availability of natural seed sources on site and within natural seed distribution distance;
- Availability of suitable snags for retention;
- Availability and suitability of hardwoods for retention;
- Plantability (reasonable ability to plant conifers in an area), an estimate of physical effort needed to conduct artificial regeneration;
- Regeneration potential, an estimate of the potential for artificial regeneration; and
- Site class, aspect, and elevation estimates as they relate to artificial regeneration attributes and regeneration potential.

Stand data were compiled from existing plots in the Project area and were used to simulate future stand conditions based on proposed treatments. The Forest Vegetation Simulator was used to estimate time needed to establish conifer-dominated stands.

Northern spotted owl dispersal habitat characteristics were used as a threshold for considering a stand to be on a trajectory towards late-successional characteristics (diameter at breast height of 11.0 inches, canopy cover 40 percent, and percentage of conifer composition since conifers make up the majority of desired species for late-successional forest in this area). In addition to using professional judgment and visual cues during site visits, the 1944 Wieslander vegetation mapping was used to assess historic species composition and conifer dominance throughout the Project area (Kelly et al. 2005). Units proposed for planting were substantiated using this background information.

Analysis Indicators

- Acres on which conifer regeneration will be accelerated;
- Percent of moderate- to high-severity burned landscape restored to a mature conifer-dominated stand within 60 years through site preparation and planting;
- Acres on which conifer regeneration will be delayed (early successional forest will be long-lasting); and
- Type of vegetation that is likely to regenerate in the short term and long term.

Spatial and Temporal Context

Spatial bounding is limited to units within the Project area considered for regeneration treatments (including salvage units, existing plantations, and select natural stands not included in salvage) and hazard tree removal along roads (areas where regeneration is likely to be affected by the Project).

Both short-term and long-term effects will be considered in this analysis. Short-term temporal bounding is the time period of harvest activity, site preparation, and planting treatments, which is about one to eight years. Effects on regeneration will begin to be visible during this time period. Long-term temporal bounding is for an estimated 40-100 years from Project implementation and is based on the maximum time needed for reduction of surface woody fuels following fire (Peterson et al. 2014), and computer-generated modeling that shows stand conditions approaching the desired late-successional characteristics. There is no mid-term analysis because the effects progress between short term and long term.

Affected Environment

Before the fires of 2014, vegetation types within the Project area generally ranged from an oak/brush/grass type to well-stocked mixed conifers. Age classes ranged from 20 year-old plantations to late-successional forest. Using the existing vegetation layer provided from the CALVEG dataset, the size classes described in Table 3-1 were distributed throughout the Project area. California Wildlife Habitat Relationships (CWHR) type is derived primarily from CALVEG type and relative cover of conifer and hardwood trees for various mixed conditions. It represents an estimate of the variation in stand conditions that existed before the 2014 fires. Table 3-1 displays the percentage of the Project area that was classified by a specific size class prior to the fires as well as the percentage of each size class included within salvage units. The affected environment includes a mosaic of levels of severity of vegetation burned but the proposed treatment areas are focused on moderate to high severity vegetation mortality (i.e. greater than 50 percent of trees fire-killed on a unit level, based on Rapid Assessment of Vegetation Condition after Wildfire

(RAVG)). Compared to the size of the project area, relatively few acres are proposed to be treated in order to protect multiple resource concerns. In summary, Table 3-1 shows that of the large trees in the Project area (CWHR codes 4 and 5), less than five percent, are within proposed treatment units. About three percent of the 11-24 inch diameter class trees that burned at moderate to high severity are proposed for treatment and two percent of the greater than 24 inch diameter class trees that burned at moderate to high severity are within treatment units.

Table 3-1: Percentage of size classes within the Project area

CWHR Code	CWHR Size Class	Diameter at breast height	% of diameter class within Project Area	% that burned with greater than 50 percent mortality	% that burned with greater than 50 percent mortality within proposed action treatment units
1	Seedling tree	<1.0"	1 %	<1 %	
2	Sapling tree	1.0" - 5.9"	6 %	2 %	
3	Pole tree	6.0" - 10.9"	16 %	4 %	1 %
4	Small tree	11.0" - 23.9"	41 %	11 %	3 %
5	Medium/large tree	≥24.0"	25 %	6 %	2 %
6	Multi-layered tree	A distinct layer of size class 5 trees over a distinct layer of size class 4 and/or 3 trees, and total tree canopy of the layers ≥60 percent (layers must have ≥10.0 percent canopy cover and distinctive height separation).	0 %	-	N/A
0	Not Determined	N/A	<1 %	-	1 %

The oak/brush/grass type vegetation is typically found on low-elevation sites on shallow, rocky soils located on southerly and westerly aspects, which exhibit harsher conditions than on northerly and easterly aspects. As elevation increases, conifer species become more prevalent, primarily as a function of favorable environmental conditions for conifer survival and growth. Deeper, more developed soils than those found at low elevations supported mixed conifer stands of Douglas-fir, ponderosa pine, incense cedar, and sugar pine. Higher elevation sites within the Project area lend themselves to favorable conditions for red fir and white fir survival and growth, with white fir becoming a substantial component of the mixed conifer type. Hardwood species, including Pacific madrone, California black oak, canyon live oak, Oregon white oak, tanoak, and bigleaf maple are generally a minor component of mixed conifer stand composition.

Project treatments are focused on areas that burned with moderate and high vegetation severity. High severity areas are characterized by total or near-total conifer crown consumption. Individual trees in this condition were either killed or damaged by fire beyond their ability to survive. Within areas of moderate burn intensity, some crown consumption has occurred as a result of the fire, but these areas are characterized by total or near-total crown scorch. The vast majority of crown-scorched trees were killed by the fire or damaged beyond their ability to survive. Within areas of light vegetative burn

severity, the impacts on conifers were often severe, especially to the smaller size and lower crown classes. More than 50,000 acres of the Project area burned at moderate- to high-severity vegetation burn, about 30 percent of the Forest land within the burned area.

Understory vegetation has been totally consumed or top-killed throughout much of the Project area; the degree of mortality is primarily a function of fire intensity. On areas burned at moderate to high intensity levels, mortality is essentially complete. On areas burned at low-intensity levels, if the fire was hot enough to consume the organic layer then understory vegetation, including conifer seedlings and saplings, were also killed.

Light-seeded, prolific, early successional weed and grass species, having survived the fire in unburned pockets and perimeter areas, will rapidly reinvade burned areas. Well-established perennial root or rhizome species will likely re-sprout from existing root systems. Brush species, such as manzanita, snowbrush, deerbrush and whitethorn, are well-adapted ecologically to the fire-impacted ecosystems. Assuming that fire intensity and duration were at less than lethal levels, these species are capable of root collar sprouting. Brush seed, which may retain viability for 40-150 years in the duff layer, will germinate in potentially large numbers for two to three years after fire-scarification. Fire top-killed hardwood tree species, such as black oak, tanoak, madrone, and live oak are also capable of root-collar sprouting. These species are able to take immediate advantage of a well-established root system, giving them the inherent capability to grow rapidly for early site dominance.

Generally speaking, the Beaver Fire consists of more pine-dominated stands with a heavy hardwood component, while the Happy Camp Complex and Whites Fire are more mixed-conifer type stands. Forest lands within the Beaver fire incurred about 7,050 acres of moderate- to high-severity vegetation burn (greater than 50 percent loss of canopy). Within the Happy Camp complex, about 34,060 acres burned at moderate to high severity, and about 10,260 acres burned at moderate to high severity within the White fire. Additional information regarding the acreage of various levels of fire severity in the entire Project area, and in each fire-related area, is provided in Chapter 2.

Environmental Consequences

Relevant scientific literature

Relevant scientific literature on the regeneration of conifer forests includes documents that support natural regeneration and others that support the usefulness of logging and planting in restoring forests. Planting seedlings from site-specific seed sources after a wildfire may hasten the return to a large-conifer dominated forest ecosystem by as much as 50 years, compared to the alternative of not planting, which could take more than 100 years to even establish conifer forests (Sessions et al, 2004). There are many variables that contribute to successful natural regeneration, many of which are difficult to predict. Intricacies of seed production and dissemination for individual conifer species, including distance of seed dispersal, probability of germination, environmental factors contributing to failure, and periodicity of viable cone crops (Burns and Honkala 1990). White fir species, with a reliable downwind, only spreads seed 1.5 to 2 times its tree height (Burns and Honkala 1990, page 40). Ponderosa pine can spread seed up to 400 feet away, but only eight percent of the seed produced has been found at this distance. Even at 120 feet away, only 22 percent of disseminated seeds were found. Additionally, good cone crops

with heavy seed production only occur, on average, every eight years (Burns and Honkala 1990, page 416). Douglas-fir has potential for seed dissemination up to 1.2 miles in notable cases, but most seed falls within 330 feet of a seed tree. The major deterrents for successful regeneration of this species is limited seed supply, low viability of seed, consumption of seed by insects, animals and birds, competing plant species and unfavorable environments (Burns and Honkala 1990, page 532).

Other research shows that, in the absence of continued stand-replacing fires, succession may converge with the succession following a long-interval fire trending toward mature forests (Donato et al. 2006). Lindenmayer and Noss (2006) provide general discussion of potential impacts to post-fire salvage not specific to the Klamath Province or the objectives of this project.

Other scientists demonstrate that silvicultural treatments can increase stand structural variability, move stands toward multilevel canopies and increase residual tree growth (Dodson et al. 2012). Through artificial reforestation, conifers are given a head start at re-establishment, and subsequent thinning treatments can move stands towards a condition more ecologically suitable for wildlife, in a shorter time frame than if left to establish naturally. Other research has documented the advantage of planting conifers and controlling shrubs to increase tree density and growth over the early years of stand development (Shatford et al. 2007). Sessions et al. (2004) reiterate that regeneration cost effectiveness depends largely on the delay in establishment. Competition from brush and hardwoods severely hampers early conifer growth.

Thompson et al. (2007) found that salvage-logged and planted young stands southwestern Oregon were more likely to reburn with higher severity than comparable unmanaged areas. Unlike what is being proposed for the Westside project, Thompson et al. note: "*Records of site preparation and their effectiveness in reducing fuels in the plantations are incomplete; however, at least 17 of the 44 plantations are reported as ''broadcast-burned.'' In a separate analysis, we found that these 17 plantations also burned with higher severities than comparable unmanaged stands. The planting component of the system is intended to promote long-term regrowth of conifer trees, but it also creates dense or continuous fuels that are at elevated risk of high severity fire."* This finding by Thompson et al. is important because it describes the very condition we don't want to create in the Westside Fire Recovery Project. Stocking in the Thompson et al (2007) study typically ranged from 600 to 1,100 trees per hectare (240 to 440 trees per acre). From Thompson et al., we conclude that the plantations described were dense continuous fuels. We agree that plantations of that nature are at risk of being consumed in future fires and can in fact help propagate high intensity fire. What is unknown in this discussion is the amount of slash present from previous salvage operations, or how slash from competing vegetation release was handled. We do know that when dense young stands are combined with untreated or inadequately treated logging slash, the result is a volatile mix that is prone to high severity fire. In the Westside Fires, 70 percent of plantations exposed to fire survived. The common denominator in plantations that survived was treated activity fuels (Varak, personal communication). In the Westside Fire Recovery, we propose to treat the activity fuels (slash) from salvage logging, and plant at lower densities and variable spacing to create stands with discontinuous fuel that would be resilient to fire and could tolerate low to moderate severity fires typical of the Klamath Province. Thompson et al (2007) note that "*reducing connectivity of surface fuels at*

landscape scales is likely the only way to decrease the size and severity of reburns until vertical diversification and fire resistance is achieved." That is exactly the objective of the Westside Fire Recovery Project in salvage harvest units.

Thompson et al. (2007) conclude that *"The decision to salvage-log and plant, or not, after fire depends on a number of management considerations including risk of future high-severity fire, reducing hazards to fire fighters, timber revenue, and conservation of biodiversity."* These are considerations in the development of the Westside Fire Recovery Project.

Other research in drier forests indicates that by reducing surface fuels, the probability that planted areas will survive future fires is increased (Weatherspoon and Skinner, 1995). These planted stands are more likely to survive than the young trees that become established in large areas where fuels remain untreated. The planted trees in areas where fuels have been successfully reduced are expected to provide "islands" of coniferous forest in a sea of brushfields perpetuated by reburns where fuels have not been reduced. This would provide a measure of vegetative diversity that would not otherwise be present on the landscape. These planted stands also have a much higher probability of achieving the desired late- successional stand condition for the Late Successional Reserve than unplanted areas.

Alternative 1

Project Area A: Beaver Fire

Direct and Indirect Effects

Under Alternative 1, the entire burned area, of which about 7, 050 acres burned at moderate to high severity, will be left to recover naturally. Severely burned trees that survived the Beaver Fire will continue to die for several years due to injuries to crowns and cambium tissue, drought stress, and post-fire insect attack of weakened trees. Natural regeneration of coniferous forest may occur in severely burned patches, but it will be highly variable. Larger burn patches will regenerate more slowly because of distances from seed sources.

Successful natural regeneration within one to two decades, though highly variable, has been documented within white fir, Douglas-fir, and Douglas fir/tanoak stands following stand-replacing fires in the Klamath Province (Shatford et al. 2007; Joint Fire Science Program Final Report, Project 05-2-1-40 2009). Pine and mixed-conifer associations were not sampled in the Shatford et al. study. More typically, vegetation is likely to go through an extensive time-period of hardwood- and brush-dominated site occupancy (Zhang, Webster, Powers and Mills 2008). Reforestation will slowly occur naturally but may take many decades to replace brushfields (Zhang et al. 2008). In larger patches, where the majority of the trees were killed by the fire, re-establishment of forest cover would rely on natural regeneration and may take decades or longer. For the larger, contiguous areas of high-severity burn, distance from seed sources may further delay natural regeneration. In some cases of high-severity burn, there are no living conifer trees within several miles of the burned area. This condition is most evident in portions of the Walker Creek drainage, including the East Walker Creek, upper O'Neil Creek, and Slinkard Peak areas. There are very few conifer trees remaining in these areas capable of

providing potential seed sources for future potential natural regeneration needs in the near-term.

Overstory and understory vegetation which was killed, but not consumed, by the fire will remain and over time contribute to higher fuel loadings (Peterson et al. 2014). Given the high residual fuel loading, probable length of time required for site dominance by conifers and the fire history, it is likely the area will re-burn before fire-resilient trees can become established.

Lands unsuitable for conifer growth will re-vegetate through natural successional processes. Grasses, forbs, brush, and hardwoods will continue to dominate these sites for many years.

Suitable lands for conifer regeneration will be re-occupied, generally by brush and hardwood species. Without salvage, site preparation, planting, and proposed fuels treatments, severely burned stands will likely be replaced by shrubs and brush (Skinner et al. 2006) and regeneration of conifers and restoration of forested wildlife habitat may take decades.

Without the reforestation and fuels treatments proposed, these areas will re-vegetate primarily as areas of grass, shrubs and some hardwoods for an indefinite period of time, resulting in a loss of the conifer forest habitat that previously existed. Conifers will generally consist of scattered individual or small groups of ponderosa pine, sugar pine, knobcone pine, Douglas-fir, incense cedar, and white fir.

Although natural regeneration of conifer species has occurred elsewhere, following more typical wildfire site conditions, the Project area has a higher percentage of acres burned at high intensities than more typical historic patterns, resulting in prolonged regeneration periods and variable stocking patterns on unplanted sites (Shatford et al. 2007). Assuming large, stand-replacing fires will continue to occur, long-lasting early-seral plant communities will increase within the Project area primarily because more area is burned at higher intensities than historic patterns predict (Skinner et al. 2006). Although post-fire observations may indicate surprisingly prolific regeneration, even on severely burned sites, natural regeneration establishment in local wildfires in the past led to desired stocking levels typically only being met around the edges of the fire, where a good seed source is still intact (Bonnett et al. 2005). Most of the Project area will be allowed to naturally regenerate. It is likely that smaller patches across the landscape will successfully regenerate conifers if a seed source is present. Most treatment units are part of larger areas that have minimal, if any, conifer seed sources to assist in the natural regeneration of conifers. The remaining standing dead trees would be a hazard to new plantations, forest visitors, and forest workers as dead trees fall or create increased fuel on the ground.

The likelihood and time required for conifer regeneration is also affected by bark beetle infestations. Alternative 1 has a sizeable risk of bark beetle population increases, primarily because all stressed trees remain. This results in the maximum potential habitat source for beetles, and the maximum potential loss of living trees as the insect population moves into lightly burned areas and adjacent green stands. Lesser levels of mortality are anticipated in stands outside the fire-affected area than in the Project area, but some increase in beetle infestation is expected among live trees. Experience from previous wildfires indicates that an outbreak can be intense for the first two years post-fire.

Activities that accelerate the regeneration of forests (conifer and hardwood) after moderate- to high-severity vegetation burns, promote the use of dead and dying wood rather than allowing it to decay, and lessen the likelihood of stand-replacing wildfire and insect disturbance, would have a beneficial effect on carbon storage. Therefore, beneficial effects of this alternative on carbon storage are expected to be less than those of action alternatives.

Cumulative Effects

Adding the effects of Alternative 1 to those of current and reasonable foreseeable future actions listed in Appendix C for the Beaver fire-related area will provide no measurable cumulative effects to the extent and time required for conifer regeneration.

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

Effects to analysis indicators would be the same as for the Beaver fire-related area except there would be 34,060 acres of moderate to high severity burn on which conifer regeneration would be delayed.

Cumulative Effects

Adding the effects of Alternative 1 to those of current and reasonable foreseeable future actions listed in Appendix C for the Happy Camp fire-related area will provide no measurable cumulative effects to the extent and time required for conifer regeneration.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

Effects to analysis indicators would be the same as for the Beaver fire-related area except there would be 10,260 acres of moderate to high severity burn on which conifer regeneration would be delayed.

Cumulative Effects

Adding the effects of Alternative 1 to those of current and reasonable foreseeable future actions listed in Appendix C for the Whites fire-related area will provide no measurable cumulative effects to the extent and time required for conifer regeneration.

Alternative 2

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

Salvage Harvest and Reforestation

Salvage harvest, and subsequent site preparation, planting, and fuels treatments, are proposed, on an estimated 590 acres within the Beaver Fire area. Proposed acres of salvage harvest and planting are in areas that primarily burned with high severity effects on vegetation. High-severity burned areas have very few seed-cone capable trees remaining to provide natural seedling capability. Without salvage and planting, these areas will likely not regenerate satisfactorily for many decades. The techniques used for salvage harvest, site preparation and planting, and the number of acres proposed for each technique, are displayed in Chapter 2. For the purposes of this analysis, trees within

salvage units that have a 70 percent or greater probability of mortality from fire damage are considered fire-killed and may be harvested; trees that have greater than 30 percent probability of surviving are considered green and will be retained, unless they pose an eminent threat to safety or must be removed for safe and efficient logging operations. Salvage harvest unit boundaries may include Riparian Reserves and patches of green trees that burned with lower severity, but these areas will not be harvested.

Acres salvage-harvested and site-prepared will be planted with a variety of coniferous species to ensure diversity, and will be released from competing vegetation within a year or so of being planted. Appendix A of the silviculture report provides specific trees per acre and species mix for the proposed harvest units. “Crop row” reforestation is not our intent, and planting will be at a wider, more variable spacing than in the past. Most salvage units are prescribed for 300 trees per acre to be planted, which roughly translates to a 12 foot by 12 foot spacing. It is expected that by the third year 40-50 percent of the planted seedlings will experience mortality which will result in a much lower stocking density than the original 300 trees planted per acre. The desired condition is to have an adequately stocked stand of conifers, representative of historic species mix and density; this desired forest also incorporates naturally-regenerating/sprouting hardwood species and shrubs. Trees will be planted on the most favorable sites for their growth which will lend to natural variability in spacing including gaps and clumps of conifers across the landscape. Seedlings will be produced from seeds selected for their ability to adapt to future climate changes. The Regional Genetics program has been collecting selected cones throughout the Klamath Mountains, growing seed, and monitoring growth so that the seedlings produced have a wide genetic base allowing these future forests to adapt to changing conditions.

The reforestation stocking objective after planting in the Westside Fire Recovery Project is a stand of 75 to 225 variably spaced young trees with treated, discontinuous activity fuels, not densely stocked regularly spaced plantations that form continuous fuel beds. Stand density would vary with slope position and aspect with lower stocking on upper slopes and south and west aspects and higher stocking on north and east aspects that would form a closed canopy on lower slopes. Hardwoods would be included in the target stocking levels so the number of conifers would be less where hardwoods occur. Most reforestation units in the Beaver Fire area would be planted at lower densities as most of the units are on upper slopes or dry south aspects. We also anticipate there would be losses from future fires that would further reduce stand density. Our long term objective is 30-50 large, variably spaced, fire-resilient trees per acre with openings as described by Taylor and Skinner (1996).

Salvage harvest, followed by site preparation, planting, and release gives the highest likelihood of successful conifer regeneration. Twenty-eight percent of the landscape that burned at moderate to high severity will be treated to achieve mature conifer stands. Planting without fuels reduction and site preparation would likely result in the loss of conifer plantations before they mature, given the median 8- to 38-year fire return interval of the Klamath Province (Skinner et al. 2006).

Planting when combined with the effective fuels treatments proposed, may likely reduce the amount of time needed to restore the site to a sustainable coniferous forest. Removing large trees by salvage alone is not sufficient fuel treatment. Low-impact site preparation methods, which create fewer suitable planting spots, combined with losses inflicted by

falling snags, and limited access, result in generally poor chances for conifer re-establishment on these sites.

Research has shown that plantations established in areas with high slash loadings burned severely, while those where residual slash had been adequately treated, burned with much less intensity or not at all (Weatherspoon and Skinner 1995). Research has also shown that the quickest way to reestablish a coniferous forest after stand-replacing fire is by active reforestation (Zhang et.al. 2008). The reduction of residual fuels, as proposed, is necessary to prevent future fire events from becoming stand-replacing fires that destroy planted seedlings. Fuel treatments increase the likelihood of planted trees surviving future fires (Weatherspoon and Skinner 1995, Omi and Kalabokidis 1991). Heavy residual fuels need to be reduced substantially to help assure sustainability of plantations. Follow-up reforestation surveys will be completed to assure that the reforestation objectives are achieved.

About only five percent of the total fire area will be salvage harvested with another five percent being site prepared and planted outside salvage harvest units. Since most of the fire-burned areas will be allowed to regenerate naturally, many acres of lands suitable for conifer growth will continue to be understocked or not stocked by conifers, possibly for decades. These suitable lands will generally be re-occupied by early seral species (e.g. grasses, forbs, and brush) and hardwood species. Substantial snag stocking will remain. (See Chapter 1 for a discussion of salvage harvest in Late Successional Reserves.)

Lands unsuitable for conifer growth will also re-vegetate through natural successional processes. Early seral species, including grasses, forbs, brush, and hardwoods will dominate vegetation on these sites. Since activities that accelerate the regeneration of forests (conifer and hardwood) after moderate- to high-severity vegetation burns promote the use of dead and dying wood rather than allowing it to decay, and lessen the likelihood of stand-replacing wildfire and insect disturbance would have a beneficial effect on carbon storage. As a result, Alternative 2 is expected to be more beneficial than Alternative 1.

Natural Stand Areas Reforestation and Conifer Plantation Reforestation outside Salvage Units

Conifer plantations and selected natural stands that were deforested as a result of the 2014 fires will be re-established as part of Alternative 2. Natural stand and conifer plantation site preparation and planting are proposed on an estimated 1,780 acres within the Beaver Fire area. Proposed acres of site preparation and planting are primarily in high severity burned areas that have very few seed-cone capable trees remaining to provide natural seedling capability. Thus, without site preparation and planting, these areas will likely not satisfactorily regenerate conifers for many decades. Techniques and acres assigned to each technique are displayed in Chapter 2.As discussed earlier, fuels reduction treatments will also help to ensure successful regeneration efforts.

Under Alternative 2 within the Beaver Fire area, there would be 2,370 acres on which conifer regeneration will be accelerated (about 34 percent of the area burned at moderate to high severity) and 4,680 acres of moderate to high severity burn on which conifer regeneration would be delayed. Salvage harvest will occur on about 590 acres, and about 1,780 acres of planting will follow site preparation, for a total of 2,370 acres of site preparation and planting.

Roadside Hazard Tree Removal

Hazard tree removal is not a silvicultural treatment to promote conifer regeneration. Hazard tree felling, and where appropriate, removal, is proposed to address public and administrative safety concerns due to the risk of trees falling onto roads. Where hazard tree removal overlaps with proposed salvage harvest units, the effects are the same as the effects of salvage harvest. Hazard tree removal where it does not overlap with proposed salvage harvest units will decrease fuel loading and, therefore, potential fuels hazard indirectly promoting conifer regeneration through reduced fire risk. Where seed sources are adjacent to roadside hazard removal areas, it is likely that natural regeneration will occur.

Cumulative Effects

No Forest projects are within the spatial bounds of the Beaver fire-related analysis area for vegetation, so none are added to the effects of the past actions (the affected environment). Projects on private land that are interspersed with the Forest in the Beaver area include private land salvage; adding the effects of these projects to the effects of Alternative 2 would result in an increase in acres treated to provide fuels reduction and conifer restoration.

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

Effects to analysis indicators would be the same as for the Beaver fire-related project area except there would be 12,230 acres on which conifer regeneration will be accelerated (about 36 percent of the area burned at moderate to high severity) and 21,830 acres of moderate to high severity burn on which conifer regeneration would be delayed. Salvage harvest will occur on about 6,790 acres and planting after site preparation on another 5,440 acres for a total of 11,570 acres of site preparation and planting.

The reforestation stocking objective after planting in the Westside Fire Recovery Project is a stand of 75 to 225 variably spaced young trees with treated, discontinuous activity fuels, not densely stocked regularly spaced plantations that form continuous fuel beds. Stand density would vary with slope position and aspect with lower stocking on upper slopes and south and west aspects and higher stocking on north and east aspects that would form a closed canopy on lower slopes. Hardwoods would be included in the target stocking levels so the number of conifers would be less where hardwoods occur. We also anticipate there would be losses from future fires that would further reduce stand density. Our long term objective is 30-50 large, variably spaced, fire-resilient trees per acre with openings as described by Taylor and Skinner (1996).

Cumulative Effects

Among Forest projects added to the effects of the past actions (the affected environment) and the direct and indirect effects of the proposed project are portions of the Elk Thin project (underburning), the Happy Camp Fire Protection project, Phase 2 (roadside buffer) and the Thom-Seider Vegetation Management and Fuel Reduction project (various treatments); see Appendix C for a list of projects that may have cumulative effects. Projects on private land that are interspersed with the Forest in the Happy Camp fire-related area include some private land salvage and timber harvest plans; adding the effects of all of these projects to the effects of Alternative 2 would result in an increase in acres treated to provide fuels reduction and conifer restoration.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

Effects to analysis indicators would be the same as for the Beaver fire-related project area, except there would be 1,200 acres on which conifer regeneration will be accelerated (about 12 percent of the area burned at moderate to high severity) and 9,060 acres of moderate to high severity burn on which conifer regeneration would be delayed. Salvage harvest will occur is proposed on about 560 acres and site preparation and planting on another 640 acres for a total of 1,200 acres of site preparation and planting.

The reforestation stocking objective after planting in the Westside Fire Recovery Project is a stand of 75 to 225 variably spaced young trees with treated, discontinuous activity fuels, not densely stocked regularly spaced plantations that form continuous fuel beds. Stand density would vary with slope position and aspect with lower stocking on upper slopes and south and west aspects and higher stocking on north and east aspects that would form a closed canopy on lower slopes. Hardwoods would be included in the target stocking levels so the number of conifers would be less where hardwoods occur. We also anticipate there would be losses from future fires that would further reduce stand density. Our long term objective is 30-50 large, variably spaced, fire-resilient trees per acre with openings as described by Taylor and Skinner (1996).

Cumulative Effects

Among Forest projects added to the affected environment and the direct and indirect effects of the proposed Project are portions of the Eddy Late Successional Reserve project (underburning), the Jess project (insect and disease reduction) and the Salmon Salvage project (removal of dead and dying trees); see Appendix C for a list of these projects. Projects on private land that are interspersed with the Forest in the Whites fire-related area include some private land salvage and timber harvest plans; adding the effects of all of these projects to the effects of Alternative 2 would result in an increase in acres treated to provide fuels reduction and conifer restoration.

Alternative 3

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

Effects to analysis indicators would be the same as for Alternative 2 except there would be 1,780 acres on which conifer regeneration will be accelerated (about 25 percent of the area burned at moderate to high severity) and 5,270 acres of moderate to high severity burn on which conifer regeneration would be delayed. No salvage harvest will take place.

Cumulative Effects

Cumulative effects of site preparation and planting outside of salvage units are the same as for Alternative 2. Effects of areas that are not salvage-harvested are the same as those in Alternative 1.

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

Effects to analysis indicators would be the same as for Alternative 2, except there would be 11,570 acres on which conifer regeneration will be accelerated (about 34 percent of the area burned at moderate to high severity) and 22,490 acres of moderate to high severity burn on which conifer regeneration would be delayed. Salvage harvest will take place on about 6,130 acres and site preparation and planting on another 5,440 acres for a total of 11,570 acres.

Cumulative Effects

Cumulative effects for Alternative 3 are the same as for Alternative 2 for areas in which salvage harvest is implemented. Effects of site preparation and planting outside of salvage units are the same as for Alternative 2. Effects of areas that are not salvage-harvested are the same as those in Alternative 1.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

Effects to analysis indicators would be the same as for Alternative 2 except there would be 1,100 acres on which conifer regeneration will be accelerated (about 11 percent of the area burned at moderate to high severity) and 9,160 acres of moderate to high severity burn on which conifer regeneration would be delayed. Salvage harvest will take place on about 460 acres and site preparation and planting on another 640 acres for a total of 1,100 acres.

Cumulative Effects

Cumulative effects for Alternative 3 are the same as for Alternative 2 for areas in which salvage harvest is implemented. Effects of site preparation and planting outside of salvage units are the same as for Alternative 2. Effects of areas that are not salvage-harvested are the same as those in Alternative 1.

Alternative 4

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

Effects to analysis indicators would be the same as for Alternative 2 except there would be 2,300 acres on which conifer regeneration will be accelerated (about 33 percent of the area burned at moderate to high severity) and 4,750 acres of moderate to high severity burn on which conifer regeneration would be delayed. Salvage harvest will take place on about 520 acres and site preparation and planting on another 1,780 acres for a total of 2,300 acres.

Cumulative Effects

Cumulative effects for Alternative 4 are the same as for Alternative 2 for areas in which salvage harvest is implemented. Effects of site preparation and planting outside of salvage units are the same as for Alternative 2. Effects of areas that are not salvage-harvested are the same as those in Alternative 1.

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

Effects to analysis indicators would be the same as for Alternative 2 except there would be 11,270 acres on which conifer regeneration will be accelerated (about 33 percent of the area burned at moderate to high severity) and 22,790 acres of moderate to high severity burn on which conifer regeneration would be delayed. Salvage harvest will take place on about 5,830 acres and site preparation and planting on another 5,440 acres for a total of 11,270 acres.

Cumulative Effects

Cumulative effects for Alternative 4 are the same as for Alternative 2 for areas in which salvage harvest is implemented. Effects of site preparation and planting outside of salvage units are the same as for Alternative 2. Effects of areas that are not salvage-harvested are the same as those in Alternative 1.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

Effects to analysis indicators would be the same as for Alternative 2 except there would be 1,200 acres on which conifer regeneration will be accelerated (about 12 percent of the area burned at moderate to high severity) and 9,060 acres of moderate to high severity burn on which conifer regeneration would be delayed. Salvage harvest will take place on about 560 acres and site preparation and planting on another 640 acres for a total of 1,200 acres.

Cumulative Effects

Cumulative effects for Alternative 4 are the same as for Alternative 2 for areas in which salvage harvest is implemented. Effects of site preparation and planting outside of salvage units are the same as for Alternative 2. Effects of areas that are not salvage-harvested are the same as those in Alternative 1.

Alternative 5

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

Effects to analysis indicators would be the same as for Alternative 2 except there would be 2,350 acres on which conifer regeneration will be accelerated (about 33 percent of the area burned at moderate to high severity) and 4,700 acres of moderate to high severity burn on which conifer regeneration would be delayed. Salvage harvest will take place on about 580 acres and site preparation and planting on another 1,770 acres for a total of 2,350 acres.

Cumulative Effects

Cumulative effects for Alternative 5 are the same as for Alternative 2 for areas in which salvage harvest is implemented. Effects of site preparation and planting outside of salvage units are the same as for Alternative 2. Effects of areas that are not salvage-harvested are the same as those in Alternative 1.

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

Effects to analysis indicators would be the same as for Alternative 2 except there would be 3,830 acres on which conifer regeneration will be accelerated (about 11 percent of the area burned at moderate to high severity) and 30,230 acres of moderate to high severity burn on which conifer regeneration would be delayed. Salvage harvest will take place on about 1,750 acres and site preparation and planting on another 2,080 acres for a total of 3,830 acres.

Cumulative Effects

Cumulative effects for Alternative 5 are the same as for Alternative 2 for areas in which salvage harvest is implemented. Effects of site preparation and planting outside of salvage units are the same as for Alternative 2. Effects of areas that are not salvage-harvested are the same as those in Alternative 1.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

Effects to analysis indicators would be the same as for Alternative 2 except there would be 30 acres on which conifer regeneration will be accelerated (less than 1 percent of the area burned at moderate to high severity) and 10,230 acres of moderate to high severity burn on which conifer regeneration would be delayed. Salvage harvest will take place on about 30 acres and no additional acres of site preparation and planting for a total of 30 acres.

Cumulative Effects

Cumulative effects for Alternative 5 are the same as for Alternative 2 for areas in which salvage harvest is implemented. Effects of site preparation and planting outside of salvage units are the same as for Alternative 2. Effects of areas that are not salvage-harvested are the same as those in Alternative 1.

Alternative 2 Modified

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

Effects to analysis indicators would be the same as for Alternative 2 except there would be 2,000 acres on which conifer regeneration will be accelerated (about 28 percent of the area burned at moderate to high severity) and 5,050 acres of moderate to high severity burn on which conifer regeneration would be delayed. Salvage harvest will take place on about 220 acres and site preparation and planting on another 1,780 acres for a total of 2,000 acres.

Cumulative Effects

Cumulative effects for Alternative 2 Modified are the same as for Alternative 2 for areas in which salvage harvest is implemented. Effects of site preparation and planting outside of salvage units are the same as for Alternative 2. Effects of areas that are not salvage-harvested are the same as those in Alternative 1.

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

Effects to analysis indicators would be the same as for Alternative 2 except there would be 11,780 acres on which conifer regeneration will be accelerated (about 35 percent of the area burned at moderate to high severity) and 22,280 acres of moderate to high severity burn on which conifer regeneration would be delayed. Salvage harvest will take place on about 6,340 acres and site preparation and planting on another 5,440 acres for a total of 11,780 acres.

Cumulative Effects

Cumulative effects for Alternative 2 Modified are the same as for Alternative 2 for areas in which salvage harvest is implemented. Effects of site preparation and planting outside of salvage units are the same as for Alternative 2. Effects of areas that are not salvage-harvested are the same as those in Alternative 1.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

Effects to analysis indicators would be the same as for Alternative 2 except there would be 1,140 acres on which conifer regeneration will be accelerated (about 11 percent of the area burned at moderate to high severity) and 9,120 acres of moderate to high severity burn on which conifer regeneration would be delayed. Salvage harvest will take place on about 500 acres and site preparation and planting on another 640 acres for a total of 1,140 acres.

Cumulative Effects

Cumulative effects for Alternative 2 Modified are the same as for Alternative 2 for areas in which salvage harvest is implemented. Effects of site preparation and planting outside of salvage units are the same as for Alternative 2. Effects of areas that are not salvage-harvested are the same as those in Alternative 1.

Alternative 3 Modified

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

Effects of Alternative 3 Modified within the Beaver Fire will be substantially different from Alternative 2, as no salvage is proposed. Twenty four percent (1,660 acres) of Forest lands that burned with moderate to high severity within the Beaver Fire will be treated to achieve mature conifer stands including the zero net acres of salvage and 1,660 acres of planting existing plantations and natural stands that are not part of salvage units.

Cumulative Effects

Cumulative effects for Alternative 3 Modified are the same as for Alternative 1 for salvage (none proposed). Effects of site preparation and planting outside the salvage units are the same as for Alternative 2.

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

Effects of Alternative 3 Modified within the Happy Camp Complex will be the same as those for Alternative 2 for areas in which salvage harvest is implemented (5,200 net acres

within 6,210 acres in salvage harvest units). Thirty percent (10,120 acres) of Forest lands that burned with moderate to high severity within the Happy Camp Complex will be treated to achieve mature conifer stands including the 5,200 acres of salvage and an additional 4,920 acres of planting existing plantations and natural stands that are not part of salvage units.

Cumulative Effects

Cumulative effects for Alternative 3 Modified are the same as for Alternative 2 for areas in which salvage harvest is implemented. Effects of site preparation and planting outside of salvage units are the same as for Alternative 2. Effects of areas that are not salvage-harvested are the same as those in Alternative 1.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

Effects of Alternative 3 Modified within the Whites Fire will be the same as those for Alternative 2 for areas in which salvage harvest is implemented (550 net acres within 680 acres of salvage harvest units). Eleven percent (1,110 acres) of Forest lands that burned with moderate to high severity within the Whites Fire will be treated to achieve mature conifer stands including the 550 acres of salvage and an additional 560 acres of planting existing plantations and natural stands that are not part of salvage units.

Cumulative Effects

Cumulative effects for Alternative 3 Modified are the same as for Alternative 2 for areas in which salvage harvest is implemented. Effects of site preparation and planting outside of salvage units are the same as for Alternative 2. Effects of areas that are not salvage-harvested are the same as those in Alternative 1.

Comparison of Effects

Alternative 2 would provide for the most acres on which conifer regeneration would be accelerated over the greatest extent of the landscape. Alternative 2 Modified, Alternative 3, Alternative 3 Modified and Alternative 4 would all result in fewer acres on which conifer regeneration would be accelerated compared to Alternative 2, with reductions occurring on all three fire areas. Alternative 3 and Alternative 3 Modified result in no salvage harvest proposed in the Beaver fire-related area, leaving previously conifer-dominated forests to naturally regenerate to early seral species, primarily brush and hardwoods. The areas around O'Neil and Walker Creeks in the Happy Camp fire-related area will have substantial snag component and subsequent high fuel loadings intermixed with treated areas. Alternative 4 affects the conifer regeneration potential in Upper Elk and Little Elk Creeks of the Happy Camp fire-related area by reducing considerable salvage treatments in those areas as well as leaving land located behind private land in Seiad Valley as brush fields and snag patches for decades to come. The Tyler Meadows and Faulkstein areas will also become brush-dominated in spite of previous conifer dominance due to large distances from viable seed sources to grow trees. Alternative 5 would provide for substantially reduced acres on which conifer regeneration would be accelerated, with reductions occurring mostly on the Happy Camp Complex and Whites fire areas although several units in Beaver Fire were also eliminated. Most of the previously existing conifer-dominated landscape within the Happy Camp Complex and

Whites Fire will become brush and hardwood dominated. Alternatives 1 and 5 will, over an intergenerational period, result in reestablishment of a coniferous forest (Zhang et al. 2008, Shatford et al. 2007). However, that forest may not be sustainable in terms of fuels and fire history because residual fuels will not have been treated or will only have been treated in part, and it may also take decades to reach that stage (Zhang et al. 2008). Given the fire return interval of the Klamath Province and the fuels present on the site, a stand replacement re-burn is likely because it takes so long for a coniferous forest to reestablish itself. Without fuels reduction and active reforestation in these conditions, re-burns where fuels are heavy tend to be stand-replacement events (Skinner et al. 2006, Weatherspoon and Skinner 1995). The result will likely be a loss of forest cover in this area and a conversion to brush/hardwoods.

Analysis indicators for each alternative for the Beaver fire area are compared in Table 3-2: , for the Happy Camp fire area they are compared in Table 3-3 and for the Whites fire area they are compared in Table 3-4.

Table 3-2: Summary of Effects by analysis indicator for the Beaver Fire Area

Indicator		Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 2 Mod.	Alt. 3 Mod.
Acres on which conifer regeneration will be accelerated		0	2,370	1,780	2,300	2,350	2,000	1,660
Percent of moderate to high severity burned landscape restored to a mature, conifer-dominated stand within 60 years		0%	34%	25%	33%	33%	28%	24%
Acres of moderate to high severity burn on which conifer regeneration will be delayed		7,050	4,680	5,270	4,750	4,700	5,050	5,390
Type of vegetation likely to regenerate in short term and long term	Short term	Grass, forbs, brush	Brush, hardwoods, young conifers	Brush, hardwoods, young conifers	Brush, hardwoods, young conifers	Brush, hardwoods, some young conifers in treated matrix lands	Brush, hardwoods, young conifers	Brush, hardwoods, young conifers
	Long term	Brush, hardwoods, isolated patches of conifers	Mature, mixed conifer stands in treated areas	Mature, mixed conifer stands in treated areas	Mature, mixed conifer stands in treated areas	Mature, mixed conifer stands in treated areas	Mature, mixed conifer stands in treated areas	Mature, mixed conifer stands in treated areas

Table 3-3: Summary of Effects by analysis indicator for the Happy Camp Fire Area

Indicator	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 2 Mod.	Alt. 3 Mod.

Indicator		Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 2 Mod.	Alt. 3 Mod.
Acres on which conifer regeneration will be accelerated		0	12,230	11,570	11,270	3,830	11,780	10,120
Percent of moderate to high severity burned landscape restored to a mature, conifer-dominated stand within 60 years		0%	36%	34%	33%	11%	35%	30%
Acres of moderate to high severity burn on which conifer regeneration will be delayed		34,060	21,830	22,490	22,790	30,230	22,280	23,940
Type of vegetation likely to regenerate in short term and long term	Short term	Grass, forbs, brush	Brush, hardwoods, young conifers	Brush, hardwoods, young conifers	Brush, hardwoods, young conifers	Brush, hardwoods, some young conifers in treated matrix lands	Brush, hardwoods, young conifers	Brush, hardwoods, young conifers
	Long term	Brush, hardwoods, isolated patches of conifers	Mature, mixed conifer stands in treated areas	Mature, mixed conifer stands in treated areas	Mature, mixed conifer stands in treated areas	Brush, hardwoods, mature mixed conifer within treated matrix lands, isolated conifers in LSRs and IRAs	Mature, mixed conifer stands in treated areas	Mature, mixed conifer stands in treated areas

Table 3-4: Summary of Effects by analysis indicator for the Whites Fire Area

Indicator	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 2 Mod.	Alt. 3 Mod.
Acres on which conifer regeneration will be accelerated	0	1,200	1,100	1,200	30	1,140	1,110
Percent of moderate to high severity burned landscape restored to a mature, conifer-dominated stand within 60 years	0%	12%	11%	12%	<1%	11%	11%
Acres of moderate to high severity burn on which conifer regeneration will be delayed	10,260	9,060	9,160	9,060	10,230	9,120	9,150

Indicator		Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 2 Mod.	Alt. 3 Mod.
Type of vegetation likely to regenerate in short term and long term	Short term	Grass, forbs, brush	Brush, hardwoods, young conifers	Brush, hardwoods, young conifers	Brush, hardwoods, young conifers	Brush, hardwoods, some young conifers in treated matrix lands	Brush, hardwoods, young conifers	Brush, hardwoods, young conifers
	Long term	Brush, hardwoods, isolated patches of conifers	Mature, mixed conifer stands in treated areas	Mature, mixed conifer stands in treated areas	Mature, mixed conifer stands in treated areas	Brush, hardwoods, mature mixed conifer within treated matrix lands, isolated conifers in LSRs and IRAs	Mature, mixed conifer stands in treated areas	Mature, mixed conifer stands in treated areas

Compliance with law, regulation, policy, and the Forest Plan

All alternatives are in compliance with law, regulation, policy and the Forest Plan in relation to vegetation as displayed in the Forest Plan consistency checklist. Silvicultural prescriptions under action alternatives comply with the Forest Plan. Salvage, site preparation and planting are all methods for establishing desired conifer stocking with some level of fire resilience once seedlings are established.

Fire and Fuels

This section provides a synopsis of the effects of the Project on fire behavior potential and resistance to control of future wildland fire activity across the Project area.

Methodology

The fire and fuels report takes into consideration the three elements that affect fire behavior: fuels, weather, and topography. The interactions of these elements present potential issues to vegetation and fire suppression capabilities. Although all of the elements are important, the Project realistically can only affect the fuels element. A combination of field-collected data, geospatial data, fire modeling, professional judgment, and literature review were used to provide a landscape level picture of potential fire behavior and analyze environmental consequences of the Project to fire and fuels.

Using Behave Plus and FlamMap fire behavior modeling programs, fire behavior outputs were generated to compare all alternatives over time. Post-fire stand data were collected in areas that burned with high, moderate and low severity effects. The collected data were entered into the Fire Management Analyst (FMAPlus 3) model to quantify canopy and tree bole biomass loading. These data were used to enter into a snag-fall and decay model that quantifies potential surface fuel loads overtime as snags weaken, break and/or fall over. Selected stands were also evaluated using the Forest Vegetation Simulator along with the Fire and Fuels Extension of Forest Vegetation Simulator to project future surface fuel loads over time. More detailed information and modeling assumptions for each

program are provided in the Fire and Fuels resource report, available on the Project website.

Analysis indicators used to evaluate effects of the Project include potential fire hazard and resistance to control; these are measured by flame length, fireline intensity, rate of spread, and surface fuel loading.

Fire hazard is defined as a fuel complex, defined by volume, type condition, arrangement, and location, which determines the degree of ease of ignition and of resistance to control. Fire severity and fire behavior are often terms used to describe how a fire may burn depending on the fuels conditions (i.e. fire hazard). Since the terms fire severity and fire behavior are used throughout the Fire and Fuels Report to describe affects to the measurement indicator fire hazard, there is a need to further define.

Although the term fire behavior commonly refers to the variable characteristics of an active flaming front, in some instances, the term fire behavior is used interchangeably with fire severity. The term fire severity relates specifically to the level of effects of fire on the post burn landscape. In most cases when the term fire behavior is used to indicate fire severity, it adds the qualifier "problem fire behavior." According to the Fire Effects Information System website "Fire severity generally indicates the degree of environmental change caused by fire. Scott and Reinhardt (2007) provide a slightly more detailed definition: "[fire severity is] the effect of a fire on ecosystem properties, usually described by the degree of soil heating or mortality of vegetation. Fireline intensity is the rate of heat release per unit time per unit length of fire front. Not synonymous with fire severity, which refers to the degree of environmental change caused by fire."

Measurement indicators to assess fire hazard include flame length, fireline intensity, and rate of spread as fire modeling predicts fire behavior based on surface fuels less than three inches in diameter. Fuels larger than 3" in diameter are not used in fire modeling programs to display potential fire behavior outputs but are important indicators of resistance to control.

Flame lengths are a visual indicator of fireline intensity; as flame lengths increase, fireline intensity increases (see the body of the Fire and fuels resource report).

Byram (1959) defined fireline intensity as the rate of heat energy release per unit time per unit length of fire front, regardless of the depth or width of the zone of active flaming combustion. With respect to fire suppression, fireline intensity is how hot the fire is burning and how close resources can be to the fire. Fireline intensity is used to forecast whether to use direct or indirect firefighting tactics.

Resistance-to-control is generally viewed as an estimate of the suppression force required for controlling a unit of fire perimeter. For example, "high" resistance to control means "slow work for dozers, very difficult for hand crews; hand line will be difficult" (Brown, Reinhardt, & Kramer, 2003).

Surface fuel loading by fuel size category is evaluated as a measure of resistance to control. To quantify potential intensity of large fuels (greater than three inches in diameter) Byram's (1959) fireline intensity equation and surface fuel loadings (tons/acre) of zero to three inch and three to ten inch diameter material is used to measure resistance to control related to fireline production capabilities of fire suppression resources (see the body of the fire and fuels resource report).

Spatial and Temporal Context

This analysis is limited to the spatial extent of the Project area because effects on fire and fuels can be accurately estimated within this area.

Short-term analysis is considered at one to five years post-fire, and long-term analysis extends out to greater than 20 years to model the potential effects of standing snags, downed wood and subsequent surface fuel loading over time.

Affected Environment

Few forested regions have historically experienced fires as frequently and with such high variability in fire severity as the Klamath Mountains Bioregion (Taylor & Skinner, 1998), this is primarily due to climatic variables and the diverse physical and biotic arrangement of the Klamath Mountains. South and west facing aspects and upper slope positions typically experienced higher severity fire than lower slopes and north- and east-facing aspects. On the eastern edge of the Klamath Mountains, median fire return intervals range from 8 to 38 years (Taylor, Skinner, & Agee, 2006). With frequent fire of low to mixed severity, fuel accumulations over most of the area were historically maintained at low levels, and landscape features such as ridge-tops and streams were often sufficient to impede fire spread.

Fire history data from years 1911-2012 provides insight into fire cause and size to identify trends in fire patterns and relationships on the landscape. Table 3-5 displays fire ignitions by cause. Lightning accounts for 74 percent of fire starts, and 82 percent of the acres burned within the Project area over a 101 year history, which highlights the notion that fire will continue to be a factor across the Project area. Table 3-6 outlines fire by size class indicating that 72 percent of all fires in the Klamath Mountain Bioregion are less than .25 acres.

Table 3-5: Wildfire ignition by cause and total acreage burned

Fire Cause	Total Number of Ignitions	Total Reported Acres Burned
Lightning	1410	93,207
Human	355	15,605
Unknown	143	3,965
Grand Total	1908	112,776

Table 3-6: Wildfire ignition by size class.

Fire Size Class	Total Number of Fires
A (0-.25 acres)	1383
B (.25-1 acres)	397
C (1-10 acres)	76
D (10-100 acres)	18
E (100-1000 acres)	12
F (1000-5000 acres)	16
G (> 5000 acres)	6
Grand Total	1908

Figure 3-1 graphs acreage burned by decade. The data includes large fire history within the Project area including the 2014 Beaver, Happy Camp Complex and Whites Fires. 2014 fires represent 59 percent of the acreage burned over the 103 year period. **Table 3-7** displays the acreage burned by decade within the Project area.

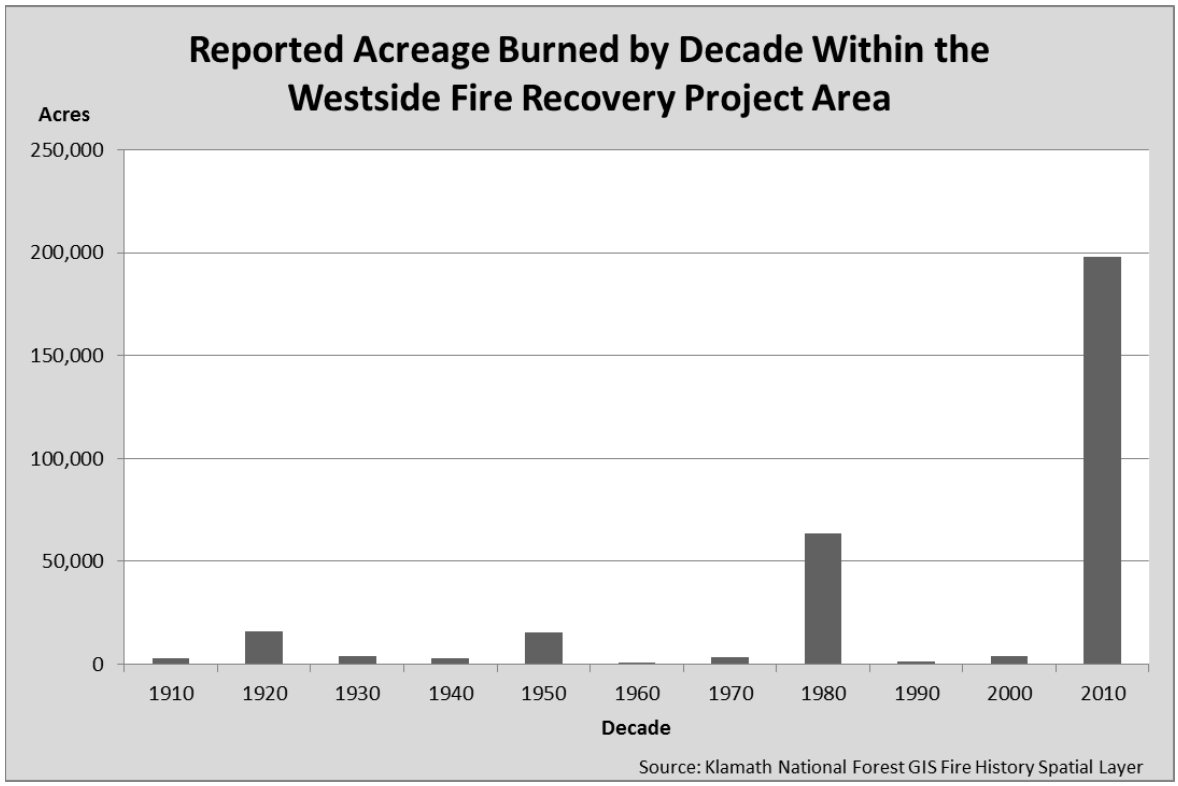

Figure 3-1: Summary of the acreage burned by decade within the Westside Fire Recovery Project area.

Table 3-7: Acreage burned by decade.

Decade	Acres Burned By Decade
1910	2,811
1920	15,914
1930	4,063
1940	2,660
1950	15,399
1960	103
1970	3,155
1980	63,287
1990	1,501
2000	3,882
2010	197,967
Total	310,743

Figure 3-2 provides a spatial representation of past fire history over a 103 year period time. What can be observed is that the fires within the Project area have experienced long periods with an absence of fire on the landscape. A great portion of the landscape has not experienced large fire within the past 20 to 100 years within the Project area.

Prior to the 2014 fires, much of the landscape within the Project area had a long absence of fire. Fire history is rich and overlapping outside of the Project area; moreover, fire will continue to be a presence on the landscape and shape future fuels and vegetation profiles within the Project area in the future.

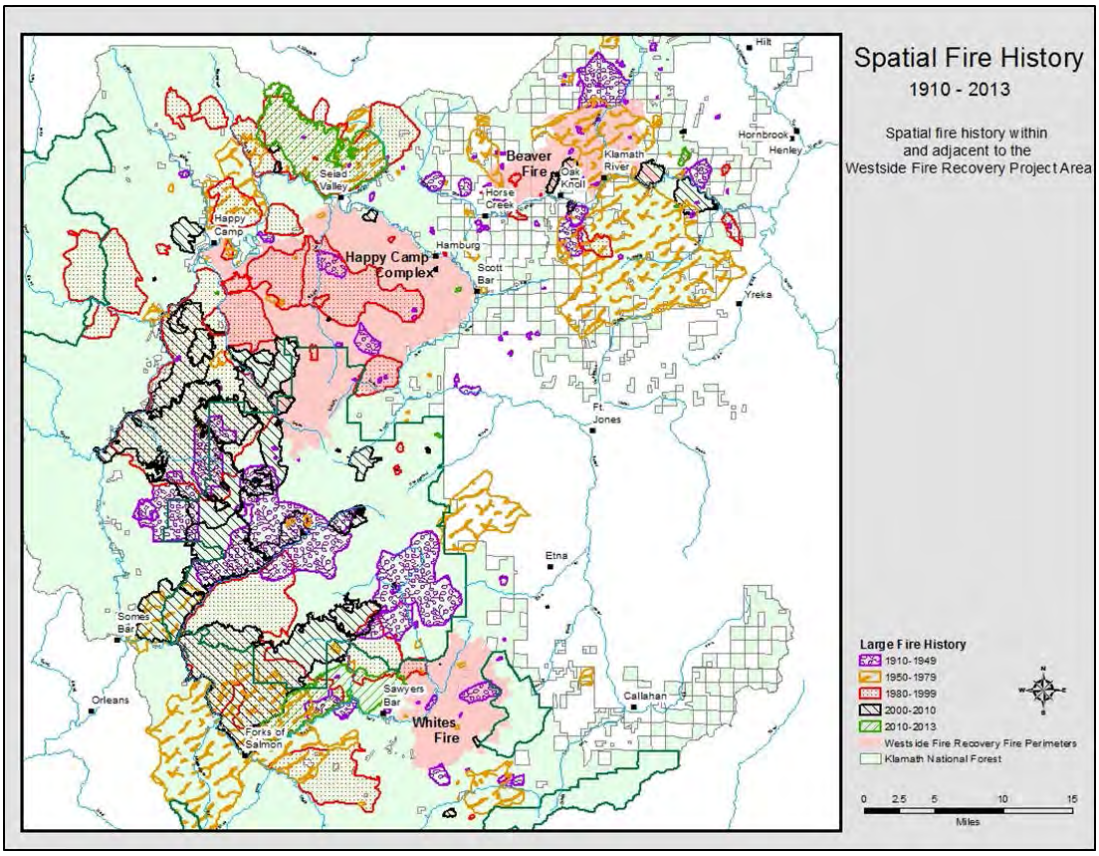

Figure 3-2: Spatial Large Fire History within and adjacent to the Westside Fire Recovery Project.

Fuels

The effects of uniform fuel beds at the surface and canopy in combination with weather and climatological conditions, led to significant fire growth and high severity fire effects on the Forest during 2014. The resulting fires brought upon a mosaic mix of fire severity within each fire and across the Project area (Table 3-8). High severity fire effects occurred over 26 percent of the Project area resulting in 75 to 100 percent mortality of trees (based on tree basal area loss). Patch size within high severity fire areas ranged from less than 1 acre to 3,890 acres in size; 37,325 acres within the Project area have contiguous patch sizes greater than 100 acres.

Table 3-8: Fire (Vegetation Burn) Severity (Basal Area Loss) within the Westside Fire Recovery project area

Fire Severity	Beaver		Happy Camp Complex		Whites		Total	
	Acres	%	Acres	%	Acres	%	Acres	%
Low	14,310 (43%)	43%	73,152	62%	21,666	63%	109,129	59%
Low/Moderate	3,139	10%	9,986	8%	2,087	6%	15,213	8%
Moderate/High	2,465	7%	7,305	6%	1,566	5%	11,336	6%
High	13,012	40%	27,334	23 %	8,889	26%	49,236	27%

High severity fire areas experienced crown fire activity resulting in full consumption of ground, surface and aerial canopy fuels. High severity crown fires result in high levels of tree mortality, consuming leaves and small branches but leaving the boles largely intact (Ritchie, Knapp, & Skinner, 2012). At the ground and surface fuel level, duff and needle cast, small branches and large downed woody material were fully consumed. In the canopy full consumption of leaf and needle foliage occurred leaving standing dead trees and barren soils. Overall, the impact led to high levels of tree mortality.

Moderate to high severity fire areas experienced similar conditions. Surface fuel loadings were primarily fully consumed. Pockets of larger downed fuels remain visible on the surface. Generally, full consumption within all categories of surface fuel loads were consumed (i.e. small branches, twigs, and large downed woody debris).Dead needles continue to fall from the canopy covering the forest floor. The crown fuel profile varied with some trees being consumed by the fire and other trees retaining needles in the tree canopy. Overall, the majority of the overstory canopy burned intense enough resulting in brown needles with few green needles remaining on conifer trees with full consumption of hardwood species.

Low to moderate severity stands have a mix of live and dead trees remaining within the understory. Primarily, overstory crown fuels remain intact and survived the fire while surface fuels and small trees within the understory were consumed leading to small tree and shrub mortality.

Resistance to Control

The influence of fuels, weather and topography plays a role in the ability to effectively suppress unplanned ignitions. Topography and road access is the primary factor inhibiting the suppression or control of fires within the Forest. The high density of fire-killed trees within the Project area, present a unique hazard to fire fighters and promote future problem fire behavior, as these are both ember producers and receptors to fire

ignition. Over time, dead trees fall and new vegetation establishes across the fire area, contributing to surface fuel loadings. The result is the difficulty of control increases. For example, additional kinds and types of fire equipment may be needed or firelines might take longer to construct.

Coarse Woody Debris

Within Late Successional Reserve's, it is necessary to retain snags and large woody logs that are likely to persist until late successional conditions develop. However, retaining snags and large woody debris is not desirable where they would be in excess of fuel reduction requirements, as excessive large woody debris loads are not characteristic of a fire resilient ecosystem that allows old growth characteristics to re-occur on the landscape (see responsible opposing points of view discussion at the beginning of Chapter 3). The concept of retaining an adequate number of large logs is explained in Beardsley and Warbington (1996) whose findings and data are used as a guide within the Forest-Wide Late Successional Reserve Assessment (LSRA, 1999). It is important to note that this data reflects 60 to 80 years of fire suppression, in which values may be inflated over historical conditions (LSRA, page 1-4). Table 1-1 of the LSRA, and Table 2 of Beardsley and Warbington, show that downed dead trees (logs) at least 20 inches in diameter ranged from an average of 5 to 10 trees per acre for vegetation types most impacted within the Project.

Table 3-9 is a summary of the number of downed logs by vegetation type in Late Successional Reserve's.

Table 3-9: Table 1-1 of the LSR Assessment shows the number of downed logs by series (vegetation) type.

Vegetation Series Type	Number of Downed Logs > 20" diameter at breast height
Mixed Conifer	7
White fir	10
Red fir	9
Douglas-fir - Tanoak	9

Pages 3-4 and 3-5 of the LSRA also show that the number of large downed logs per acre would be expected to be higher on north and east facing aspects as compared to south and west facing aspects. Snags and large downed wood would also be occurring in scattered clumps. This pattern is consistent with conclusions found in Skinner, 2002 (PSW-GTR-181).

Skinner (2002) describes the influence of fire on the dynamics of dead woody material and states that fire history resulted in a “landscape with many of the snags and logs clustered in both time and space, and very sparsely distributed in the intervening time and space.” Skinner also concluded that “it is unlikely that much large woody material survived long enough to decompose fully in fire regimes that proceeded the fire-suppression era.” This research suggests that the amount of dead wood would have been much less under the historical fire regime than exists today and is consistent with other research with similar fire regimes (Knapp 2015 and Stephens 2004).

The purpose and need for the Project includes a need for a restored and fire-resilient ecosystem and a reduction in fuels. This purpose and need is supported by the desired

condition in the Late Successional Reserve Assessment (page 3-4) which states that, generally, fuels conditions will be such that flame lengths would be less than 4 feet. The analysis within the Fire and Fuels Report further describes the need for action and is primarily related to the need to reduce snag densities and fuel loading (see Fire and Fuels Report). The following figures and tables (Figure 3-3, Figure 3-4, and Figure 3-5) compare Alternative 1 (no action) and Alternative 2 at representative sites proposed for treatment under Alternative 2.

Plot 3 100% Mortality						Plot 3 100% Mortality					
Year	Surface Fuel < 3" dbh (tons/acre)	Surface Fuels > 3" dbh (tons/acre)	Intensity (btu/ft/sec) 26 ch/hr	Intesity (btu/ft/sec) 40 ch/hr	Resistance to Control	Year	Surface Fuel < 3" dbh (tons/acre)	Surface Fuels > 3" dbh (tons/acre)	Intensity (btu/ft/sec) 26 ch/hr	Intesity (btu/ft/sec) 40 ch/hr	Resistance to Control
1	1.35	9.58	40	40	Low	1	0.27	1.92	8	8	Low
10	8.91	67.26	5155	7870	Extreme	10	1.78	13.45	1030	1572	Low
20	11.38	93.04	6963	10630	Extreme	20	2.27	18.61	1391	2124	Low
30	11.08	98.96	7224	11030	Extreme	30	2.21	19.79	1443	2204	Low
40	9.72	95.75	6813	10401	Extreme	40	1.94	19.15	1361	2079	Low
50	8.11	88.69	6152	9393	Extreme	50	1.62	17.74	1230	1877	Low

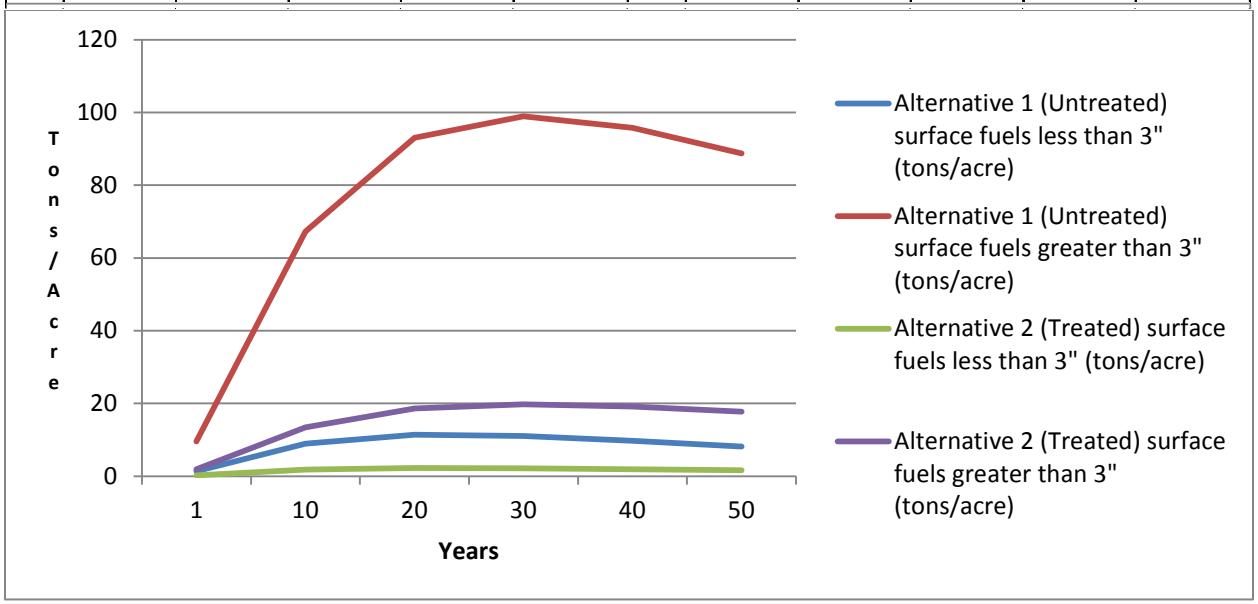

Figure 3-3: Representative stand for the Beaver Fire area with and without salvage harvest and follow-up fuels treatment. The Table on the left represents the fire area with no salvage harvest (Alternative 1) over time and the right Table represents the areas post salvage harvest and fuels reduction treatments.

Walker/Grider Creek Stand ID 050552ABCD001116414144205					
Year	Surface Fuel < 3" dbh (tons/acre)	Surface Fuels > 3" dbh (tons/acre)	Intensity (btu/ft/sec) 26 ch/hr	Intesity (btu/ft/sec) 40 ch/hr	Resistance to Control
1	1.49	14.40	55	55	Low
10	14.34	51.11	5259	8029	Extreme
20	16.82	73.97	6912	10553	Extreme
30	12.89	80.54	6567	10025	Extreme
40	10.83	76.98	6013	9179	Extreme
50	10.00	70.61	5526	8437	Extreme

Walker/Grider Creek Stand ID 050552ABCD001116414144205					
Year	Surface Fuel < 3" dbh (tons/acre)	Surface Fuels > 3" dbh (tons/acre)	Intensity (btu/ft/sec) 26 ch/hr	Intesity (btu/ft/sec) 40 ch/hr	Resistance to Control
1	3.48	12.90	70	70	Low
10	4.59	17.12	1724	2632	Low
20	5.01	18.89	1892	2889	Moderate
30	4.95	18.14	1841	2811	Low
40	5.80	15.60	1857	2835	Low
50	8.08	14.53	2204	3365	Low

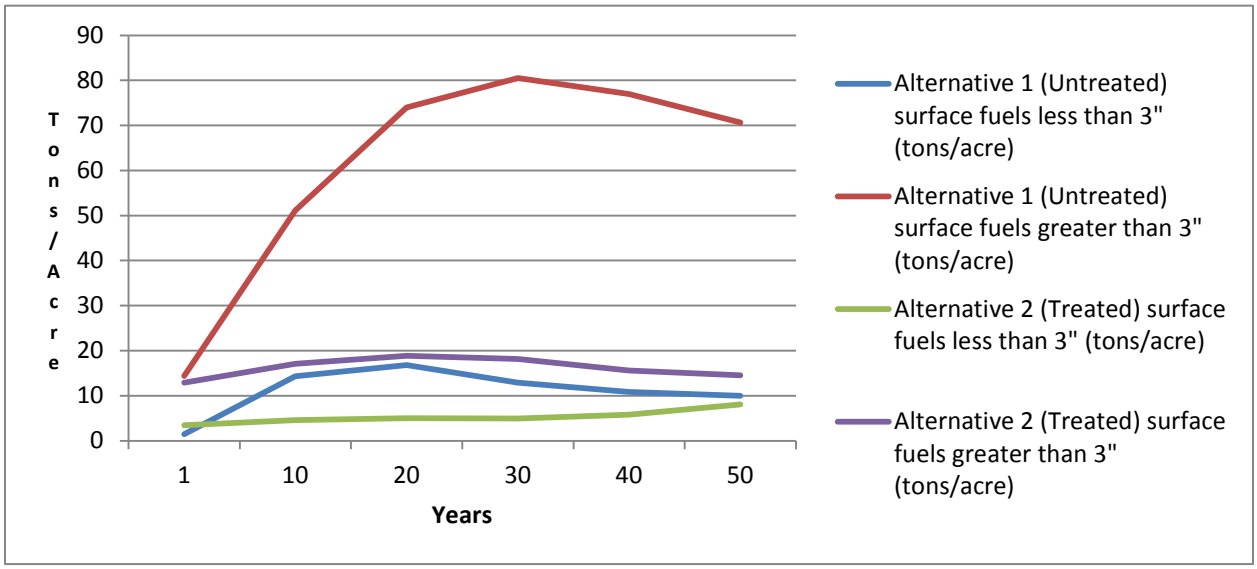

Figure 3-4: Representative stand for the Happy Camp Fire area with and without salvage harvest and follow-up fuels treatment. The Table on the left represents the fire area with no salvage harvest (Alternative 1) over time and the right Table represents the areas post salvage harvest and fuels reduction treatments.

Scott River Stand ID 05055518010208060009						Scott River Stand ID 05055518010208060009					
Year	Surface Fuel < 3" dbh (tons/acre)	Surface Fuels > 3" dbh (tons/acre)	Intensity (btu/ft/sec) 26 ch/hr	Intesity (btu/ft/sec) 40 ch/hr	Resistance to Control	Year	Surface Fuel < 3" dbh (tons/acre)	Surface Fuels > 3" dbh (tons/acre)	Intensity (btu/ft/sec) 26 ch/hr	Intesity (btu/ft/sec) 40 ch/hr	Resistance to Control
1	1.15	19.32	66	66	Low	1	3.49	10.46	63	63	Low
10	17.04	49.41	5647	8622	Extreme	10	4.71	13.44	1549	2364	Low
20	19.48	74.90	7434	11349	Extreme	20	4.86	15.21	1669	2548	Low
30	17.28	84.58	7559	11540	Extreme	30	2.12	10.27	922	1408	Low
40	15.33	89.31	7464	11395	Extreme	40	4.71	14.64	1613	2463	Low
50	13.65	89.70	7187	10973	Extreme	50	4.69	14.12	1582	2416	Low

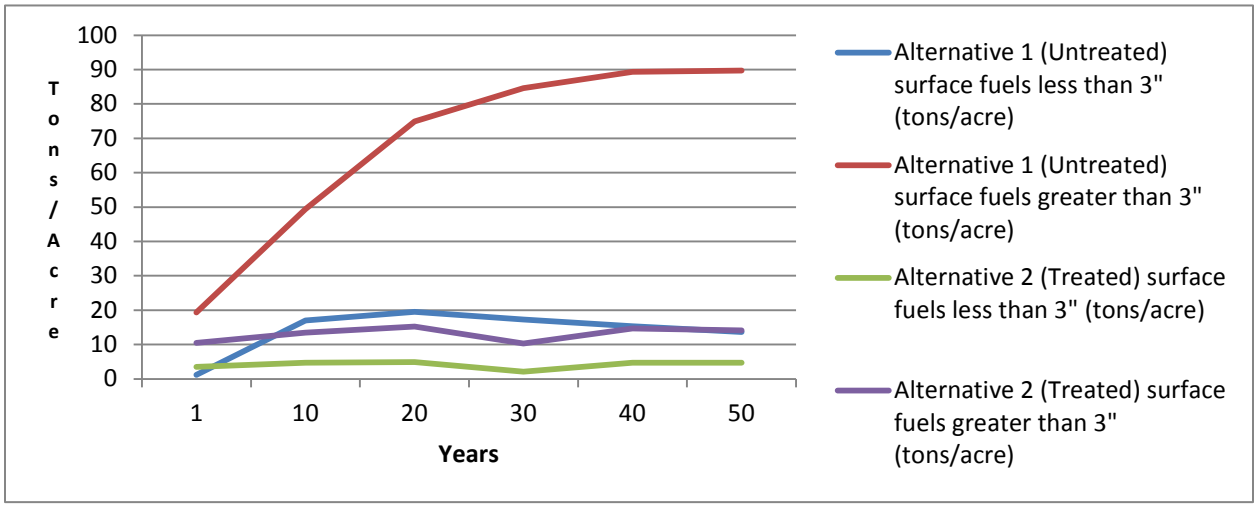

Figure 3-5: Representative stand for the Whites fire area with and without salvage harvest and follow-up fuels treatment. The Table on the left represents the fire area with no salvage harvest (Alternative 1) over time and the right Table represents the areas post salvage harvest and fuels reduction treatments.

Figure 3-3, Figure 3-4, and Figure 3-5outlines that fuel loading under Alternative 1 does not meet desired conditions for the Project for measures of fire hazard and resistance to control. The number of snags left on the landscape under Alternative 1 would create conditions in the future for an increased probability of high severity and stand-replacing fire.

Project mitigations are aimed at balancing the number of snags needed for wildlife and watershed concerns while still meeting fire and fuels resource objectives. For example, snags are being retained in aquatic Riparian Reserves and inner gorges. In addition, snags are being retained in areas related to critical habitat elements; and include legacy trees across the landscape, plus areas that will aid in maintaining wildlife connectivity. Alternatives for the Project have different levels of retention areas, where no treatment is to occur, to help describe the effects to resources.

Between draft and final, plots were taken within snag retention areas. The data shows that on average (over a 100-acre area); there are over 20 trees per acre larger than 20 inches diameter at breast height within retention areas. These snags will aid in meeting the objectives of the Late Successional Reserve and Land Management Plan as standing dead trees and as course woody debris. The Late Successional Reserve Assessment standards

are expected to be exceeded. In addition, the plots did not account for course woody debris already on the ground.

This data was used to help describe if desired conditions were met for the Project area. See individual resource reports for further analysis and the "Responsible Opposing Points of View" section in Chapter 3, EIS.

Environmental Consequences

Alternative 1

Direct and Indirect Effects

No direct effects will occur under Alternative 1 since no activities will be implemented as a result of the Project. Immediate post-fire effects in the Project are reduced fire spread and intensity, due to the reduction of available surface fuels. Over the next one to five years flame lengths, fireline intensity and rate of spread are expected to remain in a condition that will allow fire suppression resources to be capable of containing any unplanned ignition within the Project area.

From previous high severity fires on the Forest, vegetation typically begins to re-sprout and establish the year following a fire. Grasses, forbs and shrubs, such as manzanita, sprout along with oak and madrone tree species. Forested stands which had low to moderate fire severity will be expected to maintain relatively shrub free due to the overstory canopy layer shading out these species. Over the next one to five years, dead tree branches, conifer and broadleaf litter, small trees and shrubs not entirely consumed by the fire will overtime fall to the surface and contribute to surface fuel loading. In lieu of a significant fire weather event, predominately surface fire activity with low severity fire effects are projected up to five years or longer.

Over time, indirect effects of not taking any action will result in an increased potential of high severity fire occurring across the landscape again, as vegetation reestablishes and grows. Within moderate to high severity fire areas, hundreds of dead trees with few live trees remaining characterize the post-fire landscape. Indirect effects to future vegetation, fire behavior, spread and severity may be impacted as a result of taking no action and leaving standing dead trees on portions of the landscape. Standing snags may retain a substantial amount of biomass that will contribute to surface fuels over time as snags fall (Ritchie, Knapp, & Skinner, 2012).

Currently, standing dead trees are storing an enormous loading of dead fuel. Within high severity fire areas, as time increases without disturbance (i.e. fire) to the fire area, it is expected that forested areas will re-establish into non-forested vegetation predominately with shrub species. In a matter of 10 years fire hazard is expected to increase, and again be susceptible to high severity fire. Shrubs, which can act as a "heat sink" with high live fuel moisture contents, can increase duration (or heating) required to ignite foliage; however,, typical live fuel moisture patterns decrease moisture contents over time as seasonal drying and lack of precipitation continue through the summer months. These result in these fuels becoming a "heat source" and are susceptible to ignition, rapid spread rates and increased fireline intensities. The post fire effects of dead surface fuel conditions along with standing trees now add to the area's susceptibility to fire.

The Chips (2012) fire on the Plumas and Lassen National Forests highlights reburn potential within a 12 year old fire scar. The Chips fire, while occurring in the Sierra Nevada, started and burned for a long period of time within steep drainages of the Feather River Canyon and was subject to daily thermal inversions. Shrub regrowth amongst standing snags created high severity fire effects within the footprint of the 2000 Storrie fire on the Plumas and Lassen National Forest. Heavy consumption of shrub, herb, grass, snag and downed fuels is evident (Fites, Ewell, & Bauer, 2012).

FlamMap provides the ability to spatially predict fire behavior across the landscape. Fuel models are based on future vegetation utilizing fire history and vegetation regrowth after these fires. Within 10 to 20 years (Figure 3-6), approximately 60 percent of the landscape could see flame lengths greater than 4 feet and fireline intensities greater than 100 btu/ft/sec (British Thermal Units/foot/second). FlamMap does not incorporate 1000-hour fuel loadings (fuels greater than 3" diameter) into fire behavior modeling; within areas that have increased fuel loadings due to snag fall, fireline intensities could exceed 3000 btu/ft/sec.

Table 3-10: 10 to 20 Year potential flame length within the Westside Fire Recovery Project Area.

Flame Length (ft)	Acres	Percent of Project Area	Interpretation
< 4 Feet	80,739	37.55%	Persons using handtools can generally attack fires at the head or flanks. Handline should hold the fire
4 to 8 Feet	98,039	45.60%	Fires are too intense for direct attack on the head by persons using handtools. Handline cannot be relied on to hold fire. Equipment such as dozers, engines, and retardant aircraft can be effective.
8 to 11 Feet	10,875	5.06%	Fires may present serious control problems such as torching, crowning, and spotting. Control efforts at the head of the fire will probably be ineffective.
> 11 Feet	25,365	11.80%	Crowning, spotting, and major runs are common; control efforts at the head of the fire are ineffective.

Table 3-11: 10 to 20 year potential fireline intensity within the Westside Project Area.

Fireline Intensity (btu/sec/ft)	Acres	Percent of Project Area	Interpretation
< 100	75,407	35.07%	Persons using handtools can generally attack fires at the head or flanks. Handline should hold the fire
100 to 500	108,685	50.55%	Fires are too intense for direct attack on the head by persons using handtools. Handline cannot be relied on to hold fire. Equipment such as dozers, engines, and retardant aircraft can be effective.
500 to 1000	17,659	8.21%	Fires may present serious control problems such as torching, crowning, and spotting. Control efforts at the head of the fire will probably be ineffective.
> 1000	13,267	6.17%	Crowning, spotting, and major runs are common; control efforts at the head of the fire are ineffective.

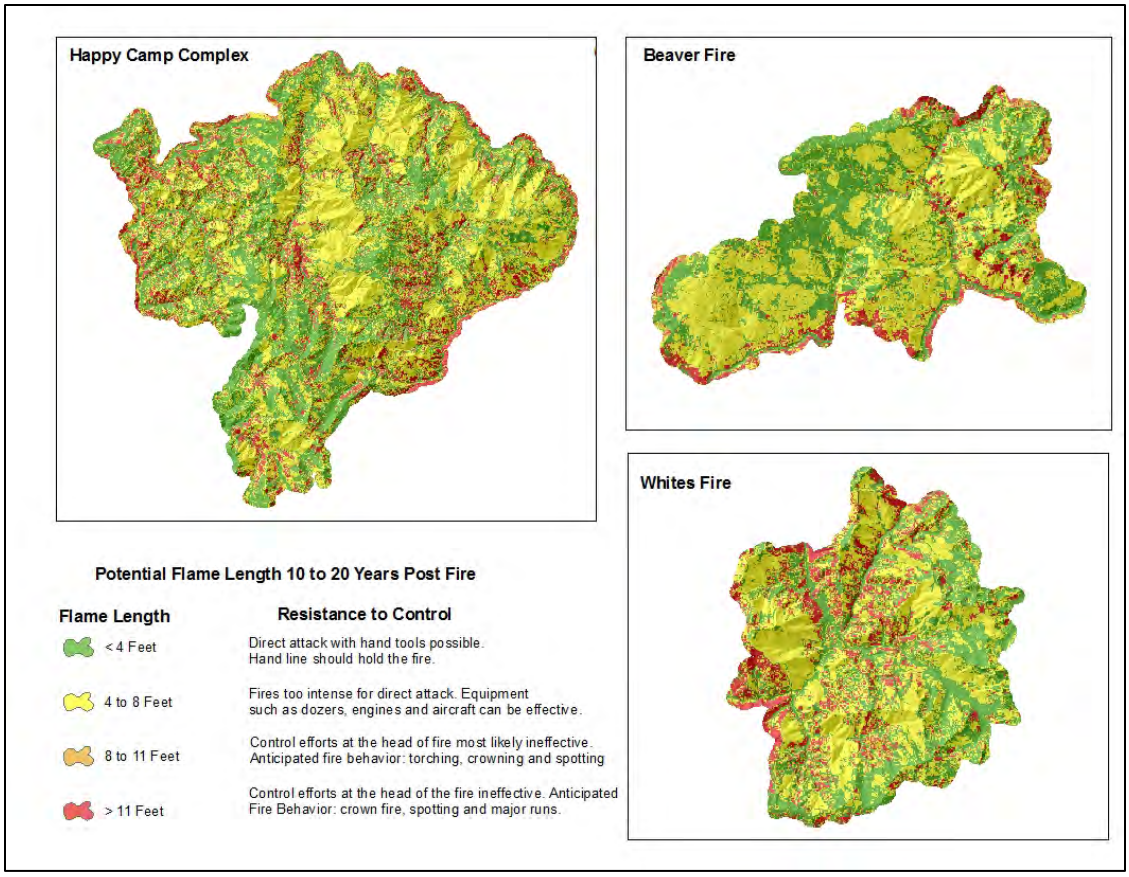

Figure 3-6. Potential flame lengths based on 90th percentile weather conditions 10 to 20 years post fire.

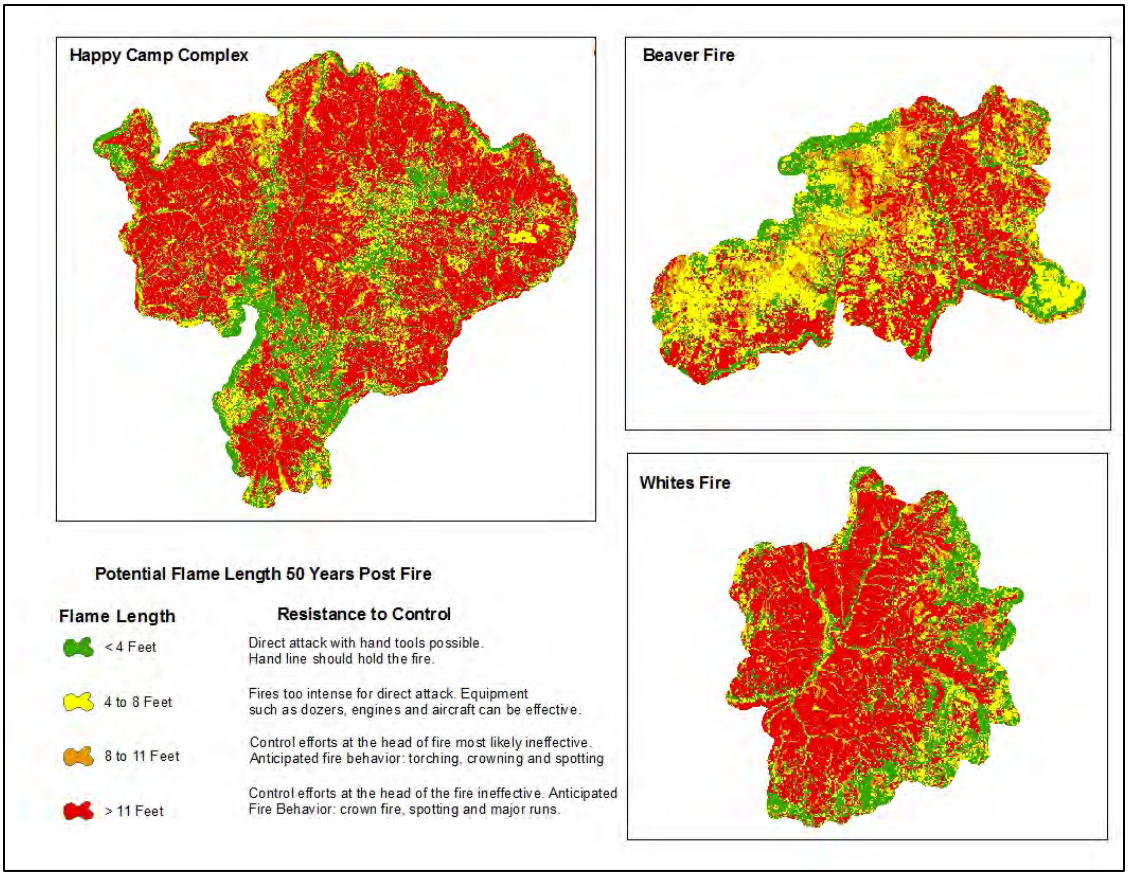

Figure 3-7: Potential flame lengths based on 90th percentile weather conditions 50 years post fire.

Fire persistence, resistance-to-control, and burnout time (which affects soil heating) are significantly influenced by loading, size and decay state of large woody material (Brown, Reinhardt, & Kramer, 2003). Large woody material can contribute to fire behavior and fire spread by acting as a source of embers, both directly by lofting from burning snags and indirectly through torching of trees preheated by burning of heavy fuels on the forest floor (Ritchie, Knapp, & Skinner, 2012).

Within ten years, large fuels have the potential to produce conditions that would result in high fire intensities and high severity fire effects in addition to increased resistance to control of wildland fires. This is especially the case where large trees are intermixed with shade tolerant small diameter trees. Such areas present a high risk of future fire effects. This is because smaller fuels accumulate to increase fire ignition and rate and size of spread. By contrast, large fuels smolder which contributes to sustained ignition during the flaming front, long duration burns, and high intensities for longer periods of time. Over the course of the next 50 years, without fire or other disturbance activities, low severity fire areas should be expected to look similar to pre-fire conditions. Odion et. al. (2004) and Thompson et al. (2007) describes this in their reviews of the 1987 Klamath National Forest fires and Biscuit fire areas, respectively. Both studies found that where low severity fire areas occurred in the past, the areas re-burned at low severity again. Conversely, areas that burned with high severity in the past tended to reburn with high severity again.

In high and moderate severity stands, large accumulations of fuels have the potential to exhibit intensities greater than 6,000 btu/ft/sec over the course of 50 years. It is

anticipated that these intensities could exhibit higher outputs based on the type of vegetation that establishes and intermixes with large fuel accumulations, affecting reburn potential and increased resistance to control over time. Much of the high severity fire areas were mixed conifer stands with closed canopies. Within areas of high severity that fully consumed forested canopies, it can be expected that non-forested conditions consisting of shrubs and grasses will persist.

The probability of a reburn is higher, though to an unknown extent, in heavy accumulations of coarse woody debris because of the high fire persistence that characterizes coarse woody debris (Brown, Reinhardt, & Kramer, 2003). (See responsible opposing points of view at the beginning of Chapter 3.) Beyond the initial flaming front, the residence time of fires is affected as large fuels smolder for long periods and then, through radiation and conduction, spread into soils and surrounding vegetation. The Fire Behavior Assessment Report from the Beaver Fire provides an example of temperature from initial flaming front through residence burn down time of larger fuels. Within the plot, estimated surface fuel loading was 70 tons/acre. The initial flaming front spiked temperatures to 1,000° Celsius then subsided to above 200 ° Celsius but sustained those temperatures for 30 minutes. Long-term smoldering can cause extended high soil heating, frequently above 140 ° Fahrenheit, which is the temperature required to kill plant tissue (Hood, 2010). Ground fires and consumption of large-diameter surface fuels can cause root and basal stem injury by consuming fine roots growing in the duff layer and through long-term heating of the soil and cambium at the tree base (Hood, 2010). As conifers reestablish within shrub fuels, they will be at risk of reburn at high severity and extended periods of heating (residence time) as large fuels burn down and smolder.

The same future conditions may exist over the course of a 50 year time period as shrubs establish and grow. Standing snags fall and contribute dead fuel loading and trees begin to intermix among the shrubs directly correlating to increased flame lengths, fireline intensity and subsequent fire severity from prolonged heating (residence time) of large surface fuels. Torching, crowning, and spotting, which contribute to large fire growth, are greater where large woody fuels have accumulated under a forest canopy and contribute to surface fire heat release (Brown, Reinhardt, & Kramer, 2003). Over time, it can be expected that the potential for high severity fire to occur where non-forested vegetation continues to grow and areas of high tree mortality continue to add to surface fuel loadings, especially where larger trees fall and decay. After enough fuels have accumulated, fire hazard likely increase with time as fuels accumulate and coarse woody debris rots, increasing its flammability (Monsanto & Agee, 2008; Peterson & Harrod, 2010). Within 50 years, approximately 80 percent of the Project area (, Figure 3-7) could exhibit flame lengths greater than four feet and fireline intensities greater than 100 feet. At this point in time, any new trees that have had the opportunity to establish in the post fire burn area will again be susceptible to crown fire activity.

Table 3-12 . Fifty year potential flame length within the Westside Project Area.

Flame Length (ft)	Acres	Percent of Project Area	Interpretation
< 4 Feet	40,906	19.02%	Persons using handtools can generally attack fires at the head or flanks. Handline should hold the fire
4 to 8 Feet	40,259	18.72%	Fires are too intense for direct attack on the head by persons using handtools. Handline cannot be relied on to hold fire. Equipment such as dozers, engines, and retardant aircraft can be effective.
8 to 11 Feet	24,510	11.40%	Fires may present serious control problems such as torching, crowning, and spotting. Control efforts at the head of the fire will probably be ineffective.
> 11 Feet	109,343	50.85%	Crowning, spotting, and major runs are common; control efforts at the head of the fire are ineffective.

Table 3-13 . Fifty year potential fireline intensity within the Westside Project Area.

Fireline Intensity (btu/sec/ft)	Acres	Percent of Project Area	Interpretation
< 100	35,849	16.67%	Persons using handtools can generally attack fires at the head or flanks. Handline should hold the fire
100 to 500	74,944	34.85%	Fires are too intense for direct attack on the head by persons using handtools. Handline cannot be relied on to hold fire. Equipment such as dozers, engines, and retardant aircraft can be effective.
500 to 1000	51,839	24.11%	Fires may present serious control problems such as torching, crowning, and spotting. Control efforts at the head of the fire will probably be ineffective.
> 1000	52,386	24.36%	Crowning, spotting, and major runs are common; control efforts at the head of the fire are ineffective.

Fire Suppression Capability

Snags are present within the wildland urban interface, road systems and strategic locations that have historically been used as primary control lines to contain previous large fire events. The impact of standing dead timber and subsequent surface fuel loading within moderate and high severity fire areas upon firefighter safety and wildland fire containment will increase resistance to control over the course of 50 years. In high severity fire areas, sampled tree data reveals snag densities ranging from 200 to 1,500 snags per acre.

It is anticipated that snags and increased surface fuels will subsequently increase suppression resource needs and the time required to control a wildland fire, even a small lightning-caused start-up. If a fire were to start in the Project area in 10 to 50 years, large downed fuel will present an increased resistance to control along with snags taking additional time and effort to control a fire. Large fuels require heavy mop-up utilizing engines or helicopters for water support to cool down the area as these fuels take time to consume and emit high fireline intensities and increase firefighter exposure to other environmental and physical factors.

To safely attack and contain a large fire in the future will also be difficult, time consuming, and require large amounts of suppression resources. Fires which start in

surrounding snag patches may require indirect suppression tactics due to safety. When fire suppression resources encounter snags, falling the tree is an option; however, when numerous standing snags exist, resources may decide to relocate control lines away from the hazards adding unburned fuel between resources and the fire, adding a new hazard. This added element generally means constructing safety zones and control lines cleared to mineral soil with equipment such as dozers and feller-bunchers. It is not uncommon to build indirect control lines 20 to 30 feet wide and safety zones five to ten acres in size utilized by firefighters as place to escape to should fire behavior be such to warrant withdrawal. When control lines are constructed by heavy equipment, the understory vegetation is pushed aside and piled without regard to consideration of other resources including archeological, soils and other sensitive features. After the fire, extensive time and energy goes into suppression repair to remove and repair control lines.

Large dead fuels that continue to decay increase their availability to ignite and consume due to increased surface area for direct flames impingement subsequently increase fireline intensity and resistance to control. Several previous fires within pre-existing fire scars have shown that large quantities of resources and indirect firefighting tactics are utilized to reduce exposure to snags. The Chips (Plumas/Lassen NF, 2012), Big Meadow (Yosemite NP, 2009), Backbone (Shasta-Trinity NF, 2009) and Corral Complex (Six Rivers NF, 2012) are examples where indirect strategies were utilized due to the presence of high amounts of snags. In these previous fire scars, fire suppression resources cut down snags along control lines to reduce aerial hazards and spot fire potential adjacent to control lines. The consequences surface fuel loadings are significantly increased adjacent to planned control lines. This results in high quantities of large fuels and subsequent potential for increased surface fireline intensities. The outcome requires equipment such as engines, dozers and aircraft to prep indirect control lines and hold burnout operations estimates potential resistance to control over the 50 year period; high to extreme resistance to control are estimated based on plots sampled within the fire area.

Snags, both ember producers and receptors in the wildland fire environment promote problem fire behavior. During the Big Meadow Fire, snags exhibited problem fire behavior as spot fires were emitted more than .25 miles ahead of the main fire and falling into receptive dead and down coarse woody debris from the 1996 A-Rock Fire scar. This result in the inability of fire suppression resources to safely construct fireline utilizing direct line tactics as the fire quickly increased in size as spot fire generated ahead of the main fire growing in size.

A case study on the Chips fire (2012) discussed resistance to control issues due to steep slopes hampering containment efforts However, once the fire burned into an area with a high density of snags, downed logs and shrub regrowth, fire intensity increased and large column development occurred causing fire suppression resource to withdrawal from direct attack and move to safer distances to construct control lines. Fireline construction on the Chips fire required great effort due to the steep terrain, heavy fuels and snags which hindered line construction. Much like the Chips fire, the Project contains steep slopes. Within the course of 10 to 50 years the Project area has the potential for significant fuel loading resulting in extreme fire behavior potential.

Wildland Urban Interface (WUI)/Strategic Fire Management Areas

Within the Project area, numerous communities, infrastructure, and private timberlands are located adjacent to National Forest System lands. With regards to the WUI, snags can jeopardize road systems as a serious ingress/egress issues during access to a fire and/or leaving the area in an emergency. Heavy fuel loads within WUI areas increases the likelihood of accelerated spread rates and higher resistance to control as a result of spot fire ignition, high intensities and large quantities of suppression resources to control a fire.

Fire suppression managers have identified and used strategic areas to control large fires. Many of the areas including natural barriers, ridge systems, and roads used to contain the 2014 fires had been used in previous fires on the Forest. It is reasonable to assume fire managers will gravitate to these locations to control an unplanned ignition. The King Fire (2014) on the Eldorado National Forest is an example of how fire managers utilized historic fire lines from the Ralston (2006) and Star (2001) fires in planning their containment efforts. Taking no action in the Project area will make future efforts to utilize these locations as effective control lines risky. Cutting snags increases the surface fuel loading adjacent to control lines and presents serious hazards to firefighters. Trees felled have been in a state of decay and weakened further subjecting hazards to falling teams (Sawyers who utilize chainsaws to fall trees) who cut down the trees. The increased fuel loading makes holding control lines difficult due to increased intensity as fuels continue to burn down igniting fires adjacent to control lines. Under Alternative 1, we can expect similar conditions along the ridge systems where high severity fire occurred.

Project Area A: Beaver Fire

The effects are the same as described above. There are currently 1,765 acres meeting desired conditions which means these acres will have a low fire hazard and a very low resistance to control for about 10 years post fire.

Project Area B: Happy Camp Complex

The effects are the same as described above. There are currently 6,895 acres meeting desired conditions which means these acres will have a low fire hazard and a very low resistance to control for about 10 years post fire.

Project Area C: Whites Fire

The effects are the same as described above. There are currently 3,740 acres meeting desired conditions which means these acres will have a low fire hazard and a very low resistance to control for about 10 years post fire.

Cumulative Effects

Project Area A: Beaver Fire

The McCollins Late Successional Reserve Enhancement project overlaps the spatial and temporal bounds with the Beaver fire area. This Project will reduce fuel loading on about 50 acres within the fire area.

The majority of the rest of the burned area is owned by Fruit Growers Supply Company and Michigan California Timber Company, and is located within the Beaver Fire Area. Both of these companies are either currently treating or planning to treat their land by conducting salvage operations on their respective properties. This accounts for about

9,900 acres in the Beaver fire area. It is understood that Fruit Growers Supply Company is planning a series of fuel breaks within the ridge and road systems of the Beaver fire area; lands owned by Fruit Growers are intermixed between Forest lands. On private timber land, salvage harvest is generally planned on slopes less than 45 percent, while commercial trees are being removed on slopes greater than 45 percent. After salvage operations are completed, replanting within these areas is expected. It is also expected that herbicide treatments will be applied to the planted areas to reduce shrub growth. As a result of operations expected on privately owned timberlands, these areas are expected to be relatively fire safe. This is primarily due to removal or reduction of most of the dead and dying trees on these lands and the use of herbicides to reduce regrowth. When added to the 1,765 acres already meeting desired condition, there will be 11,665 acres meeting desired condition over the next 10 years.

Project Area B: Happy Camp Complex

Projects that overlap in space and time with the Happy Camp Complex area include the Happy Camp Fire Protection project, Phase II, Lake Mountain Foxtail Pine project, Lovers Canyon project and Thom Seider project. These projects will reduce fuel loading on about 13,850 acres in the Project area. When added to the 6,895 acres that are meeting desired condition currently there will be a total of 20,745 acres meeting desired condition.

Project Area C: Whites Fire

The Eddy Late Successional Reserve project and Sawyers Bar Fuels Reduction project overlap with the Project area. These projects will reduce fuel loading on about 5,000 acres within the fire area. When added to the 3,740 acres that are currently meeting desired condition there will be a total of 8,740 acres meeting desired condition.

Alternative 2

Direct and Indirect Effects

Alternative 2 uses a variety of treatments to increase safety to public and forest users, reduce future surface fuel loadings, alter fire behavior and subsequently increase fire resilience over the long term as compared to Alternative 1. Alternative 2 includes salvage, site preparation, planting and release, hazardous fuels and roadside hazard treatments to meet the purpose and need of the Project and Fire Management Standards and Guides contained within the Forest Land and Resource Management Plan (2010).

Salvage Harvest & Site Preparation, Planting and Release

Post-fire logging can serve as an effective tool for managing fuel loadings in the regenerating forests after high severity wildfires (Peterson, Dodson, & Harrod, 2014). The direct effect of salvage harvest includes reducing the density of snags on the landscape (Ritchie, Knapp, & Skinner, 2012) and subsequently reducing future accumulations of large diameter surface fuels, as trees fall to the forest floor.

Within units identified for treatment, snag retention is proposed within stream course Riparian Reserves, inner gorges and identified leave locations. No salvage harvest is proposed in stream course Riparian Reserves and inner gorges. Snag retention outside of stream course Riparian Reserves and inner gorges will be in a clumping pattern in order to retain snags. This will promote decreased surface fuel loadings outside of these zones.

Within snag retention areas and RRs, surface fuel loadings will mirror conditions outlined under Alternative 1.

Post-fire logging produces a transient pulse of elevated surface woody fuel loadings followed by a much longer period of reduced surface woody fuel loadings relative to burned stands that are not logged. Peterson et al. (2014) found that post-fire logging altered post-fire fuel succession by: (1) greatly accelerating the deposition of surface woody fuels from logged snags; (2) reducing peak loadings of large diameter woody fuels; and (3) initiating the woody fuel decay earlier. Ritchie et al. (2012), evaluated salvaged units following the Cone Fire on the Lassen National Forest. They found that after four years, higher levels of surface fuel accumulations occurred in lower intensity salvage plots. The highest surface fuel accumulations occurred in un-salvaged plots four to eight years after the fire. Furthermore, the highest levels of large woody debris were associated with un-salvaged areas. Where whole tree yarding is not used follow-up fuels treatment is needed to treat activity-generated fuels (Ritchie, Knapp, and Skinner, 2012). Under Alternative 2, activity generated slash will be piled and burned, reducing surface fuels to levels consistent with low fire hazard.

Tree harvesting methods include ground based logging, cable logging and helicopter logging. It is anticipated that there will be a delay between harvesting activities and associated fuel reduction activities. During this time, logging activities will result in an accumulation of surface fuels, especially within cable and helicopter units where whole tree yarding is not planned. Logging will result in broken tops and branch wood and have a short term effect on elevated surface fuel loading. Post-harvest fuel loading is expected to be greatest within helicopter units, followed by skyline and ground-based units. However, activities following harvest break the structure and composition of the fuel bed. Ground-based units will be expected to reduce the greatest amount of surface fuels upon completion of fuels reduction due to the ease of facilitating piling and other fuels reduction activities on gentler slopes. Steeper slopes (greater than 40 percent) would require hand piling and/or broadcast burning to achieve desired surface fuel loadings of less than 10 tons per acre. Larger diameter fuels (greater than three inches in diameter) within helicopter units, or those areas on steep slopes, may increase fuel loading as these fuels can be difficult to pile by hand.

Post-implementation surface fuel loading is projected in these values, resulting from residual activity slash on site. While the tables and figures (

Table 3-12 and Table 3-13) do not contain descriptions of all of the distinct areas within the Project area, they do demonstrate the range of conditions that are predicted to exist.

Alternative 2 post treatment activities are expected to significantly reduce large surface fuel accumulations in the future, as compared to Alternative 1. Furthermore, while modeling predicts an expected increase in surface fuels that are less than three inches in diameter at breast height, it also predicts that Alternative 2 will promote low accumulation of surface fuel loadings after implementation of activities. Comparatively, Alternative 1 significantly elevates surface fuels for decades. Post-logging fuel treatments, such as piling and burning, can rapidly reduce total amounts and spatial continuity of surface woody fuels, and may allow logged stands to serve as fuel-breaks in a landscape-level fire management strategy (Peterson & Harrod, 2010).

The combination of residual slash and future fuel loading from standing trees, is low enough so that the accumulation of additional surface fuels from snags left standing for wildlife, fisheries and water quality purposes will not present a large fuels buildup over time and contribute to fire suppression difficulties.

Mastication is essentially the mulching or chipping of wood material, and may be utilized in selected stands to reduce high snag densities, in lieu of piling stands. Mastication will have a direct effect on the structure and composition of fuel beds post fire. Under Alternative 1, surface fuels will fall over in random patterns essentially "crisscrossing" as they fall, with some fuels resting on top of others, and will increase fuel bed density and height. Higher surface fuel beds will be subject to wind and fuels preheating lower in the surface profile, thus increasing fire behavior potential. Where mastication is identified as a treatment option under Alternative 2, chipped material will create a compact fuel bed, rather than having standing dead material that falls overtime Material will also be expected to decay faster with masticated material due to its proximity to the ground and being saturated for longer period of time during the winter months.

Roadside Hazard Treatments

Roadside hazard treatments increase the safety of accessing the Forest by reducing the potential for dead trees to fall across Forest roads and within recreation sites. Trees removed offsite reduce surface fuel loadings adjacent to road systems and allow for safe and improved fire control along ingress/egress roadways.

Hazardous Fuels Treatments

Hazardous fuels treatments are proposed within the WUI and along strategic road and ridge systems. Fire suppression resources have historically used these areas for the control of unplanned fires and for the implementation of prescribed underburning. Hazardous fuels treatment not meeting desired conditions will require maintenance.

Proposed thinning with follow-up pile burning, lop and scatter, or chipping, decreases surface fuel loadings to desired conditions of less than seven tons per acre (zero to three inches diameter fuels), reduces ladder fuels by removing small diameter trees, and increases canopy base heights of retained green trees. Surface fuel reduction, in conjunction with increasing canopy base heights, will reduce flame lengths and crown fire initiation.

Fuel reduction within the WUI will reduce fuel loading and minimize ladder fuels in order to create a more defensible WUI during future fire events. Both live and dead

understory vegetation (less than 14 inches in diameter at breast height) will be altered or removed to reduce potential flame length, potential fire intensity, and the potential for crown fire activity. Identified treatment areas may receive either mechanical or hand methods of fuel reduction. Mechanical treatments, other than mastication, will be followed with piling and burning of activity slash. Mastication treatments are not expected to result in activity slash that is suitable for piling and will only be used in situations where the resulting fuel bed is not determined to pose a risk to fire control or fire ecology objectives. Activity slash resulting from hand treatment will be piled and burned, chipped, or lopped and scattered. Dead trees greater than 14 inches in diameter can be cut and used for firewood, piled and burned, or lopped and scattered.

Strategic ridge systems are features on the landscape that can aid in the control or containment of future wildfires. Existing and historic control lines are being used as strategic ridgetop fuel breaks. Ridge systems will maintain existing (used in the 2014 wildfires) and historic control lines as described in Chapter 2 description of alternatives

Post-fire conditions are such that fuel loadings will be expected to recover to sufficient levels to implement low intensity fire to mimic a frequent fire return interval as dead vegetation falls from the canopy over the next three to six years. Many of the prescribed burn locations will use existing control lines established in recent large fires within the Project area. Line construction activities will occur around the perimeter of the prescribed fire unit, and will include using dozers to re-scrape control lines to mineral soil. Hand line construction to soil level will occur where mechanized equipment has no access, is impractical, or for some other reason is not available. Removal of understory vegetation (12 inches diameter or less) along control lines may occur in order to facilitate holding operations during prescribed fire implementation.

Prescribed fire activities naturally prune the lower branches of trees by burning the live and dead needles and small branch wood, which effectively increases the canopy base heights. Overall, canopy bulk density will be expected to be comparable to current conditions, since mid-story and overstory canopies will remain mostly intact. A mosaic burn pattern will be expected due to post fire burn severity patterns.

Fire Behavior Synopsis

Without active post-fire fuel reduction treatments, fuel succession processes create high potential for subsequent high severity wildfire 20-40 years following wildfire in dry coniferous forests (Peterson & Harrod, 2010). Proposed treatments in Alternative 2 effectively reduce fuel loading in the short and long term which in turn reduces fire behavior, when compared to Alternative 1. Fire hazard is diminished in the short term, one to three years, due to the lack of surface fuels to support the spread of fire. However, actions taken to reduce standing dead trees will now reduce fire behavior (flame length, fireline intensity, and spot fire potential) and associated fire hazard in the long term.

Within ten years, reductions in surface fuel loadings, as a result of planned activities, have the potential within proposed treatment areas to reduce flame lengths to less than four feet, reduce fireline intensity to less than 100 btu/ft/sec, and decrease spot fire activity through removal of snags and future fuel loading. This will effectively produce fire behavior such that persons using hand tools can generally attack fires at the head or flanks and handline is sufficient to hold the fire.

Post treatment fire hazard is expected to be reduced due to the change in structure, continuity and composition of the fuel bed, and reduction in long term fuel loadings. Within areas that receive treatment, the primary carrier of fire would be expected to consist of small diameter woody material, less than three inches diameter. Moderate load activity slash would be a representative fuel bed post-harvest prior to fuel reduction activities. The key difference from Alternative 1 is the removal of snags and reduction of large woody debris. Upon completion of harvest and site preparation activities, fuel loadings would be consistent with a low load activity slash and/or low/moderate conifer/hardwood litter, with the primary carrier of fire being small woody fuels. Conversely, Alternative 1 would consist primarily of shrub-dominated species intermixed with accumulated dead woody fuels from snag fall and still standing snags.

The type of fire behavior predicted under Alternative 2 will enable direct attack by ground crews within the units proposed for treatment. Untreated portions of units, such as RRs or snag retention pockets, will be expected to produce flame lengths greater than four feet and fireline intensities greater than 100 btu/ft/sec. Additionally, with recognition that prescribed fire activities will produce a mosaic burn pattern, within these areas, potential increases in fire behavior will occur where fire did not burn.

When compared to Alternative 1, decreased accumulations of large surface fuel loads will reduce the duration of fuel consumption and associated long term heating to surrounding vegetation and soils resulting in less fire intensity and potential severity within treated areas.

Reforestation efforts will have better chances of survival due to anticipated surface fuel load reductions within planted areas. Using empirical data for northern California forests, Weatherspoon and Skinner (1995) found that when wildfire in natural plantations spreads to adjacent plantations, fire intensity and damage to the overstory are much lower in plantations where slash has been removed following logging (Peterson, et al., 2009). Younger conifer and hardwood stands will still be susceptible to reburn and subsequent mortality even with Alternative 2, until tree age and canopy base heights increase. Younger trees have thinner bark and low canopy base heights allowing for easier transition to crown fire even with predicted flame lengths less than four feet over the majority of the proposed units. The lower the canopy is to the surface, the lesser the fire behavior required to generate crown fire initiation. However, with the removal of large surface fuels, higher survival will be expected within stands that continue to have management activities to maintain desire fuel conditions, as trees and canopy base heights increase in size.

Thompson, Spies and Olsen (2011) identified plantation age as the most important predictor of canopy damage. Older plantations experience lower levels of canopy damage; the fire resistance of Douglas-fir increases with age due to a continually thickening bark and increasing crown base heights, which reduce the likelihood of torching or crown fires. Alternative 2 effectively reduces future surface fuel loadings, especially within large fuels. This reduction in loading translates to lower predicted intensity and subsequent reduction in long duration heating to surrounding vegetation and preheating of the canopy to reduce crown fire initiation potential; thus, planted trees have a higher probability of success compared to Alternative 1.

The additional importance of fuels treatments under Alternative 2, related to reforestation, is reducing shrub growth through grubbing within planted areas, and breaking the uniformity and continuity of the fuel bed. However, without follow up maintenance, shrubs will be expected to reestablish and intermix within planted areas, producing similar fire behavior characteristics as Alternative 1. This risk may remain high for several decades if shrubs and other surface fuels are not frequently reduced. Even though maturing trees can withstand increasingly greater heat from a surface fire, in stands without fuel reductions, both litter loads and ladder fuels result in continued high vulnerability (McGinnis, Keely, Stephens, & Roller, 2010). Throughout the life of the Project, it is anticipated that tree growth (either planted or natural regeneration) is expected to reach at least 50 feet tall with 6 to 10" diameter at breast height. Post treatment units are anticipated to consist of low/moderate load conifer litter or a low slash fuel loading resulting in less than ten percent probability of mortality should a fire occur under 90th percentile weather conditions. Comparatively, under Alternative 1, shrub regrowth intermixed with snag fall would be anticipated to have mortality potentials greater than 95 percent.

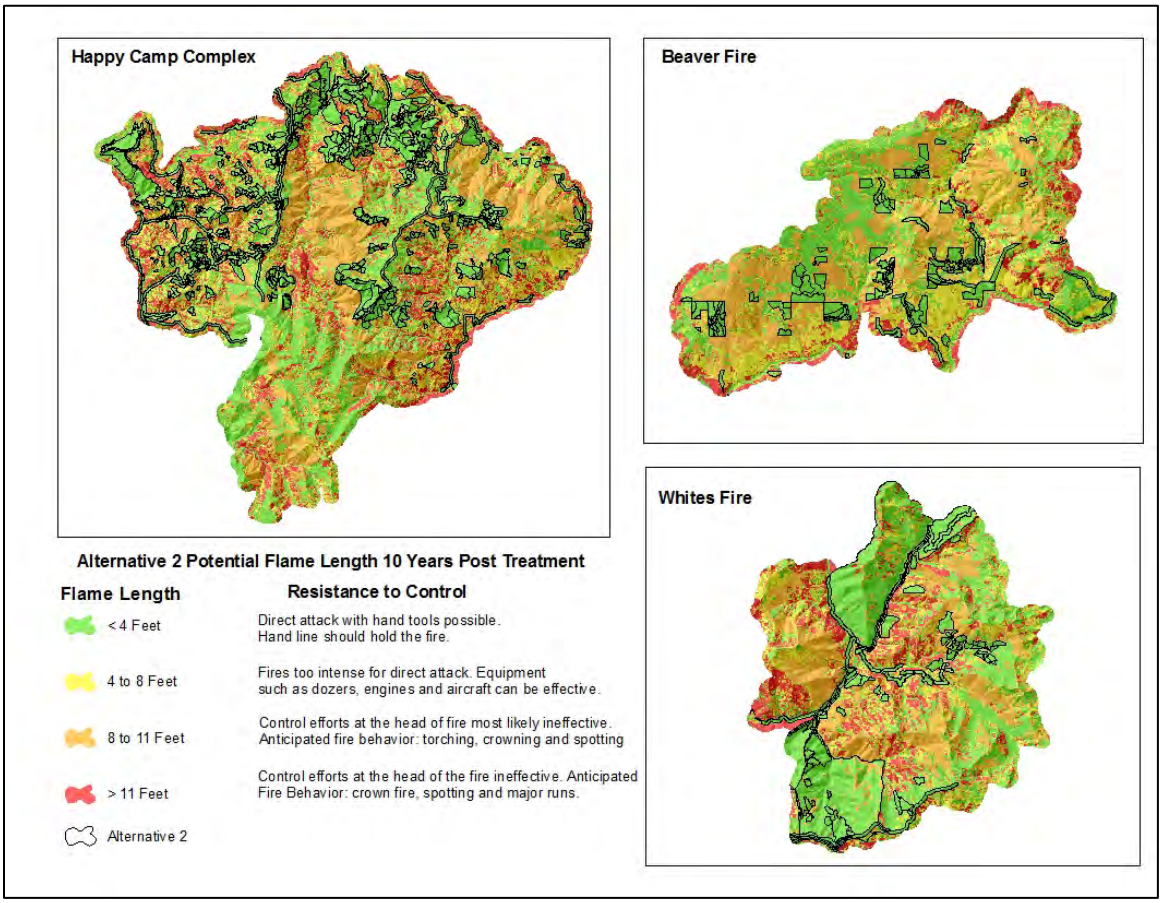

Figure 3-8. Alternative 2 potential flame length 10 years post treatment.

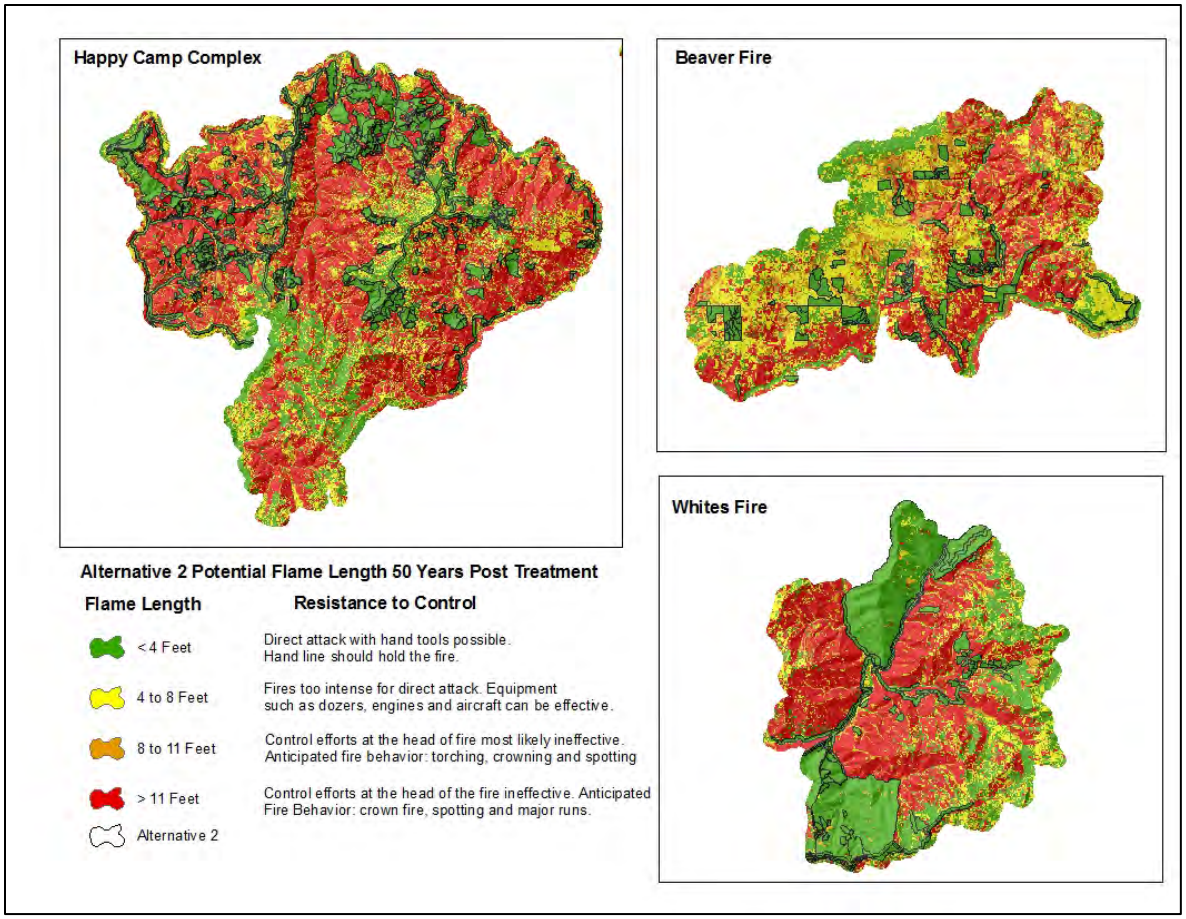

Figure 3-9. Alternative 2 projected flame lengths > 20 years post treatment.

Fire Suppression Capabilities

Under Alternative 2, safer and more efficient fire suppression actions are anticipated as a result of the proposed activities, when compared to Alternative 1. Removal of roadside hazard trees provides for safe ingress and egress to fires. The reduction of snags and subsequent fuel loadings modifies flame length and fireline intensity which enables direct attack and increases fireline production rates, effectively decreasing resistance to control by removing large fuel accumulations. Moreover, a general lack of snags will permit safer nighttime fireline operations.

Project Design Features to clump snags effectively achieves fire suppression capability. Clumped snags will allow firefighting resources to locate control lines around these areas and safely engage a fire with limited need to fall high densities of snags. Snag retention is planned in areas that are rarely used by fire managers to contain a large fire; for example, lower one-third of slopes, away from roads and ridgetops.

The Kyburz Fire provides an example of suppression success within a previous salvaged area. The fire started at the bottom of the slope within the South Fork American River; diurnal winds fanned the fire up-drainage toward the community of Kyburz, (approximately 1 mile from the fire origin) and reburned within the footprint of the Freds Fire (2004). Portions of the Freds fire included post fire logging activity to reduce future fuel loading and snag density. The lack of heavy dead and down fuels allowed for fire suppression resources to continue to construct direct control lines keeping their safety

zone with them as the "black". All things considered, salvage harvest lead to: lower intensity fire, less exposure to hazard trees, and less exposure during mop-up activities. If direct tactics were not available as a result of an increase in snag densities, indirect line would have been required during nighttime operations requiring indirect tactics and increase in fire size. Resources including aircraft, heavy equipment and personnel were safely able to drop water and retardant in open areas and construct line with minimal large woody debris, which increased line production rates, and decreased resistance to control. This allowed for resources to effectively work through the night to complete control lines, keeping the fire from entering the community of Kyburz.

Identified treatments in the WUI modify fire behavior such that fires are anticipated to spread slower, with flame lengths less than four feet, allowing responding resources to take direct action to control fires due to the change in the composition and structure of fuels which promotes low resistance to control when compared to Alternative 1.

Fuel treatments within the WUI promote safer firefighting actions and evacuation of the public should a future large fire occur within the Project area. An indirect effect of eliminating high snag densities and treating surface fuels within the WUI is a reduction in future material being available as a source of embers both as a spotting source and receptive fuel bed, when compared to Alternative 1. Spotting and increased radiation make structures more difficult to defend from crown fire than surface fire (Cohen & Butler, 1996) (Scott & Reinhardt, 2001). Spot fires commonly occur at distances of one-half miles ahead of the main fire; however, observations greater than one mile have been observed during extreme fire behavior events. For example, on two occasions, the Beaver Fire experienced multiple spot fires over one mile ahead of the main fire.

Several case studies have documented the effects of fuels treatments within the WUI. Both the Grass Valley (Rogers, Hann, Martin, Nicolet, & Morgan., 2008) and Angora Fires (Murphy & Sexton, 2007) documented how fuel treatment effectiveness assisted with protection of structures, securing control lines, and reduction of fire behavior resulting in the ability to "pick-up" spot fires with direct actions. More importantly, Cohen and Butler (1996) noted that the degree of structure survival "results from a complex, interactive sequence of events involving the ignition and burning of vegetation and structures accompanied by varying fire protection efforts by homeowners and firefighters." Treatments proposed within Alternative 2 have projected surface fuel loadings to reduce fire behavior and allow for safe and effective fire suppression actions.

The 2012 Goff Fire highlights the benefits of fuel treatments in which the objective is to reduce surface fuel loading and modify fire spread and intensity within the WUI. The Seiad Creek Road Shaded Fuel Break project, completed in 2009, was utilized as a control line for the Goff Fire. Fuels treatment contributed to easier holding and burning along Seiad Creek Road, in the community of Seiad Valley. Both proposed salvage and hazardous fuels treatments planned under Alternative 2 of the Project will produce similar fire behavior. This fire behavior could support fire suppression resources with opportunities to burnout, hold fireline and safely take action on any identified spot fires in the advent of a large fire occurring after completion of the Project.

Fuels treatments identified along strategic ridge and road systems will enhance future fire management activities including fire suppression, managing unplanned ignitions, and implementation of prescribed fire. Maintaining these treatments provides opportunities

for fire managers to focus resources at priority locations (such as in the WUI) as well as provide options to utilize confine and contain strategies of future fires where untreated areas still contain high densities of snags, which inhibit safe work areas for fire suppression resources.

In the advent of a future large fire, strategic ridge and road systems are identified as areas that could be used and maintained by fire suppression resources providing time and opportunity to ignite backfire operations ahead of the main fire. Salvage and Site Preparation units provide an added depth to hazardous fuels treatments by increasing the size and scale. For example, a large fire within an untreated portion of the landscape, spreading uphill toward a treated area, will not immediately decrease to predicted fire behavior. As fire enters the treated area, the fringes of the treatment will likely see increased fire behavior as a result of fire front entering the treatment.

As fire continues through the treated area, fire behavior is altered reducing the spread and intensity of the fire. This type of activity was observed on the King Fire where fire activity outside of the completed fuels treatment consisted of a running crown fire. As the fire entered the treated area, the fringes saw high mortality within the overstory trees and understory vegetation. However, approximately 50 to 100 feet into the unit, the fire transitioned to surface fire and eventually arrested in the fuels treatment. This area was a 50 year old plantation that was thinned in 2010 and burned one year prior to the fire.

By strategically applying and varying post-fire logging treatments within landscapes, post-fire logging could reduce woody fuels and help reduce threats to human health, property, and ecosystem services from unacceptable future wildfire behavior and effects (Peterson, Dodson, & Harrod, 2014). With approximately 98 percent of the post treated units exhibiting flame lengths less than four feet, these locations assist with “buffering” fuels treatments within WUI and identified strategic ridge and road systems. These areas provide locations that can be used as safety zones and anchor points to effectively engage future fires as well as implement prescribed fire activities.

Snag Retention

Within salvage harvest units, Alternative 2 has leave areas where no treatment is proposed within aquatic Riparian Reserves and inner gorges. Large patches of untreated retention areas would not meet the purpose and need and desired condition into the future for the fire and fuels resource. Areas with more contiguous treatment would be more effective at meeting the purpose and need. Snag retention areas within treatment units would affect fuels conditions within the treatment unit to varying degrees, depending on size and placement of the leave area. Generally, larger snag retention areas would make the treatment unit less effective in meeting desired conditions. Retention areas would increase fuel loading adjacent to the treatment units, increase fire hazard, and decrease suppression capability. In general, snag retention areas make implementation of fuels treatments more difficult.

Project Area A: Beaver Fire

There are currently 4,730 acres meeting desired conditions which means these acres will have a low fire hazard and a very low resistance to control for about 20 years post fire. The pattern of acres meeting desired condition across the landscape is represented in Figure 3-8 and Figure 3-9.

Project Area B: Happy Camp Complex

There are currently 23,610 acres meeting desired conditions which means these acres will have a low fire hazard and a very low resistance to control for about 20 years post fire. The pattern of acres meeting desired condition across the landscape is represented in Figure 3-8 and Figure 3-9.

Project Area C: Whites Fire

There are currently 12,830 acres meeting desired conditions which means these acres will have a low fire hazard and a very low resistance to control for about 20 years post fire. The pattern of acres meeting desired condition across the landscape is represented in Figure 3-8 and Figure 3-9.

Cumulative Effects

Project Area A: Beaver Fire

See Alternative 1 under cumulative effects of the Beaver Fire for a discussion of the activities considered for cumulative effects. The McCollins Late Successional Reserve Enhancement project adds 50 acres of fuel load reduction treatment within the fire areas. When added to the 4,730 acres already meeting desired condition there will be 14,680 acres meeting desired condition over the next 20 years.

Project Area B: Happy Camp Complex

The Happy Camp Fire Protection project, Phase II, Lake Mountain Foxtail Pine project, Lovers Canyon project and Thom Seider project overlap in space and time with the Happy Camp Complex area. These projects will reduce fuel loading on about 13,850 acres within the Project area. When added to the 23,610 acres that are currently meeting desired condition there will be 37,460 acres meeting desired condition cumulatively.

Project Area C: Whites Fire

The Eddy Late Successional Reserve project and Sawyers Bar Fuels Reduction project overlap with the Project area. These projects will reduce fuel loading on about 5,000 acres in the fire area. When added to the 12,830 acres that are currently meeting desired condition, there will be a total of 17,830 acres meeting desired condition.

Alternative 3

Direct Effects and Indirect Effects

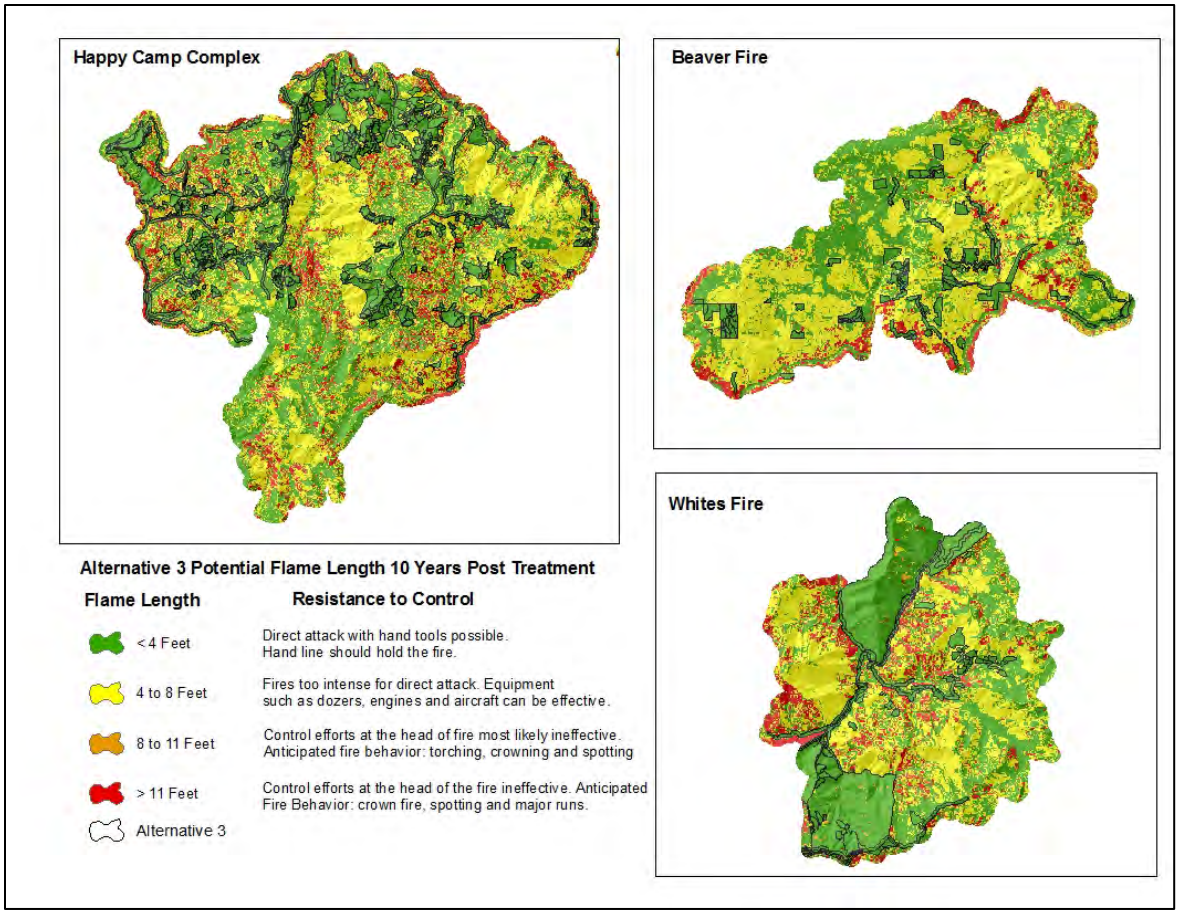

Figure 3-10 . Potential flame length 10 years post treatment, Alternative 3.

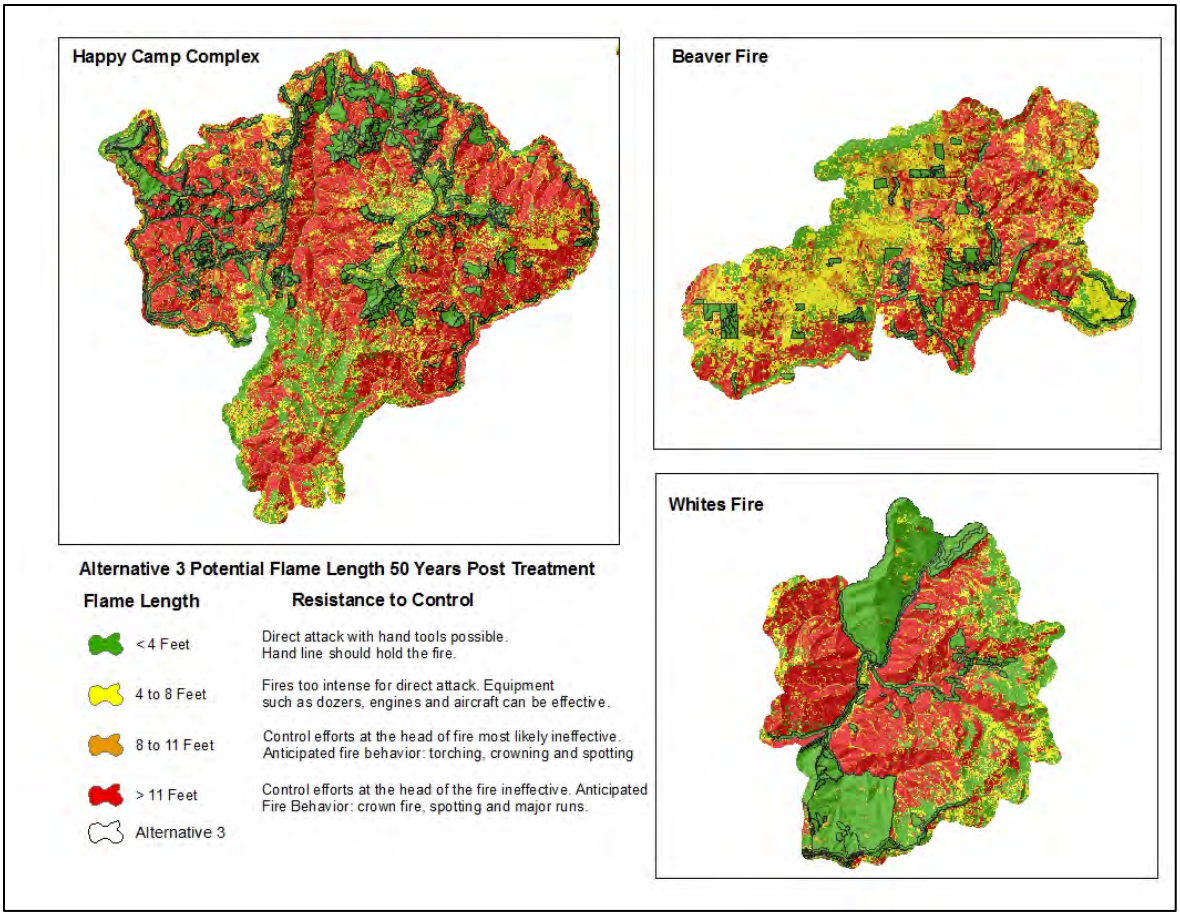

Figure 3-11. Potential flame length (Alternative 3) greater than 20 years post treatment.

Project Area A: Beaver Fire

Alternative 3 removes all salvage harvest activities from the Beaver Fire area. Areas not being treated are anticipated to be similar to those described in Alternative 1. Compared to Alternative 2, fuel loading in these areas would increase through time as snags decay and fall. Suppression capabilities would therefore decrease while fire severity and behavior would likely increase. This would increase meeting desired conditions for the additional fuels treatments proposed. There are currently 3,870 acres meeting desired conditions which means these acres will have a low fire hazard and a very low resistance to control for about 20 years post fire. The pattern of acres meeting desired condition across the landscape is represented in **Error! Reference source not found.** and Figure 3-11.

Project Area B: Happy Camp Complex

Alternative 3 has a reduction in fuel treatment area to reduce impacts to other resources compared to Alternative 2. There would be an overall reduction in fuels treatment effectiveness in meeting desired conditions and are primarily in salvage and site preparation units. There are currently 22,580 acres meeting desired conditions which means these acres will have a low fire hazard and a very low resistance to control for about 20 years post fire. The pattern of acres meeting desired condition across the landscape is represented in **Error! Reference source not found.** and Figure 3-11.

Project Area C: Whites Fire

The effects are the same as described in Alternative 2. There are currently 12,670 acres meeting desired conditions which means these acres will have a low fire hazard and a very low resistance to control for about 20 years post fire. The pattern of acres meeting desired condition across the landscape is represented in **Error! Reference source not found.** and Figure 3-11.

Cumulative Effects

Project Area A: Beaver Fire

Same as Alternative 2. When added to the 3,870 acres already meeting desired condition, there will be 13,820 acres meeting desired condition over the next 20 years.

Project Area B: Happy Camp Complex

Same as Alternative 2. When added to the 22,580 acres that are meeting desired condition currently there will be 36,430 acres meeting desired condition cumulatively.

Project Area C: Whites Fire

Same as Alternative 2. When added to the 12,670 acres that are currently meeting desired condition there will be a total of 17,670 acres meeting desired condition.

Alternative 4

Direct Effects and Indirect Effects

Project Area A: Beaver Fire

Alternative 4 would have the same proposed actions as described in Alternative 2, and therefore, the same effects. With the exception of the removal of salvage and site preparation units in section 32 and 4 of Doggett Creek, direct and indirect effects will be comparable in type and acreage described in Alternative 2. In order to mitigate the effects of dropping salvage and site preparation units in Section 32 and 4, a 200’ fuels treatment strip would be implemented along the west and south borders of Section 32. This would be an overall reduction in fuels treatment effectiveness in meeting desired conditions for this area. There are currently 4,620 acres meeting desired conditions, which means these acres will have a low fire hazard and a very low resistance to control for about 20 years post fire. The pattern of acres meeting desired condition across the landscape is represented in Figure 3-6 and Figure 3-7.

Project Area B: Happy Camp Complex

Alternative 4 has a reduction in fuel treatment area to reduce impacts to other resources, as compared to Alternative 2. There would be an overall reduction in fuels treatment effectiveness in meeting desired conditions and are primarily in salvage and site preparation units. There are currently 22,320 acres meeting desired conditions which means these acres will have a low fire hazard and a very low resistance to control for about 20 years post fire. The pattern of acres meeting desired condition across the landscape is represented in Figure 3-8 and Figure 3-9.

Project Area C: Whites Fire

The effects are the same as described in Alternative 2. There are currently 12,830 acres meeting desired conditions which means these acres will have a low fire hazard and a very low resistance to control for about 20 years post fire. The pattern of acres meeting desired condition across the landscape is represented in Figure 3-8 and Figure 3-9.

Cumulative Effects

Project Area A: Beaver Fire

Same as Alternative 2. When added to the 4,620 acres already meeting desired condition there will be 14,570 acres meeting desired condition over the next 20 years.

Project Area B: Happy Camp Complex

Same as Alternative 2. When added to the 22,320 acres that are meeting desired condition currently there will be 36,170 acres meeting desired condition cumulatively.

Project Area C: Whites Fire

Same as Alternative 2. When added to the 12,830 acres that are currently meeting desired condition there will be a total of 17,830 acres meeting desired condition.

Alternative 5

Direct Effects and Indirect Effects

Project Area A: Beaver Fire

Alternative 5 would be similar to Alternative 2 with additional fuels treatments proposed. Additional fuels treatments include fuel breaks and prescribed fire to protect private timberlands. There are currently 5,900 acres meeting desired conditions, which means these acres will have a low fire hazard and a very low resistance to control for about 10 years post fire. The pattern of acres meeting desired condition across the landscape is represented in Figure 3-12 and Figure 3-13.

Project Area B: Happy Camp Complex

Alternative 5 has a reduced amount of fuels treatment in the Happy Camp Fire area, as compared to Alternative 2. Salvage units and associated fuels treatments removed from Alternative 5 would be expected to significantly reduce opportunities to modify fire spread. There would be an increase in fuel loading, increase if fire severity and a reduction in fire suppression capability. For much of the Happy Camp Fire area, it would be expected to be comparable to Alternative 1effects described for Alternative 1. There are currently 13,300 acres meeting desired conditions which means these acres will have a low fire hazard and a very low resistance to control for about 20 years post fire. The pattern of acres meeting desired condition across the landscape is represented in Figure 3-12 and Figure 3-13.

Project Area C: Whites Fire

Alternative 5 removes all site preparation and all but 30 acres of salvage units with associated fuels treatment. Alternative 5 would continue to have hazardous fuels and roadside fuels treatments. The removal of salvage units would decrease firefighter safety and suppression capability in the future. Fuel treatments effectiveness would decrease across the Whites Fire area. Hazardous fuels treatments, primarily prescribed fire, overlap salvage units dropped in this alternative. This would dampen the effect of future fuel

loading and fire severity. However, future fires would likely be more difficult to control and require more time and effort of resources due to the safety exposure to snags and other anticipated fire hazards associated with accumulation of large fuels. There are currently 11,420 acres meeting desired conditions which means these acres will have a low fire hazard and a very low resistance to control for about 20 years post fire. The pattern of acres meeting desired condition across the landscape is represented in Figure 3-12 and Figure 3-13.

Cumulative Effects

Project Area A: Beaver Fire

Same as Alternative 2. This is primarily due to the removal or reduction of most of the dead and dying trees on these lands. When added to the 5,900 acres already meeting desired condition there will be 15,850 acres meeting desired condition over the next 10 years.

Project Area B: Happy Camp Complex

Same as Alternative 2. When added to the 13,300 acres that are meeting desired condition currently there will be 27,150 acres meeting desired condition cumulatively.

Project Area C: Whites Fire

Same as Alternative 2. When added to the 11,420 acres that are currently meeting desired condition there will be a total of 16,420 acres meeting desired condition.

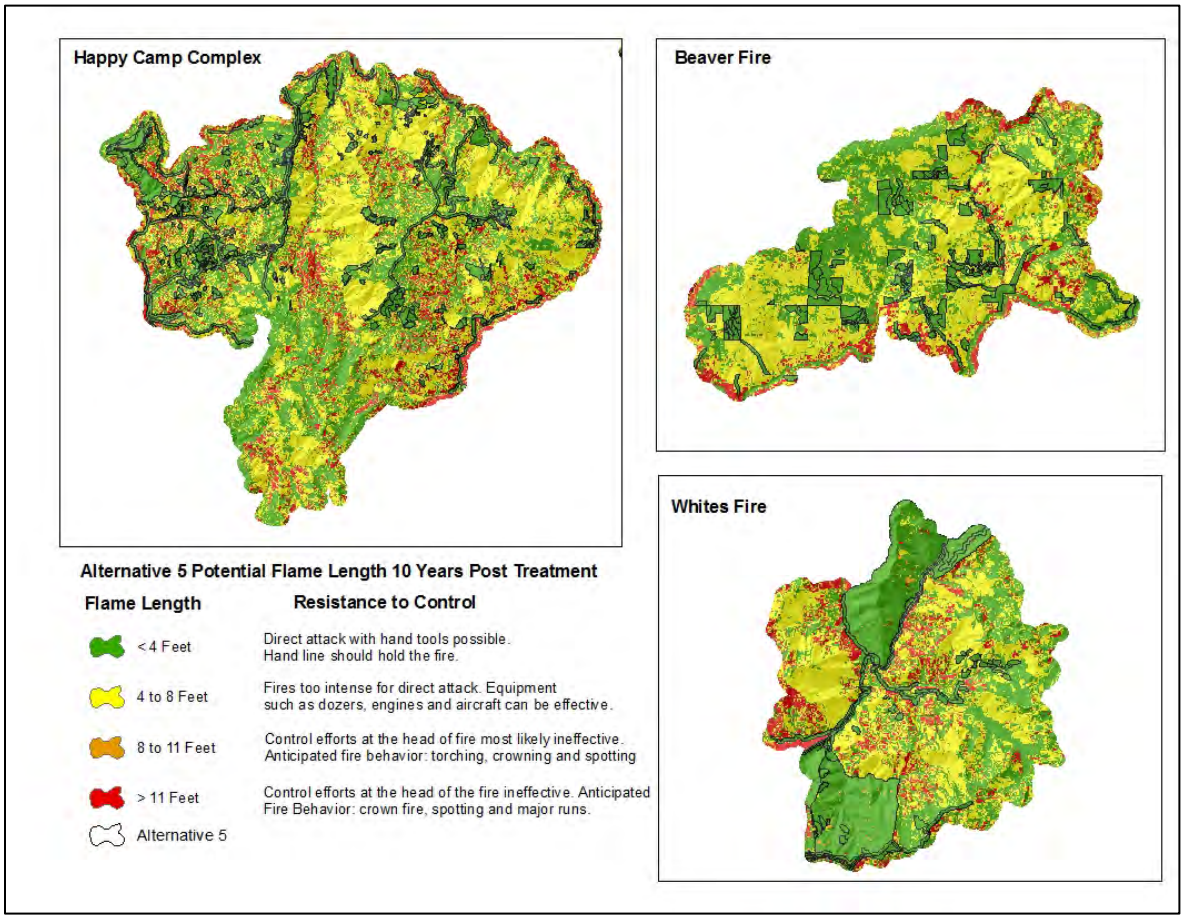

Figure 3-12. Potential flame length 10 years post treatment (Alternative 5).

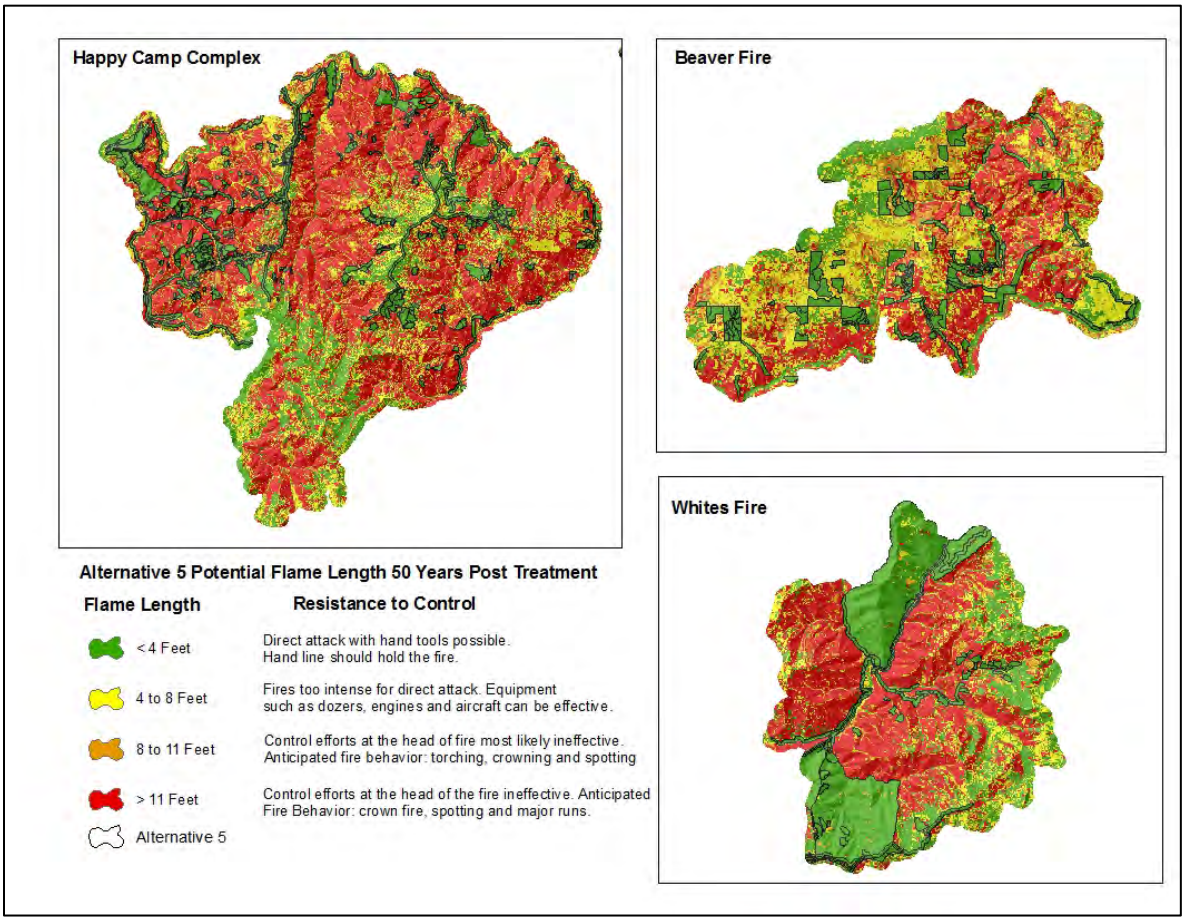

Figure 3-13 Potential flame length (greater than 20 years) Alternative 5.

Alternative 2 Modified

Direct Effects and Indirect Effects

Project Area A: Beaver Fire

The effects are the same as described in Alternative 2. There are currently 4,300 acres meeting desired conditions which means these acres will have a low fire hazard and a very low resistance to control for about 20 years post fire. The pattern of acres meeting desired condition across the landscape is represented in Figure 3-8 and Figure 3-9.

Project Area B: Happy Camp Complex

Alternative 2 Modified would have similar effects to those described in Alternative 2 with only a slight reduction in overall treated area. There are currently 22,870 acres meeting desired conditions, which means these acres will have a low fire hazard and a very low resistance to control for about 20 years post fire. The pattern of acres meeting desired condition across the landscape is represented in Figure 3-8 and Figure 3-9.

Project Area C: Whites Fire

The effects are the same as described in Alternative 2. There are currently 12,720 acres meeting desired conditions which means these acres will have a low fire hazard and a

very low resistance to control for about 20 years post fire. The pattern of acres meeting desired condition across the landscape is represented in Figure 3-8 and Figure 3-9.

Cumulative Effects

Project Area A: Beaver Fire

Same as Alternative 2. When added to the 4,300 acres already meeting desired condition there will be 14,250 acres meeting desired condition over the next 20 years.

Project Area B: Happy Camp Complex

Same as Alternative 2. When added to the 22,870 acres that are meeting desired condition currently there will be 36,720 acres meeting desired condition cumulatively.

Project Area C: Whites Fire

Same as Alternative 2. When added to the 12,720 acres that are currently meeting desired condition there will be a total of 17,720 acres meeting desired condition.

Alternative 3 Modified

Direct Effects and Indirect Effects

Project Area A: Beaver Fire

Alternative 3 Modified removes all salvage harvest activities from the Beaver Fire area. Areas not being treated are anticipated to be similar to those described in Alternative 1. Compared to Alternative 2, fuel loading in these areas would increase throughout time as snags decay and fall. Suppression capabilities would therefore decrease while fire severity and behavior would likely increase. Alternative 3 Modified would add additional fuels treatments proposed in Alternative 5. This would increase meeting desired conditions for the additional fuels treatments proposed. There are currently 4,695 acres meeting desired conditions which means these acres will have a low fire hazard and a very low resistance to control for about 20 years post fire. The pattern of acres meeting desired condition across the landscape is represented in Figure 3-10 and Figure 3-11.

Project Area B: Happy Camp Complex

Alternative 3 Modified has a reduction in fuel treatment area to reduce impacts to other resources, as compared to Alternative 2. Alternative 3 Modified would add additional retention areas for the Wildlife resource. This increase in retention areas is most pronounced in the Walker and Grider Creek drainages. Fuels treatment effectiveness in meeting desired conditions would be reduced in this area. More strategic areas such as roads and ridgetops would still be effective because leave areas were largely outside of these areas. Also, Alternative 3 Modified adds approximately 695 acres proposed in the Karuk Alternative to fuels treatment in the Happy Camp Fire area. This would increase the total area meeting desired conditions. Overall purpose and need, including forest resiliency, would be reduced from these actions for the Fire and Fuels resource.

There are currently 20,870 acres meeting desired conditions which means these acres will have a low fire hazard and a very low resistance to control for about 20 years post fire. The pattern of acres meeting desired condition across the landscape is represented in Figure 3-10 and Figure 3-11.

Project Area C: Whites Fire

Alternative 3 Modified reduces the acres of salvage and site preparation compared to Alternative 2. The majorities of these units were small acreage and isolated in nature. Therefore, similar effects would still be anticipated to those described in Alternative 2. The stand scale of units no longer being treated would not meet the desired condition. Alternative 3 Modified proposes additional hazardous fuels treatment proposed by the Karuk Alternative. Approximately 55 acres of treatment in the Rainbow Mine area would occur. This would improve meeting desired conditions for this small area and provide benefit to the adjacent private land. Overall, treatment effectiveness on the White Fire project area would be similar to Alternative 2.

There are currently 12,645 acres meeting desired conditions which means these acres will have a low fire hazard and a very low resistance to control for about 20 years post fire. The pattern of acres meeting desired condition across the landscape is represented Figure 3-10 and Figure 3-11.

Cumulative Effects

Project Area A: Beaver Fire

Same as Alternative 2. When added to the 4,695 acres already meeting desired condition there will be 14,465 acres meeting desired condition over the next 20 years.

Project Area B: Happy Camp Complex

Same as Alternative 2. When added to the 20,870 acres that are meeting desired condition currently there will be 34,720 acres meeting desired condition cumulatively.

Project Area C: Whites Fire

Same as Alternative 2. When added to the 12,645 acres that are currently meeting desired condition there will be a total of 17,645 acres meeting desired condition.

Compliance with law, regulation, policy, and the Forest Plan

All alternatives comply with law, regulation, policy and the Forest Plan pertinent to fire and fuels as displayed in the Forest Plan consistency checklist.

Terrestrial Wildlife

The Project is analyzed for its potential effects on wildlife species listed as Endangered, Threatened, or Proposed under the Endangered Species Act; designated critical habitat; Forest Service Region 5 Sensitive Species; Survey and Manage Species (under current consideration), Management Indicator Species, and Migratory Birds (MOU 2008). This section synthesizes the information and analysis of effects on Threatened, Endangered, Forest Sensitive Species, and Management Indicator Species, and compliance with requirements for Survey and Manage Species, and Migratory Birds. Relevant scientific literature is discussed in context throughout this section.

Methodology

The analyses are based on the best[34] scientific and commercial data available at the time this document was written. Information such as data collected from Forest databases, remote sensing vegetation analysis, the Forest existing vegetation (EVEG), direct field assessments, California Natural Diversity Database, and the most recent and appropriate scientific research and species information, was all used for the consideration of direct, indirect and cumulative effects.

Threatened, Endangered, Proposed and Candidate species in the Project area are identified using the U.S. Fish and Wildlife Service list of Threatened, Endangered, Proposed or Candidate Species (Document #490143515-161248 retrieved on February 11, 2015). The Forest Service (Pacific Southwest Region (Region 5)) Sensitive Species list (revised July 3, 2013) identifies the species to consider for this analysis. Survey and Manage Species are identified in Record of Decision (2001) as adjusted in 2014 and interpreted by Forest Service, Region 5 guidance (2014). Using these three lists, a determination is made of whether the species range overlaps the Project area and whether habitat is likely to exist in the Project area. If both are true, then the species is analyzed for the Project.

Special Habitat

Peregrine falcons were delisted under ESA in 1999 because the peregrine falcon is considered to be recovered by the USDI Fish and Wildlife Service. The falcon is not included in the Forest Service Sensitive Species or Management Indicator Species lists. However, the Forest Plan includes a provision for the Special Habitat Management Area around peregrine falcon eyries for the recovery of the species by managing for high quality habitat; the Forest Plan has not been amended to remove this provision so the provision will be followed.

The Project proposes fuels reduction treatment that occurs within the Special Habitat area. The treatment will reduce the risk of high severity fire and consequently maintain the existing habitat. Therefore, the proposed treatment is consistent with the management of this area and will not be analyzed further for this Project.

Bald eagles were also delisted under ESA but the eagle is included in the Forest Service Sensitive Species list. Forest Plan provisions for the Special Habitat Management Area around bald eagle nests will be followed. Effects of the project on bald eagles are disclosed under discussions of Forest Service Sensitive Species.

Northern Spotted Owl

Rapid Assessment of Vegetation Condition (RAVG) after wildfire and habitat data

For the post-fire assessment of habitat, we used Rapid Assessment of Vegetation Condition after wildfire (RAVG) data to estimate the level of fire effects to owl habitat. RAVG is a vegetation burn severity modeling approach to assess the change in vegetation condition. The RAVG data show the tree basal area loss due to fire throughout the burned area. Therefore, in any given spot in the fire perimeter, we can estimate the

[34] Best available science is defined as scientific literature that is relevant to the project and available to the reader and decision maker.

fire effects to the vegetation using the RAVG level of basal area loss. For this analysis the RAVG data were split into five classes. We interpreted these five classes into RAVG Class 0 (no burn--zero percent basal area loss), RAVG Class 1 (very low--greater than 0-25 percent loss), RAVG Class 2 (low--25-50 percent loss), RAVG Class 3 (moderate--50-75 percent loss), and RAVG Class 4 (high--75-100 percent loss) to represent the fire severity.

Using the RAVG data and the habitat GIS data, we can identify each area of habitat with a specific level of basal area loss using RAVG. Then we compared the GIS habitat layer and RAVG accuracy through multiple field visits performed in 2014 and 2015. The field reviews resulted in determining these data were sufficient for estimating the potential effects of the Project.

Habitat description

Northern Spotted Owl (NSO) habitat is commonly separated into nesting/roosting (NR), foraging (F), and dispersal (D) habitat, and these habitat types are described in detail in the NSO Recovery Plan (USDI USFWS 2011). Nesting/roosting is generally described as mid- to late-seral forests that contain stands of large trees with high canopy cover (greater than or equal to 60 percent), multilayered canopies, and nesting platforms. Foraging habitat can be described as slightly reduced canopy cover, fewer large trees, but still enough space in the understory for NSO to maneuver through the trees for hunting prey. Dispersal habitat contains a moderate level of canopy closure and trees large enough to provide shelter and potential foraging opportunities for traveling NSO. For this analysis, suitable habitat is defined as NR and F habitat.

Multiple aspects of suitable habitat are required for habitat to be considered suitable or high quality habitat such as the presence of defect and decay in the stand, large downed logs and snags, and the presence of water in appropriate distance and juxtaposition to stands that contain these attributes (USDI USFWS 2011). These habitat elements cannot be queried from the EVEG data; for specific areas of the Project, these elements were assessed through field evaluation, National Agriculture Imagery Program imagery, and discussions with field personnel familiar with vegetative conditions in the Project area. Given this level of uncertainty of the accuracy of suitable habitat designation in the GIS layer, the actual quantity of suitable habitat may be somewhat overestimated. Due to the scope and scale of this Project, it was not practicable to field validate the remotely sensed habitat data (EVEG) for all areas affected by all Project activities. However, the portion that was field evaluated resulted in a reasonably accurate assessment of the habitat layer depicting NRF habitat even though there was some error in accurately splitting NR and F over the entire analysis area. Even though NR and F are sometimes presented separately in this analysis, most of the analysis combines NR and F to reduce this potential error.

Suitable habitat that burned at very low or low fire severity typically retains the important habitat attributes associated with the NR, and F habitat function. However, NR and F habitats that burned at moderate and high fire severity typically experience a large change in vegetation structure which is evident by having the tree canopy cover reduced typically well below 40 percent and most, if not all, the understory consumed by the fire. Suitable habitats that burned at moderate and high fire severity are discussed in the literature as areas used by spotted owls for foraging (e.g. Bond et al. 2002, Clark 2007, and Bond et al. 2009). Even though the research has described spotted owl use of burned forest, there

is still a lack of certainty and agreement on this topic. For purposes of this analysis, suitable habitat that experienced moderate and high fire severity were described in categories called post-fire foraging (PFF) and fire-affected nesting/roosting (FANR).

These categories (PFF and FANR) of habitat were delineated to capture the potential for continued use by NSO of previously suitable NR and F, at least in the short term until the ultimate deterioration of the burned habitat and loss of standing trees. Even with the loss of canopy cover and key habitat components typically found in NR and F habitat, studies indicate that burned areas can still provide foraging opportunity after the fire, depending on many factors including patch size, edge type, burn severity, and proximity to known owl sites (Bond et al. 2002, Bond et al. 2009, Clark 2007, Clark et al. 2011, and Clark et al. 2013).

Although NSO use of PFF is well documented, there is still some uncertainty on how PFF contributes to reproduction. However, assuming that foraging habitat is important for providing a food supply necessary for NSO survival and reproduction, and PFF, although physically different from F habitat, may provide foraging opportunity, tracking PFF and analyzing the effects from post-fire salvage provides useful information. The foraging opportunity provided by PFF may be particularly important for active sites in core areas that have been affected by fire (Lee and Bond 2015b). The core area contains the concentrated owl use during nesting and this area likely provides all or almost all the resources for nesting.

The EVEG habitat layer provided the baseline of suitable NR and F prior to the 2014 fires. Post-fire foraging habitat was then determined by overlaying the correctly categorized RAVG data to the pre-fire NR and F. PFF was delineated where moderate fire severity or high fire severity occurred in pre-fire foraging habitat or where high fire severity occurred in pre-fire nesting/roosting habitat.

A large proportion of PFF is NR and F habitat that burned at the highest severity and, therefore, contains minimal amounts of structure or cover. Because of this, it was assumed that NSO are not likely to use PFF when it occurs too far away from existing cover (estimated to be more than 500 feet). This distance was derived from a review of recent literature on the use of edge habitat (Comfort 2013, Eyes 2014) and professional judgment. For this analysis, PFF1 is PFF that is within 500 feet of suitable habitat patches greater than or equal to five acres in size. PFF2 is the PFF that doesn’t meet the definition of PFF1.

FANR was delineated for this analysis as NR habitat that burned at moderate severity because NR habitat that has been affected at this level is not expected to function in the same way as NR habitat that has been affected by low severity fire. Because stands of habitat that burn at moderate severity can result in 50 to 75 percent of the basal area loss, fire severity can result in a wide variety of stand conditions post-fire. If a stand was typed as nesting/roosting prior to the fire, it was comprised of high canopy closure and larger trees, among other variables. Therefore, if a fire burned at the low end of moderate severity (grid code 3, closer to 50 percent loss of basal area), then the stand may retain more canopy cover and less tree mortality than a stand that received moderate fire severity at the higher end of moderate fire severity (grid code 3, closer to 75 percent basal area loss). Stands that burned at the higher end of moderate fire severity have more of the appearance of a high-severity burn and lack the characteristics necessary for cover and/or

thermoregulation to be used as nesting/roosting or foraging habitat. Fire-affected nesting/roosting is a small portion of the total acres of NRF, PFF and FANR because FANR typically occurs on the fringes of high severity burn patches, in the transition zone between high and low burn severities of pre-fire NR habitat.

In this analysis, NR habitat that burned at moderate severity is categorized separately so that fire effects specific to these areas of habitat can be accounted for in the analysis and the role that this habitat type plays in NSO use of the post-fire landscape can be captured.

FANR is considered in this analysis as possibly providing foraging opportunity rather than as NR habitat because FANR no longer contains adequate cover and structure for nesting but it can contain enough prey habitat and perch structure to allow for effective foraging. When compared to PFF, FANR will generally have larger trees/snags on average that can provide more physical structure that is likely to persist, standing for a longer period of time (assuming similar site conditions and disturbance). However, trees/snags in FANR will likely succumb to the eventual effects from the fire as many, but generally not all, of the trees in a stand that have burned at moderate severity will die and many of these will fall, possibly as soon as three to five years of this analysis. In general, some of the fire-damaged trees will have needles and leaves and these trees may provide some cover for foraging NSO.

Analysis Indicators, Spatial and Temporal Context by Status of Species

Threatened and Endangered Species

Northern Spotted Owl

Relevant Scientific Literature

Use of Fire-Affected Habitat

Research on all three spotted owl subspecies (northern, California, and Mexican) indicates uncertainty and disagreement on the extent to which spotted owls use burned forests (Jenness 2000, Bond et al. 2009, Clark et al. 2013, Lee and Bond 2015a). Spotted owls are one of the most studied bird species and the general agreement in the research is the importance of large-diameter, closed canopy forests for nesting, roosting, and successful reproduction. The loss of this habitat to high-severity fire is one of the primary threats to spotted owls (NSO Recovery Plan 2011). However, the extent to which spotted owls use this high severity fire-affected habitat still remains unclear.

Areas burned with high- and moderate-burn severity are typically no longer considered suitable habitat for nesting, roosting or long term occupation by spotted owls because these areas no longer supply the habitat attributes needed for thermal protection, nesting structure and cover from predators necessary for long-term viability. While these stands do not contain all the attributes that typically define NSO habitat, high severity burned areas are known to be used by NSO to a limited extent possibly for foraging; . Observations indicate that under certain circumstances NSO use the edges along less severely burned areas (likely existing habitat) and avoid large, contiguous patches of high severity burn (Clark 2007, Comfort 2014).

Although spotted owls may use former nesting, roosting, and foraging habitat burned with high and moderate severity located within their home range for foraging, the overall importance of these areas to NSO's survival and reproduction is still relatively unknown.

Results from radio-telemetry studies of spotted owls in post-fire landscapes indicate that spotted owls will use forest stands that have been burned, but many other factors dictate the extent and degree to which this will occur. such as the relative position to existing habitat and the contrast of edge between moderate to high severity burned areas and areas that burned with low severity or are unburned (Bond et al. 2002, Bond et al. 2009, Lee et al. 2013, Comfort 2014, Eyes 2014). Many studies indicate that NSO are potentially capitalizing on the increased prey abundance that may have resulted from the fire effects on habitat (Bond et al. 2009, Roberts et al. 2011, and Clark et al. 2013). Even though areas with little cover, like PFF and FANR, appear to possibly increase the risk of NSO being predated, foraging along the edges of suitable habitat may provide a balance between consuming the potential abundance of prey and being close to escape cover where an NSO could avoid being predated.

In the Klamath region, NSO have been found foraging within more open stands not recently affected by fire, but these areas contain brush or a low basal area of conifer trees. The presence of a few scattered trees or snags may facilitate hunting for prey such as woodrats. For one study, a particular telemetered pair made extensive use of a burned area with manzanita shrubs and scattered live trees (Irwin et al. 2012). This would indicate that, at least under certain circumstances, NSO will venture into more open habitats such as areas burned at high and moderate severity when vertical structure is present to offer perching or a certain degree of cover, although the exact level of cover that is needed to meet spotted owl needs is unknown. However, NSO use of a particular area is likely more complex than simply the amount of cover.

Site Occupancy

The amount of high severity fire within the core and home range may be an important component for estimating the likelihood that an owl may occupy a particular area. In a burned landscape, NSO generally select nesting areas with low to moderate severity fire effects (Clark 2007, Bond et al. 2009, and Clark et al. 2011) but, given the choice, NSO may select unburned areas for nesting or foraging (Clark 2007). Clark et al. (2013) found about 64 percent reduction in NSO occupancy following a fire as compared to the unburned portion of the study site that experienced about 25 percent reduction in occupancy during the same time period; however, post-fire land management likely influenced occupancy in the burned portion of the study area. Although limited by a small sample size, Gaines et al. (1997) found a similar pattern of spotted owl site occupancy as did Clark et al. (2013); both studies found that sites that were largely unaffected by fire in the core were more likely to be occupied than sites that were extensively burned. Conversely, Lee and Bond (2015a) found that NSO occupancy was largely unaffected by burn severity.

The use of fire-affected core and home range may be related to site fidelity despite possible negative tradeoffs (e.g. lower survival). Bond et al. (2002) found that a large portion of the monitored spotted owls returned to their pre-fire nest site the year following a fire, despite varying fire severities. The strength of site fidelity is shown by findings in southern California forests that spotted owls had an increased likelihood of site abandonment when most of the core area (124 acres of their 200-acre core areas) burned at high severity and not when less acreage burned at high severity; high severity fire affected about 62 percent of the core use area (Lee et al. 2013). Lee et al. (2012) also found strong site fidelity despite an average of 32 percent of the suitable habitat burned at

high severity in the core. Strong site fidelity was also apparent for the California spotted owls monitored after the Rim fire; spotted owls showed only a slightly negative response to the increased proportion of high severity fire within the protected activity center. The authors conclude that high severity fire doesn't affect spotted owl occupancy (Lee and Bond 2015). Lee and Bond (2015b) attempt to qualitatively correlate occupancy with survival and reproduction, but occupancy of a previously used site may be a result of strong site fidelity despite the habitat quality of the site. A measure of reproduction success or survival would provide a much better understanding of relating spotted owl use of fire-affected areas and possible tradeoffs.

NSO with strong site fidelity that experience moderate to high fire severity in the core and home range may encounter additional challenges. Clark (2007) generally found that severe wildfires in NSO home ranges caused owls to increase the size of their home range to encompass more suitable habitat. He also found that spotted owls with territories located immediately adjacent to moderate- and high-severity burned areas, avoided these areas; less than five percent of their locations fall within the boundaries of the fire. Owls that ventured into the burned areas were typically individuals that were displaced by fire and periodically visited their old territory. According to Clark's study, when given the opportunity, owls focused their activities in unburned habitat. In his study, several owls with territories inside the fire frequently traveled long distances to forage in unburned habitat, supporting his prediction that owls would focus activities in the oldest forest stands with the least amount of fire damage (Clark 2007).

The amount, quality, and distribution of post-fire habitat in the core and home range may influence NSO use areas and possibly nesting success. The amount of forest habitat with high (greater than or equal to 60 percent) canopy cover dominated by medium- and large-sized trees is an important predictor of survival and reproduction (Franklin et al. 2000, Dugger et al. 2005, Temple et al. 2014). The amount of habitat affected by high severity fire in the nest stand or within frequently visited foraging areas likely has a greater negative effect than does high severity fire in other areas in the home range (Jenness et al. 2004, Dugger et al. 2005). Although typically short term (one to two growing periods), low severity fire can also affect suitable habitat by removing smaller trees and/or brush that are important habitat components for prey species but low severity fire is not likely to remove all prey habitat structure. Roberts et al. (2011) found that low and moderate severity fires don't affect occupancy, especially when the area contains abundant large trees and high canopy cover.

The proportion and arrangement of unburned or low-severity burned suitable habitat in relationship to moderate- or high-severity burned areas within an NSO home range is important in determining the likelihood of NSO use of these areas. This relationship is important because NSOs will likely focus their use of burned areas for foraging in areas with adjacent cover. The distance to cover is likely a key factor influencing use of burned areas. Because habitat selection by NSOs is strongly influenced by abiotic features such as distance to water, proximity to nest, slope position and elevation, it is possible that use of the burned habitats by NSO as described by Clark et al. (2013) or Bond et al. (2009) may occur due to the juxtaposition of the burned areas to some other feature, such as a nest site or water, rather than based on the "suitability" of the area, particularly if the owls were accustomed to using the area prior to the fire. Factors involved in the NSO's periodic selection of burned areas for foraging are not known at this time; further

research is needed to account for the many other aspects of a burned landscape that may influence the NSO selection process.

Land management

Owl use of burned areas is well documented but links between owl use, fire severity, and level of salvage are not clear. Researchers are typically unable to separate effects of pre-fire timber harvest, wildfire, and post-fire salvage harvest (Bond et al. 2002, Clark et al. 2011, Roberts et al. 2011, Lee et al. 2012, Clark et al. 2013, Temple et al. 2014);). Consequently, study results are highly variable, depending on methods, burn severities, proximity of NSO to fire and spatial arrangement. Research of NSO use of burned areas has also been confounded by small sample sizes. In addition, general terms used in the literature including "fire severity" and "salvage logging" make comparison to specific conditions found within the Project area difficult. Most references to "salvage logging" in the literature refer to clear-cut logging, and do not factor in design features such as leave tree groups, legacy tree retention, treatment in relationship to core area, or even the use of limited operating periods.

Clark et al. (2013) examined the potential effects on nesting territory occupancy in areas that recently experienced fire and suggested that past timber harvest, high severity fire, and salvage within the core nesting area best explained a decrease in NSO occupancy; however, high severity fire effects to occupancy were confounded with past timber harvest and salvage logging suggesting that NSO occupancy may not persist in burned landscapes. This is not surprising given the fact that timber harvest and high severity fire commonly remove habitat attributes associated with NSO habitat; this removal leads to a reduction in habitat quality or habitat loss. Salvage logging in the Clark et al. (2013) study area used clearcutting where all the trees were harvested within an area and no areas left untreated (untreated areas are often called retention areas). Retention areas in salvage treatments can provide structure needed by NSO (Clark 2007). Clark (2007) examined NSO use of burned areas and found 60 percent of owl locations within salvaged areas were in retention areas (clumps or along riparian areas) within the unit, suggesting that owls may use salvage areas with remnant structures.

In southern California, Lee et al. (2013) found no statistically significant effects of fire or salvage logging on spotted owl occupancy. However, the authors claim that the weak statistical relationship may be biologically meaningful. They describe an inverse relationship between the amount of high severity burn in the core and occupancy but indicate this effect could be exacerbated by salvage logging (i.e. clearcutting). Salvage logging effects alone could not be separated from the fire effects; the spatial configuration of the salvage was not provided for a qualitative assessment. The authors, however, described the 203 hectare cores on average containing 106 hectares of habitat where 24 hectares burned at high severity and 63 hectares were salvaged logged. Lee et al. (2013) did not provide any information on the prescription of the salvage in the study except the salvage was visible using satellite or aerial imagery thus implying that the treatment removed many to all trees within a particular area.

Another study used an observation approach to estimate NSO use of fire-affected forest within the home range; however, without a measure of fitness, the results are inconclusive or correlative (Bond et. al 2009). Bond et al. (2009) studied four spotted owl territories (4 males and 3 female) within a wildfire perimeter about four years after the

fire; they found the owls foraged in all burn severities, with a preference for high-severity burned areas. Although this study has been widely used to demonstrate the importance of high-severity burned forests for NSO, the study is limited by the small sample size, brief study period (12 weeks), and non-random owl selection. The authors provide a snapshot of information without any link to potential effects to survival or reproduction.

Overall, research is inconclusive and contradictory regarding spotted owl use of severely burned coniferous forests (Elliot 1985, Gaines 1997, Bond et al. 2002, Bond et al. 2009, Clark 2007, Clark et al. 2012, Comfort 2013, Eyes 2014). Some studies have shown spotted owls to exhibit site fidelity and occupancy of sites is not likely to be affected by fires even if a large portion of a territory is burned at high severity (Bond et al. 2002, Lee et al. 2012, Lee and Bond 2015) while others studies have shown owls to move completely away from previously occupied areas after high-severity burns (Elliot 1985, Gaines 1997) particularly when burns occurred within core areas of resident birds. Bond et al. (2010) reported 30 percent of California spotted owls' nonbreeding-season roost locations were within the fire's perimeter. In another study, radio-telemetry locations demonstrated that the owls selected low-severity burned forests for roosting during the breeding season, and selected low, medium, and high-severity burned forests for foraging within 1.5 km of the nest or roost site, with the strongest selection for high-severity burned forest (Bond et al. 2009). Despite these contradictory findings, the research does provide some agreed-upon principles for spotted owl use of fire affected landscapes:

Spotted owls appear to display strong site fidelity by returning to their activity centers after a fire, even if the activity center is completely burned and may not contain areas that meet the definition of suitable habitat.

Spotted owls appear to use high-severity fire affected areas for possibly roosting or foraging, although nesting in these areas is not likely to occur.

Spotted owls using burned areas may use standing snags and surviving green trees as perch sites for foraging, particularly along edges where sufficient cover is available.

Spotted owl use of burned areas appear to be influenced by the distance from suitable forest cover (use of burned habitat decreases with increased distance from suitable habitat), but a maximum distance an owl might travel from suitable habitat is unknown.

Pre-fire nesting/roosting and foraging habitat that burned at moderate and high fire severity appears to provide foraging opportunity for spotted owls but the level of effect on spotted owl survival and reproduction is unclear.

The amount, quality, and distribution of suitable habitat remaining in the core and home range after a fire appear to influence occupancy.

Salvage harvest of pre-fire nesting/roosting and foraging habitat that burned at moderate and high fire severity likely contributes to the reduction in spotted owl occupancy, but the effects may be more pronounced when salvage occurs in the core.

Analysis Indicator: Risk to Reproduction

Recent research has concluded that spotted owls use habitat that burned at moderate and high fire severity likely for the purpose of foraging, but the potential value of these fire affected areas in comparison to suitable habitat is not clear. Suitable habitat has been well described in the literature and the relationship between the habitat quality and quantity of

suitable habitat in the core and home range with successful reproduction has also been described. Foraging habitat provides habitat for prey species while providing cover, among other benefits, for spotted owls. Suitable habitat that experienced moderate and high severity fire has an apparent physical difference compared to unburned suitable habitat. Consequently, this burned habitat doesn't meet the definition of nesting, roosting, or foraging habitat which is evident by less than 40 percent tree canopy cover, little or no stand complexity, and the lack of coarse woody debris and understory vegetation that provides prey habitat (immediately after the fire). However, vegetation that composes prey habitat can regenerate quickly and, for particular prey species (i.e. deer mouse), abundance can increase rapidly.

Despite this potential reward (abundant prey) to spotted owl use of moderate and high severity fire affected suitable habitat, the cost or benefit to spotted owls may be evident in terms of survival and reproduction. A recent study looked at occupancy and reproduction of California spotted owls which identified a negative correlation between occupancy and fire and post-fire logging (Lee and Bond 2015b). For core areas affected by high severity fire, occupancy and reproduction was greater for sites with reproductive spotted owl prior to the fire than sites that were occupied by non-reproductive owls or unoccupied. In addition, post-fire logging in the core areas resulted in a lower probability of occupancy in sites with previously non-reproductive owls or unoccupied versus sites with previously reproductive owls. This study identifies the importance of previously reproductive[35] sites and the potential effects of high severity fire and post-fire logging may have on occupancy and reproduction.

Even though Lee and Bond (2015b) demonstrate the importance of minimizing disturbance in the core areas of reproductively active sites, the study didn't clearly link the pre-fire habitat condition, post-fire habitat condition, and reproduction. The authors acknowledge the inaccuracies of their vegetation data and consequently, the analysis wasn't able to fully explore the relationship between reproductive success and habitat quality, quantity, and distribution. A large body of research describes the amount of nesting, roosting, and foraging habitat that occurs in the core and home range of reproductively successful nests which provides a level of measure in concert with the abiotic variables to estimate the potential level of effects given a particular treatment. Despite the fact that suitable habitat burned at high fire severity doesn't resemble suitable habitat, it is being described in the literature as "potentially suitable" habitat (Lee and Bond 2015a).

Given the uncertainty and sometime conflicting interpretation of spotted owl use of fire-affected habitat, we have attempted to incorporate this information into our analysis by clearly separating suitable habitat from habitat that was burned at moderate and high severity to track and account for changes in this fire-affected habitat.

Fire affect habitat is described in terms of fire-affected nesting/roosting (FANR), post-fire foraging 1 (PFF1) and post-fire foraging 2 (PFF2) (see methods for detailed description). The literature provides several examples of spotted owl detections within moderate and high severity fire-affected habitat but the information is limited on

[35] Reproduction occurred during the reproductive period prior to the fire. Sites may have been active years prior to the fire, but the site may not have been active during the reproductive period prior to the fire.

determining the role that fire-affected habitat may play in spotted owl reproduction. Several authors have assumed that owls are foraging in these fire-affected areas based on the possible increase in prey abundance; however, this potential foraging opportunity may or may not offset the loss of suitable habitat. Therefore, comparison between suitable habitat and fire-affected (FANR and PFF) habitat is difficult given the large amount of uncertainty in the cost or benefits of NSO using FANR and PFF in terms of NSO survival and reproduction. However, the analysis presented in this document attempts to incorporate the possibility that this fire-affected habitat may provide foraging opportunity but at a lower quality than foraging habitat.

Therefore, the analysis indicator called "Risk to Reproduction" is split into four categories representing the relative levels of effects resulting from each alternative. Using the existing quality and amount of habitat within each core and home range (activity center), the acres of suitable habitat (nesting/roosting and foraging habitat) and FANR and PFF are calculated as the existing condition for each activity center. Since the literature doesn't provide a clear linkage between suitable habitat, fire affected habitat, and spotted owl reproduction, we used recommended habitat minimums of suitable habitat (USDI FWS 2009) as a starting point and used professional judgment to estimate the possible spotted owl use of moderate- and high-severity fire-affected habitat. Obviously, any deviation in this estimate will affect the assignment of a particular activity center (AC); however, this analysis indicator is providing a relative measure and not an absolute. The risk to reproduction category is assigned to each activity center depending on the amount of habitat, PFF, and FANR in the core and home range.

Table 3-14: Criteria for each category in the analysis indicator "risk to reproduction"

Risk to Reproduction	Criteria
Very Low	In the core, >400 acres of NRF, FANR, and PFF1 (≥250 NR must occur in the core), AND In the home range, >935 acres of NRF, FANR, and PFF1
Low	In the core, >250 acres being NRF, FANR, and PFF1 (≥150 NR must occur in the core), AND In the home range, >1,086 acres NRF, FANR, and PFF1
Moderate	In core and home range, 665 to 1,336 acres of NRF, FANR, and PFF1 (≥500 acres NRF must occur in core and home range combined)
High	In core and home range, <665 acres of NRF, FANR, and PFF1

A high risk means that successful reproduction is least likely to occur when compared to the other categories; reproduction may be attempted but ACs with high risk are considered to be deficient in resources to support the adult owls plus the offspring. High risk level ACs may have large pockets of moderate and high severity that result in the core and/or home range containing a small amount of suitable habitat. Possibly more common, high risk level ACs have a low amount of suitable habitat prior to the 2014 fires and these ACs would be considered high risk regardless of the fire effects.

Moderate level represents the ACs that are likely to have difficulty in finding resources and these owls will likely need to transverse openings (areas without overstory tree canopy) or use areas of low habitat quality to find enough resources. These challenges may result in lower survival or reproduction potential for the pair occupying moderate level ACs. Low level ACs have enough habitat in the core and home range to support reproduction, but the habitat may not be ideally distributed in large patches of high

quality habitat. The final category, very low, represents the habitat quality and distribution associated with successful reproduction over the species range.

The spatial bounds of the analysis will be limited to the home ranges that overlap the fire perimeter plus the Project area. The short-term (less than or equal to eight years) covers the time when the majority of snags will remain standing. The long-term (greater than 10 years) includes the time when the snags will likely have started falling, resulting in changes to the physical structure of the area.

Analysis Indicator: Changes to Critical Habitat

The California Klamath Province is considered a 'fireprone' area because of its frequent fire return intervals and existing vegetation condition that likely elevates the potential of fire (USDI USFWS 2012). Within fire-prone areas, resource agencies planning vegetation management in critical habitat for the northern spotted owl (NSO) are encouraged to ameliorate current threats of on-going habitat loss from uncharacteristic fires and vegetation changes that are largely related to past fire exclusion (USDI USFWS 2012). Resource agencies are also encouraged to work toward maintaining or enhancing the characteristics of older forest and providing large habitat blocks and associated interior forest conditions. Regional variations should be taken into account; in the Klamath Province this means providing mosaics of interior habitats and edges to provide for the diversity of prey for NSO.

Critical habitat is generally described as the specific geographic area occupied by the species at the time of listing plus areas that contain the physical and biological features that are essential to the conservation of endangered and threatened species and may need special management or protection. Instead of having general recommendations that cover the entire critical habitat area, critical habitat was split into units and subunits with specific recommendations because units or subunits may provide different functions to aid in the recovery of the species. For the spotted owl, the Project overlaps portions of the Klamath East and Klamath West Critical Habitat units; these units were further divided into four critical habitat subunits (KLE6, KLE7, KLW7, and KLW8). Generally, all four subunits have special management considerations to enhance or protect existing essential biological or physical features, reduce the loss of habitat to wildfire, reduce change in habitat as a result of fire exclusion, and buffer competition between NSO and barred owls, but the primary function for these subunits is to support the survival, reproduction, and dispersal of NSO (USDI USFWS 2012).

Primary Constituent Elements (PCEs) are the physical and biological features that provide the essential life history requirements of the species. The 2011 CHU designation identifies the primary constituent elements for NSO as those physical and biological features that support nesting, roosting, foraging, and dispersal. Specifically the PCEs for the NSO are summarized (from USDI Fish and Wildlife Service 2012):

1. Forest types that support the northern spotted owl across its geographic range. Within the Klamath Province, these include mixed conifer/mixed conifer-hardwood, mixed evergreen, Douglas-fir, white fir, and Shasta red fir. These forest types may be in early-, mid-, or late-seral stages.
2. Nesting, roosting, and
3. Foraging habitat,
4. Dispersal habitat.

This analysis estimates the number of critical habitat acres affected by each alternative. Given the types of treatment proposed for this Project that are likely to maintain or remove habitat, we focus the reporting of effects on downgrading and removing habitat. Habitat removal means the habitat prior to treatment will no longer function as NSO habitat after treatment. NSO habitat is generally described as a hierarchy in habitat quality with nesting/roosting being the highest quality and foraging and dispersal following in order; habitat downgrading signifies the lowering of a habitat quality from one level to the next.

Even though the NSO critical habitat rule doesn't specifically identify suitable habitat that burned at moderate and high severity within the design of PCEs, the final rule does identify the importance of early seral habitat and areas that may provide for foraging opportunity. Therefore, PCE 2 and 3 that burned at moderate and high fire severity are reported as fire-affected critical habitat.

The spatial boundary is all of the areas designated as critical habitat within the analysis area. The analysis area is the same as the spatial bounds described in the Risk to reproduction. The temporal bounds will be the same as for the analysis indicator called "Risk to Reproduction".

Forest Sensitive Species

Bald Eagle

Bald eagles generally nest near rivers, large lakes or streams that support an abundant food source. Eagles have been recorded to nest in a variety of natural and manmade structures but most often nest in mature trees or snags. The nest tree or snag is typically the tallest tree with strong limbs that can support the heavy nest. Nest sites also include a perch that is near the nest but in sight of water where the eagles would forage. Given the specific needs of an eagle, nest trees are a rare resource and should be conserved.

During the reproductive period (January 1 to August 1), eagles are sensitive to human activities. Eagles appear to be most sensitive during the beginning part of nesting - nest building through incubation (December through May). However, each eagle pair can respond to disturbance differently. Some pairs have been recorded to nest successfully just yards from human activity (e.g. along roads) while other pairs may abandon their nest in response to human activities much further away. The variability may be related to a number of factors: visibility of the disturbance, duration of the disturbance, noise level, extent of the area affected by the activity, prior experiences with humans, and tolerance of the nesting pair.

During the nesting period, human activity can also disrupt eagle roosting or foraging which can result in negative affects to nesting. Disruptive activities that result in interfering with eagle foraging can increase the time it takes for a parent to find food and feed the chicks. This could result in the chicks not receiving enough food.

The U.S. Fish and Wildlife Service (USDI FWS 2007) has developed a series of management recommendations to minimize effects on bald eagles. These recommendations include: 1) keeping a distance from nest sites; 2) maintaining landscape buffers between the nest and the activity; and 3) avoiding certain activities during the reproductive period. The size and shape of the buffer around nest sites depend on the activity and topographical features. Natural noise barriers like forest and mountains can

reduce the visual effects and loudness of the activity, thus reducing the disturbance. The U.S. Fish and Wildlife Service provides general guidance and buffer distance for various activities that might disturb an eagle nest, but these buffers may need to be adjusted depending on nest location and nesting pair tolerance of activity.

- Recommendations for an active eagle nest (January1 to August 1):
- No loud noises (e.g. chainsaw and yarder) within 660 feet of the nest;
- No aircraft within 1,000 feet of nest site; and
- Avoid any potentially disruptive activities in the eagles' direct flight path between their nest site and foraging area.
- Recommendations for habitat management (November 1 to March 31):
- Preserve potential roost and nest trees within 0.5 mile of large rivers or lakes.

Analysis Indicator: Level of Disturbance to Nest/Roost Sites

The two most common activities likely to occur in this Project that may disturb eagles are helicopters and noise created by equipment. Helicopters typically present loud and intermittent noise disturbance over a large area that are also visible to a nesting eagle thus these activities are likely to disturb nesting eagles. Unlike helicopters, equipment noise (e.g. chainsaw or yarder) can be loud when it occurs near a nest but the noise is not expected to travel far given the forested environment and topography.

Disturbance will be assessed as a distance from the known nest sites. Any level of disturbance less than 1,000 feet from a known nest is a high level of disturbance. Disturbance that occurs between 1,000 feet and 1,500 feet of the nest is a moderate disturbance. A low level of disturbance is any noise producing activity that is farther than 1,500 feet from known nests. For this analysis, a high level of disturbance will likely result in an eagle pair abandoning the nest. Moderate level of disturbance will result in the adults leaving the nest for a short period of time; this may result in delayed feeding of young or not incubating the egg(s). Low level of disturbance may result in the adult eagles displaying behavior indicating acknowledgment of the human activity but the adults continue to feed offspring.

The spatial boundary of the analysis is known nest sites in the Project area plus a 1,500-foot buffer. The temporal bounds for the short-term will be the time during implementation (about eight years) during the reproductive period (January 1 to August 1) and roosting period (November 1 to March 31); long term will be ten years.

Analysis Indicator: Risk to Future Potential Nest Areas

Bald eagles usually build nests on prominent features in the landscape that overlook aquatic foraging area typically within stands of mature and old-growth forest (Anthony et al. 1982). However, eagles have been documented to build nests in a variety of tree species and in California and Oregon, nests are most often found in large ponderosa pine (diameter at breast height of greater than 40 inches) (Anthony et al. 1982). Nest trees are typically used for many years, but nest trees do fail at some point and another nest tree will be needed or an alternate nest may be used. Alternate nest is a nest that is not used for a given breeding season, but the longer an alternate nest goes unused, the likelihood of the nest being used again decreases over time. Alternate nest or a new nest is usually occupied within one mile of the former nest site but topographic features should be considered when determining the area an alternate nest may occur because nests are typically contained within a single drainage (Anthony and Isaacs 1989).

For land management, the National Bald Eagle Management Guidelines (2007) recommends no removal of overstory trees within 330 feet of the nest tree and to protect and preserve potential nest sites by retaining mature trees within 0.5 mile from water. The Forest Plan uses a nest protection zone for the area up to 0.5 mile around a nest site to identify the area that may influence nesting conditions (pg. 4-90). For known eagle nests along the Klamath River (portion within the Forest), the average distance from a nest to the Klamath River is 0.23 mile.

It is important to note that the bald eagle management guidelines are just guidelines. These guidelines provide useful information on minimizing effects to eagles, but they don't provide recommendations for every situation. For this analysis, we used these guidelines as a starting point and used professional judgment and experience to create the risk categories. These risk categories are a relative measure that attempt to estimate a level of effects resulting from the proposed activities. However, these risk levels are not a guaranteed result; rather these risk levels represent a scenario of potential consequences.

A low level of risk will result in a distribution of potential future nest trees that will likely provide ample opportunity for a new nest site. Moderate level of risk will result in fewer potential nest trees. High level of risk may result in the eagle not finding another nest tree near the current nest tree; thus, the eagles may need to move to another portion of the drainage or possibly leave the drainage to find another nest site.

The analysis assumes that future potential nest areas will be within 0.5 miles of the known nests. If the nest is greater than 0.5 miles from the river then the analysis area includes the area between the buffer and the river as well. The temporal bounds for the short-term will be the time during implementation (about eight years) and long term will be ten years.

Northern Goshawk

Analysis Indicator: Level of Disturbance to Nest Sites

Loud noises further from the nest site are expected to create less disturbance than the same noise closer to the nest. Disturbance will be assessed as a distance from the known nest sites. If there are any treatments within 500 feet of a known nest site during nesting period (March through August), the level of disturbance is high. Treatments between 500 feet and 0.25 miles of the nest during the nesting period will lead to a moderate level of disturbance; greater than 0.25 miles from known nests during the nesting period is a low disturbance.

Low level of disturbance means that the nesting goshawk is not likely to respond to the noise; thus, the noise will not reduce the likelihood of the success of the nest. Moderate level of disturbance is likely to result in one of the adults alarm-calling and possibly flying toward the noise, thus reducing the time spent foraging to feed the offspring. A high level of disturbance will likely result in both adults moving toward the source of the disturbance and displaying aggressive behavior; this may lead to the nest being abandoned.

The spatial boundary for the analysis is 0.25 miles from all known goshawk nest sites. The nest sites considered for this analysis have the foraging zone that overlaps the Project area. The short-term and long-term temporal bounds are eight years and 10 years, respectively.

Analysis Indicator: Risk to Reproduction

The amount and quality of nesting habitat can affect successful reproduction. Risk to reproduction is analyzed using the amount of habitat in each primary nest zone (0.5 mile from nest) and the foraging habitat zone (one mile from nest). The smaller the number of acres in each zone, the greater the risk to reproduction (see the Terrestrial Wildlife Biological Evaluation for details).

A high level of risk will result in a nesting pair of goshawks not finding enough resources to successfully produce offspring and contribute to the population. A moderate risk may provide enough habitat to raise offspring but the pair may spend more time foraging for food, which may be more difficult for nests with more than one chick. A low level of risk will provide enough habitat and diversity of habitat to find sufficient resources to produce a successful nest.

The spatial bound for the analysis is one mile from known goshawk nest sites. The nest sites considered for this analysis have the foraging zone that overlaps the Project area. The short-term temporal bound is the time for Project implementation (about eight years) and the long-term temporal bound is ten years.

Fisher, Marten, and Wolverine

Fisher

Fishers are strongly associated with dense, mature forest which provides the necessary food, water, shelter for reproduction and survival. Fisher use a variety of mid- to low-elevation forested types in California such as Douglas fir, mixed conifer, ponderosa pine, and mixed conifer-hardwoods (Zielinski et al. 2004). Throughout the varying tree species composition types, moderate and dense forest canopy closure appears to be an important predictor of fisher occurrence at the landscape scale (Carrol et al. 1999, Zielinski et al. 2004, Zielinski et al. 2006, Davis et al. 2007). At the stand scale, fisher habitat may have a diversity of tree sizes and species creating a closed canopy (greater than 40 percent) (Zielinski et al. 2004) along with canopy gaps and associated understory vegetation and decadent structures (snags, cavities, and fallen trees) (Zhao et al. 2012, Powell and Zielinski 1994).

Tree species composition may be less important to fisher than components of forest structure, which can affect foraging success and provide denning and resting sites (Buskirk and Powell 1994). Common resting structures include live trees, snags, cavities, large branches, large woody debris and mistletoe clumps, but fisher have been found using many other resting structures (Zielinski et al. 2004, Yaeger 2005). Trees used for resting are usually the largest trees (typically greater than 30 in dbh) in the fisher home range (Zeilinski et al. 2004). Denning sites are commonly associated with cavities in large live or dead trees (Powell and Zielinski 1994). Large denning trees (greater than 30 in dbh conifer and greater than 16 in dbh hardwood) are needed because fisher need a large cavity (greater than 12in diameter) to provide enough space for the female fisher and young (Truex et al. 1998, Weir and Corbould 2008, Weir et al. 2012). Potential denning and resting sites can be found in younger and mid-seral forest which may contain only a few large trees with cavities, large logs, and snags (Self and Kerns 2001, Lindstrad 2006).

Juvenile fishers are capable of dispersing long distances and navigating various landscape features such as highways, rivers, and rural communities to establish their own home range (Weir and Corbould 2008). Long distance dispersal has been documented for fishers; males move greater distances than females. Arthur et al. (1993) reported an average maximum dispersal distance of 9.3 mi and 10.7 mi for females and males, respectively (range = 4.7 mi to14.0 mi for females and 6.8 mi to 14.3 mi for males). However, dispersing individuals that traveled longer distances have a greater risk of mortality (Weir and Corbould 2008).

The dispersal distance for a fisher is likely related to habitat quality and spatial separation of habitat. Fisher can use closed canopy habitat to cross the landscape, if available, but fisher tend to avoid areas with no overhead cover likely because of the exposure to predators (Buskirk and Powell 1994). Large areas without overhead cover may create a barrier to dispersing fisher (Jones and Garton 1994, Weir and Corbould 2010) and dispersing fisher may have difficulty locating and occupying distant, disjunct but suitable habitat (Carroll et al. 2001). In general, fisher dispersal is affected by the reduction in fisher habitat and the distance between patches of habitat (Weir and Corbould 2010).

Given the uncertainty of the maximum elevation a fisher may occur on the west-side of the Forest, we are not using an elevation maximum for this analysis.

Fire effects on fisher habitat

Wildfires are a natural part of California's forests and given the severity, fires can dramatically affect fisher habitat. Depending on the severity and spatial distribution of the fire and the habitat prior to the fire, the level of fire effects can vary. Low severity forest fires are considered to have a beneficial effect on fisher habitat in the long-term by building fire resiliency. In the short-term, low severity fires can decrease habitat components for fisher prey species thus reducing prey abundance and availability. Reduction in prey populations would affect the fisher's ability to find enough food within a home range (Lehmkuhl et al. 2006). Catastrophic, or stand-replacing, wildfires burn at high intensity over large areas removing forest habitat. Since fisher are dependent on dense canopy cover and late-seral forest structures for resting and denning, the loss of these important habitat components are likely to negatively affect fisher over the long-term (Powell and Zielinski 1994, Naney et al. 2012). The regeneration of forest development into large-diameter trees may require 100 or more years of growth before the trees reach the desired size.

Moderate and mixed severity fires can affect fisher habitat by removing canopy cover and important habitat components. Small patches of habitat may receive moderate or mixed fire severity while leaving other patches of habitat minimally affected. Regardless of the fire severity, the loss of canopy cover greatly diminishes the potential of fisher use likely because the lack of canopy cover increases the risk of predation (Buskirk and Powell 1994, Naney et al. 2012).

Fisher use of fire-affected habitat is not well understood (Hanson 2013). In the southern Sierra Nevada, fisher scat was found in pre-fire dense, mature mixed conifer that was both fire effected and not fire effected (Hanson 2013). Complex forests are likely important to fisher, but logging can remove structural diversity; consequently, the loss of structural diversity can negatively affect fisher (Hanson 2013).

Overall, fisher use of fire-affected conifer forest is likely related to the pre-fire habitat quality and the amount of post-fire canopy cover, large live or dead trees, woody debris, and understory vegetation. Low to moderate severity fire in high quality fisher habitat may still provide enough physical cover for fisher to forage or disperse, but not likely denning in the short-term. For high severity fires, retention of large trees and snags may be more important than canopy cover (Thompson et al. 2011). Observations of fisher in high severity fire affected areas may be related to the amount remaining physical structure especially for dispersal or possibly movements through the home range. However, high severity fire affected areas typically have no canopy cover or understory vegetation, immediately after the fire. Fishers are known to avoid crossing openings with no cover (Powell 1993, Jones and Garton 1994, Weir and Corbould 2010). Even areas with shrub and other ground cover, fisher are subject to higher rates of predation (Wengert 2013). In high fire severity affected habitat, the area may be used for dispersal, but denning and resting structures, although possibly present, may not have enough physical cover for fisher to adequately avoid predation.

Marten

Marten population viability is related to the amount and quality of habitat. Like fisher, marten are also associated with late-successional conifer forests characterized by an abundance of large dead and downed wood and large, decadent live and dead trees (Powell et al. 2003, Buskirk and Ruggiero 1994). In general, marten elevation range overlaps the fisher slightly, but marten occupy higher elevations, typically in true fir and lodgepole forests. Marten appear to select particular physical structure in the forest over the tree species composition. Foraging sites are commonly associated with riparian areas near late-successional habitat (Zielinski 1983). Resting sites are common in large trees and snags and possibly logs and stumps that create an opening near the ground (Spencer 1987). Denning sites are typically cavities in large diameter trees or snags. Marten may inhabit younger forests as long as the area contains important habitat components for resting and denning (e.g. large trees and snags) (Thompson et al. 2012).

Martens typically avoid areas lacking sufficient overhead cover (Slauson et al. 2007) and are sensitive to forest fragmentation (Chapin et al. 1998). Distribution of mature forest on the landscape scale may be the primary determinant of marten distribution and subsequently affect habitat selection at finer scales (e.g. home range) (Kirk and Zielinski 2009). Marten were found to select areas with more habitat, larger patch sizes, and larger areas of interior forest (Hargis et al. 1999, Kirk and Zielinski 2009). Habitat characteristics usually include high (greater than 40 percent) canopy cover (Hargis et al. 1999).

Areas without overhead cover may inhibit marten movements. In the Rocky Mountains, marten were found to cross clearcuts (no standing trees) about 460 feet in width (Heinemeyer 2002) while a different study found a similar relationship from a habitat modeling approach (Hargis et al. 1999). In other forest treatment areas that contain some structure (isolated trees, snags, and logs) in the unit, marten crossed areas up to 600ft in width (Heinemeyer 2002).

Marten dispersal is not well known or documented (Broquet et al. 2006). In Ontario, Canada, marten were found to disperse about 4 miles (maximum 112 miles) on average for females and about 11 miles (maximum 150 miles) for males (Johnson et al. 2009).

Genetic testing has shown evidence of marten disperse over long distances (greater than 150 miles) (Kyle and Strobeck 2003). The variation in the distances for marten dispersal may be in response to changes in landscape pattern and habitat loss (Hargis et al. 1999). Martens are sensitive to increasing size of open areas and decreasing distance between openings (Hargis et al. 1999). However, marten survival decreases as the distance of dispersal increases (Johnson et al. 2009). Therefore, marten that travel long distances have a much higher likelihood of dying compared to marten that disperse a short distance.

Fire effects on marten habitat

Fire, especially high severity fire, will affect marten habitat components similarly as described for fisher. Marten were found in burned habitat that had large amount of coarse woody debris (Paragi et al. 1996). Even though little research examines the effects of fire on marten habitat, fire effects on habitat are likely very similar to fisher except martens use higher elevation habitat.

Wolverine

Wolverine population viability is related to the amount and quality of habitat. Wolverines are typically associated with high elevation (greater than 7,200 feet) montane conifer forest consisting of Douglas fir in lower elevation to true fir and lodgepole pine at higher elevation (Copeland et al. 2007). In California, wolverines have been documented at much lower elevations (1,600feet) than recorded for most of the species range. Studies in Montana, Yukon, and Alaska reported wolverines having a strong association to mid- to late-successional conifer forest habitat possibly indicating conifer forests as the preferred habitat type (Hornocker and Hash 1981, Banci and Harestad 1990), but wolverines have been found in a variety of high elevation habitat types (Copeland et al. 2006).

Young females typically establish residency next to or within the natal home range (Magoun 1985). Natal dens are difficult to find, but the small number of dens located were found in a variety of conditions from snow created caves, under tree stump or boulders or within dense conifer forest (Hash 1987). Males typically disperse possibly traveling great distances (e.g. 230 miles) and through varying habitat types (Magoun 1985). Wolverines are known to use rivers and streams as travel routes possibly because the riparian area provides water and food resources (Magoun 1985). Wolverines typically avoid humans and human related infrastructure, but a few exceptions have been recorded (Copeland et al. 2006).

"The dispersal and travel corridors that connect refugia, at least for males, likely need not have the habitat attributes necessary to support self-sustaining populations. Atypical or low quality habitats may be important to wolverines if they connect otherwise isolated populations and allow for genetic exchange or colonization." (Ruggiero et al. 1994)

Fire effects on wolverine habitat

Very little information is available for describing possible fire effects on wolverine habitat. The closest research related fire effects was a study that examined the effects of timber harvest on wolverine (Hornocker and Hash 1981) which is difficult to relate to fire effects because of the possible effects of human activity. However, wolverines commonly use conifer habitat that is susceptible to fire. Like marten and fisher, fire would alter wolverine habitat by removing canopy cover, large trees, snags, and large woody debris.

Fisher, marten, and wolverine occupy similar habitat of late-successional, dense conifer forest. These species are commonly found at different elevations with some overlap. Fishers are commonly observed on the lower 2/3 of the slope while martens occupy higher elevations with true fir vegetation types. Wolverines have not been observed on the Forest for several years. There is very little information on wolverines in California, but wolverines are suspected to use the true fir to alpine zones. However, all three of these species move across the landscape and use higher or lower elevation conifer forests even though the elevation being used may be outside the average elevation range for the particular species.

Analysis Indicator: Connectivity of Habitat for fisher, marten, and wolverine

For this analysis, connectivity will be assessed by measuring the change in gap distance between areas that provide the necessary cover to avoid predation.

- High level of connectivity is when the average gap distance is less than 160 feet.
- Moderate connectivity is when the average gap distance is between 160 and 460 feet.
- Low connectivity is when the gap distance is between 460 and 600 feet; very low connectivity is when gap distance is more than 600 feet.

High connectivity means that there is sufficient habitat to provide cover for fisher, marten, and wolverine moving within a 7th field watershed. Moderate connectivity means there is some challenge to the species moving within a 7th field; this increases the risk to mortality and requires extra expense of energy to deviate around large openings. Low connectivity presents a great challenge because these species are likely to shift their territory to a more contiguous placement of habitat or move through areas with little to no cover. The final category, very low connectivity, represents a situation where openings exceed the gap distance that would let these species move through a 7th field watershed; risk to survival is substantially increased when compared to the high level of connectivity.

The spatial boundary for the analysis is the 7th field watersheds within the Project area because this scale represents the area that is likely to affect movement within a home range or dispersal of individuals. The short-term temporal bound is the time during implementation (about eight years). The long-term is greater than 20 years to represent the time when the snags will begin to fall over and connectivity may decrease.

Analysis Indicator: Change in Fisher Home Range

Fisher home range selection is important because the home range must provide sufficient resources for survival and reproduction. Some of the basic characteristics of home range selection appear to be related to tree canopy closure, tree size class, percentage of conifer, and openness (area with little to no overhead cover) (Carroll et al. 1999, Wier and Corbould 2010). However, the amount and distribution of these habitat characteristics can affect a fisher home range. Fisher habitat can be split into three habitat categories: denning/resting, foraging, and movement (described in table 8). Denning/resting habitat is typically the least common on the landscape followed by foraging. Movement habitat which provides overhead cover for fisher to move from one patch of denning/resting habitat to another and avoid predation is more common.

The loss overhead cover creates openings that may affect the function of a fisher home range. Fishers avoid crossing large openings (discussed earlier in the fisher, marten, and

wolverine analysis indicator section) and moving around these large openings while staying within habitat may not be feasible for a home range to function. For example, Weir and Corbould (2010) found that fisher occupancy decreases with the increase in openness within the home range. This basically means that fisher home ranges that experience an increase in openness (loss of overhead cover) to about 20 percent of the home range will likely not be occupied by fisher. In addition, fisher home ranges need about 50 percent or more denning/resting and foraging habitat in the home range with at least 50 percent tree canopy cover. Therefore a fisher home range needs about half of the home range with at least 50 percent canopy cover and 30 percent of the home range with 20 percent overhead cover.

Identifying the actual home range of fisher is difficult because it requires extensive monitoring of individuals that are tagged with some kind of transmitting device. We don't have this level of information for any of the fisher home ranges in the Project area, but using some the basic principles identified in fisher research, we can estimate the potential effects.

For this analysis indicator, the change in fisher home range is designed to estimate the effect to fisher at the home range scale. The amount of habitat in each 7th field watershed is assessed for this analysis in its current post-fire condition. If more than 50 percent of the watershed contains denning/resting or foraging habitat, and more than 80 percent of the watershed contains denning/resting, foraging and movement habitat, the 7th field watershed contains a viable home range. If the watershed does not meet these criteria, it is assumed that the 7th field watershed does not contain a home range.

The effect of a loss of a home range is difficult to estimate in terms of population viability. Habitat lost is difficult to replace and it may take many years before the area develops into habitat again. However, this analysis doesn't use true home ranges; rather, the analysis provides a metric to display the potential effects. The loss of one home range may not have large effects on the population, but the loss of several home ranges can result in large effects to the population.

The spatial bound is the 7th field watersheds that intersect the Project area. The 7th field watershed is used because the size of the watershed fits within the range of a female fisher's home range and it is a natural division in the landscape.

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

Analysis Indicator: Risk of Disturbance to Roost Sites

The Project area doesn't contain any known bat hibernacula or maternity roosts but does have caves and mines that can provide habitat for bats that do exist in the Project area. A hibernaculum (plural: hibernacula) is usually a cave or mine that provides a constant temperature and protection for bats during the winter months. A maternity roost is a place where bats give birth and rear their young; maternity roosts can occur in a variety of structures such as caves or abandoned buildings. In order to account for the potential existence of an undiscovered hibernaculum and maternity site, geological mapping is used as a proxy to locate bedrock that typically contains caves (marble/limestone deposits). For mining activity, Forest mining data is used to identify the type of mine and locations. Using the combination of the geological data and mining data, a 250-foot buffer is created for a distance from all potential areas that may contain cave and cave-

like structures (possibly containing a maternity roost or hibernaculum); the location of this buffer is overlaid with Project activities for each alternative to estimate affects to these bat species.

If treatment occurred within 250 feet of the potential hibernaculum or maternity site, the risk of disturbance is high. If there is only treatment between 250 feet and 1,320 feet of the potential site, the risk of disturbance is moderate. If treatment occurs more than 1,320 feet from the potential site, the risk of disturbance is low.

High risk of disturbance may result in a maternity roost being abandoned with the fate of the offspring likely dependent on their age. High disturbance of a hibernaculum will likely result in all bat ages leaving the warmth of the cave to the colder outside; this may result in death of the bats. Moderate risk of disturbance is not likely to affect the maternity roost or hibernaculum but instead disturb individuals that come and go from the cave (excluding the winter months). Low risk of disturbance will be potentially moving a very few individuals from a foraging area but no disturbance of the hibernaculum or maternity roost.

The spatial bound for these bat species is 0.25 miles around all potential hibernacula and maternity roosts within the Project area. The temporal bound is about eight years for the short-term representing the time during implementation and greater than ten years for the long-term.

Willow Flycatcher

Analysis Indicator: Level of Habitat Alteration

This analysis will estimate the amount of habitat disturbed by the proposed activities; the level of effect will be presented in acres and in proportions of habitat affected, based on the 7th field watershed scale. Habitat for the species is assumed to be 3rd order streams (extent or location of resident trout used as a proxy) and wet meadows (mapped springs used as a proxy). If more than ten percent of the habitat is disturbed the level of habitat alteration is high. If between five percent and ten percent of habitat is disturbed, this is a moderate level of habitat alteration. If less than five percent of the habitat is disturbed, the level of habitat alteration is low.

High level of habitat alteration will likely affect flycatcher reproduction for a given 7th field watershed and possibly an entire population. Moderate level will likely affect a small number of territories and possibly affect a portion of a population. Low level of habitat alteration may affect individuals but the population is not likely affected.

The spatial bound is the 7th field watershed. The temporal bound in the short-term is about eight years and long-term is ten years.

Siskiyou Mountains Salamander

Analysis Indicator: Risk of Disturbance

The Siskiyou Mountains salamander habitat is generally described as diverse, typically on slopes with conifer or mixed conifer canopy cover with wet microclimates in rocky substrates (DeGross and Bury 2007) but there is some variation in habitat descriptions. Olivier et al. (2001) study described the area surrounding salamander locations with more boulders, deeper leaf litter, higher canopy closure, higher subsurface temperatures, and lower fern cover; these microhabitat conditions described areas where the species was

found south of the Siskiyou Crest which includes a portion of the Klamath National Forest. Welsh et al. (2007) found similar habitat attributes; they found Siskiyou Mountains salamanders in moist, older, closed canopy forests with deep litter and cobble- to boulder-sized rock substrates. Other studies have described this species' habitat with the presence of talus and canopy cover (Clayton et al. 1999, Suzuki et al. 2008). However, these microhabitat characteristics may not completely describe every site the salamander has been located. Sometimes, the species is located in areas that don't meet this general habitat description like areas with low amount of canopy cover; these sites may be able to maintain rocky, cool, moist habitat based on the physical location (e.g. aspect) (DeGross and Bury 2007).

The loss of canopy cover may not affect micro-site conditions equally across sites thus other factors may need to be considered to determine whether a site may persist after a disturbance event. The Siskiyou Mountains salamander activities are affected by the micro-site conditions; this species is typically associated with cool, moist conditions (Chen et al. 1995 and Welsh et al. 2007). The effects on micro-site conditions are variable depending on the habitat characteristics and the distance from the edge into the habitat (Chen et al. 1993). Latitude, aspect, and local climate are important for considering changes in micro-site conditions (Chen et al. 1993). South aspects are generally hotter and drier than north aspects; south aspects may only provide a limited period during the year where the micro-site conditions may meet the conditions needed for these salamanders to be active at or near the ground surface while the north aspects may create favorable conditions for a longer period of time (Chen et al. 1995, Welsh et al. 2007).

Fire can change the micro-site climate conditions by changing the site composition. Even though fire can physically change the rocky substrate that makes up a large portion of the salamander habitat, the change isn't usually enough to change the rock quality of the salamander habitat; however, fire can consume the organic material (e.g. leaf litter) that may cover the rocky areas and reduce the surrounding vegetation that shades the rocky areas. The surrounding vegetation and organic ground material likely contribute to the micro-site conditions by creating cooler and moister site conditions (Bury et al. 2002). The loss of canopy cover and organic ground material can affect these desirable conditions and possibly result in reducing the capability of the salamanders to be active at or near the ground surface. However, like described above, other physical features (e.g. aspect) may aid in offsetting the change in vegetation.

The Siskiyou Mountains salamander's range overlaps one subunit (Happy Camp) of the Project area. This area has been surveyed using a strategic survey approach over the last few years (not part of this Project) and several occupied sites have been found. Strategic surveys target areas that are likely to contain the species, but this approach didn't survey every acre in the Project area. For this Project, additional surveys are underway that are focused in the treatment units and areas identified as salamander habitat are subject to the project design features that are intended to reduce the effects this species.

For this analysis, an analysis indicator is used to estimate the level of risk to disturbing a known site. The following criteria were used for this analysis indicator. If more than 25 percent of the known sites are disturbed by the Project, the risk of disturbance is high. If between 20 percent and 25 percent of known sites are disturbed, the risk of disturbance is

moderate; if less than 20 percent of the known sites are disturbed, it is considered a low risk of disturbance.

A high risk of disturbance would include a large proportion of known sites being affected by the use of heavy equipment during Project activities that disturb habitat and likely result in negatively affecting the population. The moderate level may include effects to localized areas and the population as a whole but to a lower magnitude than high risk. Low risk will affect individuals but it is not likely to affect the population.

The spatial bound will be defined by a 130-foot buffer around all known sites. The temporal bound in the short-term is the time during implementation about eight years. The long-term is greater than ten years.

Tehama Chaparral Snail

Analysis Indicator: Likelihood of Dispersal

Snails, in general, have limited mobility and are reliant on specific habitat requirements. Snails require moisture for breathing and movement thus moist to wet, humid microclimates are critical for most snail species' survival and reproduction. During dry periods of the year, snails must conserve body water by avoiding intense sun exposure, elevated temperatures, and reduced humidity (Kappes 2005). Snails are so sensitive to the loss of moisture that the primary cause of snail death (all life stages) is considered to be desiccation (Asami 1993).

The level of moisture needed for snail to reproduce and survive is dependent on the species (Asami 1993). Snail species found in arid habitat tend to have greater tolerance and range of moisture conditions compared to a snail species found in moist habitat (Asami 1993). Moisture conditions are related to several factors, but dense tree canopy cover, abundant physical structures, and close proximity to water can produce desired microclimatic conditions (Asami 1993).

Snail habitat can vary between species, but the habitat must meet their needs. Plant (dead or alive) is the base food source for most snail species even though preferred plant species may vary greatly between snail species (Gervais et al. 1998, Sarma et al. 2007). Although one study reported a higher snail density in conifer forest (Locasciulli and Boag 1987), most studies found snails dependent on deciduous tree litter (Addison and Barber 1997, Abele 2010). Reasons for the reduced number of species found in conifer forests is thought to be related to reduced food sources, lack of essential mineral (i.e. calcium), and resinous extracts from conifer tree species (Karlin 1961). There are species specific responses to particular habitat types, but generally, most land snails are found in deciduous forests while others may be found in deciduous and conifer mixed forests (Abele 2010). Overall, deciduous tree leaf litter appears to be a component of land snail habitat.

Coarse woody debris is an important habitat component for many mollusk species. Woody debris can absorb and retain water for several weeks during periods without precipitation thus creating moist environment for snails (Kappes 2005). Moist, decaying logs provide an area for hibernation, feeding, breeding, egg development, and simply shelter thus a shelter from microclimatic extremes (Kappes 2005). Coarse woody debris may also buffer the effects of disturbance. The removal of canopy cover can change the microclimate, but woody debris may provide cool, moist conditions for possibly a short

period of time (Bros et al. 2011). However, coarse woody debris can't correct the overall result of losing canopy cover to microclimate conditions.

The Tehama chaparral snail is not well studied thus little information is available that describes the habitat. Generally, the species' habitat is composed of rocky areas (talus), deciduous hardwood and shrub leaf litter, and other debris (e.g. logs) covered with abundant shade (Burke et al. 1999). Dunk et al. (2002) found a weak but statistically significate relationship between species occurrence and riparian reserves suggesting this species may be prefer habitat near streams; riparian areas typically provide high relative humidity that is desired by most, if not all land snails. In the drier portions of this species range, the talus areas provide refugia from predators, temperatures, and moisture extremes; the snails rarely travel more than 33ft beyond talus habitat (Duncan et al. 2003). The size and type of the rock in the talus may be an important habitat characteristic; this species is more commonly associated with talus composed of small (less than three inches in diameter) limestone and basalt rock (Duncan et al. 2003).

Areas affected with high severity wildfire are less likely to support a snail population, and snails are likely to disperse to less-affected habitat. This analysis will use the pre-fire GIS habitat layer and known sites where snails have been located to identify treatment units that may contain snails. The amount of woody debris (greater than 12 inches in diameter) will equate to the likelihood of snails being able to disperse to viable habitat. If there are more than seven logs (greater than 12 inches in diameter) the likelihood of dispersal is high. If there are five to seven logs per acre, the likelihood of dispersal is moderate. If there are fewer than five logs per acre, the likelihood of dispersal is low.

High likelihood of dispersal means that there will be a sufficient amount of woody debris to provide cover and moist conditions for snails to move from one location to another. Moderate likelihood of dispersal will provide enough woody debris for snails to move through part of the area but open areas that impede movement or reduce potential survival are likely to be present. Low likelihood of dispersal means little continuous cover is present and there is a lower survival of individuals, with the possibility of severing connectivity between populations of snails.

The spatial scale is the Happy Camp and Beaver project areas. The temporal scale is about eight years, which is the time for implementation. Long-term is greater than 20 years.

Western Bumble Bee

Analysis Indicator: Level of Habitat Disturbance

The western bumble bee, like other species of bumble bees, is sensitive to habitat disturbance. In the Project area, high-quality habitat for bees is likely to occur in the meadows where several species of flowering plants occur. Meadows also offer a high density of plants to provide additional structure and small animal burrows that bees also use for nesting. Heavy equipment and tree harvest are the most likely source of ground disturbance in this Project. If more than five acres of meadow habitat will be disturbed by ground-based equipment, the level of disturbance is high. If one to four acres of meadow are disturbed, the level of disturbance is moderate. If less than one acre of meadow is disturbed, the level is low.

A high level of disturbance will result in affecting at least one bee colony where reproduction will be compromised. Moderate level of disturbance will result in removing flowering plants or preventing bees from using an area because of activities. This will result in bees traveling further to find food resources if a colony is present within close proximity to the treatment. A low level of disturbance will be a temporary interruption of bee activities lasting a few hours but bees will return to the area.

The spatial bound is the meadows within the Project area. The temporal bound in the short-term is about eight years (during the period when implementation is expected to occur and bees may be disturbed) and long-term is ten years.

Management Indicator Species

The requirement to evaluate landscape and Project-level impacts to habitat conditions associated with species associations and related management indicator species is identified in the Forest Plan (page 4-39). Habitat monitoring requirements are summarized in the Management Indicator Species Report Part I. “Habitats” are the vegetation types (for example, mixed conifer forest) and/or ecosystem components (for example, river and ponds) and special habitat elements (for example, snags) identified in the Forest Plan. “Habitat status” is the current amount of habitat on the Forest. For the post-fire assessment of habitat, the Rapid Assessment of Vegetation Condition after Wildfire (RAVG) data are used (Appendix A).

Project-level effects on management indicator species are analyzed and disclosed by examining the impacts of the proposed Project on habitat for management indicator species by discussing how direct, indirect, and cumulative effects will change the quantity and/or quality of habitat in the analysis area for each habitat association. For this analysis, the following analysis indicators are used to determine the level of effects.

Hardwood-Associated Species

Analysis Indicator: Change in hardwood habitat abundance

Overlaying treatment prescriptions for each defined treatment unit with the defined habitat results in estimating the acres of hardwood habitat affected by the treatment and the levels of effects to the habitat (whether habitat will be degraded or removed). Degraded hardwood habitat means that physical structures are changed to the point that the quality of the habitat is lessened. Removed habitat is no longer functioning as habitat as a result of proposed activities or events. For each alternative, the acres of habitat affected are reported for each habitat association.

Spatial bounding for the hardwood associated species is defined by the Project area. The temporal bound for the hardwood associated species is eight years for the short-term to include the expected time to complete implementation of the Project. The long-term spatial bound is ten years which will capture the anticipated fire affected vegetation response (e.g. hardwood regeneration).

Snag-Associated Species

Guidelines for Snag Retention and Coarse Woody Debris

The Species Associations identified in the Forest Plan under the Management Indicator Species sections was developed to represent habitats or features of a habitat type that are

important for many plant and animal species. Snags are an important feature so a series of Snag Associated Species were identified to represent the snag feature in different but sometimes overlapping habitat types as a measure of potential effects of passive and active land management. However, the importance of snags extends across all of the land management allocations including the Late-Successional Reserves. The Late-Successional Reserves have similar guidance in the Forest Plan but serve a different purpose; Late-Successional Reserve guidance targets a wide spectrum of plants and animals associated with late-successional forests which also includes snags as part of the habitat. Below describes and discusses the guidance for managing snags and coarse woody debris in the Forest Plan and the Late-Successional Reserves and the relevant research. Although this discussion doesn't apply strictly to snag associated species, public comment typically points out the need for the management of snags in reference to the Snag Associated Species so the discussion is presented in this section even though snags and coarse woody debris are important to many other species analyzed for this Project.

Snag and down wood are essential parts of late successional forest stands. There is however a tension between leaving enough snags and coarse woody debris for habitat needs and leaving so much dead wood that fuel loads are unacceptably high (Knapp 2015). The LSRA, in describing Desired Condition, noted that minimum amounts of snags and coarse woody debris (CWD) could be exceeded, but not to the point that they were likely to create the likelihood of a stand-replacing event (LSRA 1-3). Skinner et al. (2006) observed that:

> *"Quantities of large woody material for standards and guidelines were developed from contemporary old-growth forests that had experienced many decades of fire suppression. These quantities of woody material were probably unusually high compared to typical pre- fire suppression values. Consequently, a management emphasis on meeting or exceeding standards and guidelines for dead woody material has and will increase fire hazard over time and threatens the very habitat the standards and guidelines were designed to improve."*

As noted by Knapp (2015):

> *While the importance of woody detritus to the ecological health of many forested ecosystems is undeniable, it is also recognized that in seasonally dry forests a balance is necessary so that excessive fire hazard does not result (Brown and See, 1981; Brown et al., 2003; Lehmkuhl et al., 2007). A substantial proportion of lighting- ignited fires start in snags (Komarek, 1968). Burning snags, particularly ones that are highly decayed, are also a prolific source of embers that propagate spot fires, contributing to rapid fire spread (Barrows, 1951). In addition, the instability and unpredictability of burning snags are a serious safety issue for fire management personnel (Page et al., 2013). While a greater proportion of the dead wood biomass in coniferous forests is typically found in CWD than in snags (Harmon et al., 1986), consumption of both standing snags and CWD increases fire-line intensity, contributing to extreme fire behavior and more severe fire effects (Page et al., 2013). <u>With CWD, Brown et al. (2003) speculated that an optimum quantity for warm and dry ponderosa pine and Douglas fir forest types of the western U.S. that would provide for wildlife, nutrients and other ecological benefits, without contributing to excessive risk of an uncharacteristically severe wildfire, would fall within the range of 11.2–44.8 Mg ha-1 (5–20 tons ac-1), with the higher fuel loading acceptable if the CWD was comprised of larger pieces.</u> (Emphasis added).*

In the Westside Fire Recovery Project, we address this balance between habitat and fuel accumulation by utilizing landform, slope position and aspect to determine snag and coarse woody debris amounts and distribution. All snags and coarse woody debris are

retained in hydrologic Riparian Reserves and designated snag retention areas which are generally associated with hydrologic Riparian Reserves or pockets of larger trees and lower slope positions. This mimics the natural fire pattern because fires burned with lower severity in riparian areas particularly on lower slope positions where riparian areas are wider and denser. Historically even in a frequent fire environment there would tend to be more snags in these areas. Coarse woody debris is retained as specified in the Forest Plan but in amounts that vary with slope position.

The Forest Plan provided guidelines for retention of snags (Forest Plan, page 4-30) and coarse woody debris (Forest Plan, page 4-25). Guidelines for snag retention in the Forest Plan are reproduced here in Table 3-18.

> *Forest Plan Standard and Guide 8-25: Use Table 4-4 [Table 3.18] as guidelines in ecosystem analysis and project-level planning. The relative numbers of hard and soft snags in various size classes show the habitat needs of the different cavity-association Forest wildlife species. The number of snags on a given acre will vary, depending on the site and on the number of snags within the landscape.*

Table 3-15: Numbers of Snags Required per 100 acres to support "Good" Quality Habitat for Primary Cavity-Association Species ( )= Number of Snags per 100 acres

Snag Diameter (DBH)	Hard Snags	Soft Snags	Total Snags by diameter class
11+		Downy (16)	(16)
15+	Red Breasted / Black Backed (45	Hairy / White hd. (225)	(270)
20+	Vaux's Swift(200)		(200+)
24+	Pileated(14)		(14)
		Total Snags	(500)

The Forest Plan direction does not require that these snag metrics be met on every acre; the Forest Plan requires that within any 100-acre area, the appropriate number of snags be retained. This allows Project design to mimic the natural snag distribution described by Skinner (2002) and Taylor and Skinner (1996) with concentration of snags in time and space, and intervening areas where snags would be relatively sparse or would not occur.

To meet the snag standards of the Forest Plan shown in Table 3-18, the following project design features would be implemented:

- Within harvest units, all snags are retained in hydrologic Riparian Reserves, which include inner gorge areas and additional snag retention areas associated with hydrologic Riparian Reserves
- Within hydrologic Riparian Reserves in salvage units, surface fuels would be treated by broadcast burning at the time that activity fuels within units are burned. This reduces surface fuels, and increases the probability that retained snags would survive future fires.
- Green trees and lower-severity fire areas where most of the trees survived will be retained as they occur and are not "included timber" in proposed salvage harvest areas even if they occur within salvage unit boundaries. Over time, these green trees contribute to snags and coarse woody debris. Trees with less than 70% probability of mortality would be maintained.
- Large, fire-resistant legacy live trees, legacy trees killed by the fire and trees that were dead at the time of the fire are retained where they occur within salvage units. If these pose a safety hazard, they would be felled and left to provide large woody debris.

The Forest Plan also provides guidelines for coarse wood debris (CWD) (Forest Plan, Forest-wide Standard and Guideline 6-16, page 4-25). These are shown in Table 3-16, which includes a brief discussion of implementation.

Table 3-16: Guidelines for Coarse Woody Debris

Guideline	Implementation
6-16 Until standards are developed as described above, the following guidelines apply in areas of regeneration harvests and other vegetation manipulation:	No additional standards have been developed for CWD. The standards provided in the Forest Plan will be implemented.
a) Manage to provide a renewable supply of large down logs well distributed across the matrix landscape in a manner that meets the needs of species and provides for ecological functions. Develop models for groups of plant associations and stand types that can be used as a baseline for developing prescriptions.	Green trees have been retained wherever they occur. Reforestation will contribute to down logs in the future.
b) Maintain 5 to 20 pieces of CWD per acre in various states of decay. The specific amount of materials specified for retention on individual projects shall be determined by the project ID team. At a minimum, the ID team should consider the amount of materials existing on site, the amount of material needed to provide for nutrient cycling and site productivity, the denning needs of wildlife species, and the fire risk as a result of fuel material on site. Attempt to maintain these levels of CWD on site throughout the life of the project or throughout the rotation (if timber harvest is planned.) Leave large logs, conifer and hardwood, sound and cull of at least 20 inches in diameter and about 40 cubic feet in volume when they are available. Most of the logs should be in Decay Class 3, 4 and 5 (defined in the USDA Handbook 553, page 80) with at least 2 logs per acre in decay Class 1 or 2. Do not count logs less than 12 inches in diameter or stumps as CWD. This guideline may be waived in strategic fuelbreak areas or for documented safety reasons. Down logs should reflect the species mix of the original stand. In areas of partial harvest, the same basic guidelines should be applied, but they should be modified to reflect the timing of stand development cycles where partial harvesting is practiced.	CWD in these amounts and size classes will be retained. On upper slopes and south and west aspects, fewer pieces (~5 pieces > 15 inches diameter and 10 feet long - the lower range) would be retained because historically, frequent fires consumed down wood in these locations. On north and east aspects and on lower slopes, relatively more pieces (up to 20 pieces - the upper range) will be retained because historically, these areas burned less frequently, or burned with less severity. Snags in clumps, and green trees within units may count towards these targets. These values are consistent with those recommended by Brown et al. (2003) and cited by Knapp (2015). Fuel modeling shows that salvage harvest followed by activity fuel treatment would accomplish the LRMP goal of reducing fuel concentrations that would contribute to future high-intensity fire (Forest Plan, page 4-8). Areas of snag retention would provide large pulses of dead wood as that material breaks and falls to the ground.
c) CWD already on the ground should be retained and protected to the greatest extent possible from disturbance during treatment (e.g., slash burning and yarding) which might otherwise destroy the integrity of the substrate.	All CWD that is currently on the ground will be retained.
d) Down logs should be left within forest patches that are retained under green-tree retention guidelines in order to provide the microclimate that is appropriate for various organisms that use this substrate.	All CWD within patches of standing trees will be retained.

Analysis Indicator: Change in snag habitat abundance

The analysis of habitat is the same as for hardwood associated species except with a focus on snag habitats[36]. Spatial bounding for snag-associated species is defined by the Project area. The temporal bound for snag associated species is eight years for the short-term to include the expected time to implement the Project. The long-term spatial bound is ten years which will capture the anticipated fire affected vegetation response (e.g. the time for most or all snags to fall over).

[36] Snags ranging in diameter and distribution in the project area were created by the 2014 fires. The current conditions resulting from these fires include a particular type of habitat that is favorable to some wildlife species. One of those species, the black-backed woodpecker, occurs in the snag species association for this project. It is a well-studied species that uses stands of dense trees that are affected by high-severity fires. Although habitat for black-backed woodpeckers may be affected by this project, the snag association was chosen as a management indicator to represent the use of true fir habitat, not the use of fire-affected areas. Therefore, effects of the project on snag associated species are analyzed based on the assigned habitat type for each species as described in the Forest Plan.

Survey and Manage

Analysis Indicator: Habitat protection

Each alternative is evaluated in terms of how the proposed activities will meet the requirements of the species-specific management recommendations if known sites of survey and manage species are present, and how the Project will comply with the 2001 Record of Decision (USDA 2001) and the 2001, 2002, and 2003 annual species reviews. Requirements of the 2001 Record of Decision include management of known sites as recommended by species review and conducting pre-disturbance surveys of potential habitat and managing any discovered sites for Siskiyou Mountain salamander and Tehama chaparral snail (both analyzed as sensitive species), and the blue-gray taildropper. The analysis indicator for effects on survey and manage species is the number of known sites affected by the Project activities.

For action alternatives (2, 3, 4, 5, Alternative 2 Modified, and Alternative 3 Modified) the spatial boundary will be limited to the treatment units. For Alternative 1, the spatial boundary will be the same as Alternative 2 since this alternative has the maximum footprint of treatment. The short-term temporal bounds will be limited to the time for each activity to be implemented which is about eight years. The long-term bound will be 20 years.

Summary of Analysis Indicators, and Spatial and Temporary Boundaries

Table 3-17 displays a summary of the name, status, and spatial and temporary boundaries of each species considered in this analysis with relevant analysis indicators for each.

Table 3-17: Analysis Indicators, Spatial and Temporary Boundaries by Species

Species	Status	Analysis Indicator	Spatial Boundary	Temporal Boundary
Northern spotted owl	Federally-listed as Threatened	Risk to Reproduction	Home ranges that overlap fire perimeter	Short-term = ≤ 8 years Long-term = >10 years
		Changes to Critical Habitat	Area designated as critical habitat within the home ranges that overlap the fire perimeter	Short-term = ≤ 8 years Long-term = >10 years
Bald eagle	Forest Service Sensitive	Level of disturbance to nest/roost sites	Known nest sites plus a 1,500-foot buffer around known sites in the project area	Short-term = ≤ 8 years during reproductive period (Jan. 1 to Aug. 1) and roosting period (Nov. 1 to Mar. 31) Long-term = >10 years
		Risk to future potential nest areas	Within ½ mile of known sites and the area between the nest and a river if the known nest is greater than ½ mile from a river in the project area	Short-term = ≤ 8 years Long-term = >10 years
Northern goshawk	Forest Service Sensitive	Level of disturbance to nest sites	¼ mile from all known goshawk nest sites (foraging zone overlap the project area)	Short-term = ≤ 8 years during reproductive period (March 1 to August 31) Long-term = >10 years
		Risk to reproduction	1 mile from known goshawk nest foraging zone that overlap the project area	Short-term = ≤ 8 years Long-term = >10 years
Fisher, Marten, Wolverine	Forest Service Sensitive	Connectivity of habitat	7th field watersheds that intersect the project area	Short-term = ≤ 8 years Long-term = >20 years
		Changes in fisher home range	7th field watersheds that intersect the project area	Short-term = ≤ 8 years Long-term = >20 years
Pallid Bat, Townsend's Big-eared Bat, Fringed Myotis	Forest Service Sensitive	Risk of disturbance to roost sites	¼ mile around all potential hibernaculum and maternities in project area	Short-term = ≤ 8 years Long-term = >10 years
Willow Flycatcher	Forest Service Sensitive	Level of habitat alteration	Meadow and riparian (3rd order streams or greater) within project area	Short-term = ≤ 8 years Long-term = >10 years
Siskiyou Mountains Salamander	Forest Service Sensitive and Survey and Manage Species	Risk of Disturbance	130-foot buffer around all known sites in project area	Short-term = ≤ 8 years Long-term = >10 years
Tehama Chaparral Snail	Forest Service Sensitive and Survey and Manage Species	Likelihood of dispersal	Boundaries of Happy Camp and Beaver project areas	Short-term = ≤ 8 years Long-term = >20 years
Western Bumble Bee	Forest Service Sensitive	Level of habitat disturbance	7th field watersheds that contain meadow features in the project area	Short-term = ≤ 8 years Long-term = >10 years
Hardwood-Associated Species	Management Indicator Species	Change in hardwood habitat abundance	Project area	Short-term = ≤ 8 years Long-term = >10 years
Snag-Associated Species	Management Indicator Species	Change in snag habitat abundance	Project area	Short-term = ≤ 8 years Long-term = >10 years
Survey and Manage Species	Survey and Manage Species	Habitat protection	Potential treatment units	Short-term = ≤ 8 years Long-term = >20 years

Affected Environment

Project Area A: Beaver Fire

Wildlife Biological Evaluation

Northern Spotted Owl

Risk to Reproduction

The Beaver analysis area contains 23 activity centers; seven of these activity centers are completely outside the fire perimeter or they are only affected on the far outside portions of their home ranges. The remaining 16 activity centers have varying levels of fire effects; nine activity centers were mostly burned through. Given the existing habitat in the activity centers analyzed in the Beaver analysis area, two activity centers have very low risk to reproduction. Six activity centers have low, eight activity centers have moderate, and seven activity centers have high risk to reproduction. Therefore, without any treatments, in the seven activity centers in the "high" category, a pair of owls occupying the area may have a difficult time finding enough resources to support themselves plus offspring.

Changes to Critical Habitat

The analysis estimates the number of critical habitat acres affected by each alternative. Northern Spotted Owl (NSO) use of fire affected areas for foraging is unclear in the literature for several possible reasons, but for this analysis, the pre-fire suitable habitat that burned at moderate and high fire severity is included. Suitable habitat that burned at very low and low fire severity still contains the physical attributes of suitable habitat thus this habitat is identified as suitable habitat. Given the types of treatment proposed for this Project, the treatments are likely to result in maintaining, degrading, downgrading or removing habitat. We focus the reporting of effects on downgrading and removing habitat. Habitat removal means the habitat prior to treatment will not function as spotted Owl habitat after treatment. NSO habitat is generally described as a hierarchy in habitat quality with nesting/roosting being the highest quality and foraging and dispersal following in order; habitat downgrading signifies the lowering of a habitat quality from one level to the next.

NSO critical habitat overlaps a large portion of the 2014 fires and consequently, a large number of critical habitat acres were burned at high severity. The loss of critical habitat is often coinciding with the loss of the better NSO habitat. Alternative 1 will not affect NSO critical habitat. The lack of treatment will retain all the remaining habitat and important legacy structures to aid in the development of NSO habitat by providing physical structure as the stand regenerates. Since NSO and their prey rely on these structures to fulfil their needs for survival and reproduction, the maintenance of large trees and large woody debris may increase the quality of future NSO habitat, if subsequent fires don't consume these features. However, the lack of treatment will not aid in reducing fuels that can increase the potential of these areas to naturally regenerate without interruptions of high severity fire.

The Beaver analysis area contains about 4,881 acres of critical habitat and about 229 acres of fire affected critical habitat within two critical habitat subunits (KLE6 and KLE7). The estimated amount of critical habitat for each habitat type is summarized in Table 3-18.

Table 3-18: Existing conditions for Northern Spotted Owl Critical Habitat for the Beaver fire area.

Critical Habitat Subunit	Critical Habitat area in Analysis Area (acres)	Northern Spotted Owl Critical Habitat			
		Nesting/roosting (acres)*	Foraging (acres)*	Dispersal (acres)*	Fire-Affected Critical Habitat (acres)
KLE6	7,429	1,577	1,402	1,401	229
KLE7	650	172	52	277	0

Bald Eagle

There is one nest site in this fire area. It is at the bottom of Dona Creek along the Klamath River.

Northern Goshawk

There are three potentially occupied Northern Goshawk territories in the Beaver fire area. The territories are the Beaver, Kohl and the Woodchopper nests. Woodchopper and Kohl territories have a high risk to reproduction and Beaver has a moderate risk to reproduction. The risks are a result of past events including the 2014 wildfire event.

Fisher, Marten, and Wolverine

Level of Habitat Connectivity

Past fires that created large openings in a given watershed are among the causes of the number of watershed with low or very low connectivity. The Beaver analysis area has seven watersheds with a moderate level of connectivity, five watersheds with a low and one with a very low level of habitat connectivity.

Change in Fisher Home Range

The Beaver analysis area contains 4 watersheds that may support a fisher home range. Nine of the watersheds have too many open areas (many of which were created by the 2014 fires) or do not have enough acres of denning/resting and foraging habitat to meet the criteria of a home range.

Pallid Bat, Townsend's Big-eared Bat, and Fringed myotis

There are seventeen potential hibernacula/maternities in the Beaver Fire area.

Willow Flycatcher

There are eleven watersheds with potential willow flycatcher habitat in the Beaver fire area.

Siskiyou Mountain Salamander

The Siskiyou Mountains salamander is known to occur in the Happy Camp project area, but there are no detections of the species in the Beaver or Whites project areas.

Tehama Chaparral Snail

There are no known sites in the Beaver fire area. Generally, the known sites inside and outside the Project area are located on southerly aspects close to riparian areas. The area outside the riparian areas around the known sites is much drier and the riparian areas are likely important for this species. However, the general area that appears to fit the habitat description best burned mostly at low and moderate severity in the riparian area during

the 2014 fire. Given this species possible association with riparian habitat, the species may have pockets of remaining high quality habitat.

Western Bumble Bee

Level of Habitat Disturbance

The western bumble is likely to occur over much of the Forest. However, the species has only been incidentally observed on the Forest. The actual distribution of the bee on the Forest is not known. Although the species is not exclusively associated with meadows, there is a strong relationship with the habitat needs and meadows. Meadows can occur on the Forest at almost any elevation possible, but the majority of the meadows in the Project area occur above 4,000ft in elevation. The elevation range and the differences in aspect can provide bumble bees with a diversity of flowering plants. There are five watersheds that have potential Bumble Bee habitat (meadows) in this fire area.

Management Indicator Species

Snag Species Association

Changes in Snag Habitat Abundance

There is about 23,400 acres of snag species associated habitat in the Beaver fire area. Many of the cavity-nesting, snag-associated species that potentially occur in the Project area have interdependent and complex life cycles that rely specifically on this habitat type. The abundant selection of snags can provide primary cavity nesters the opportunity to construct several cavities that will in turn provide secondary cavity nesters more potential nest sites.

Hardwood Species Association

Changes in Hardwood Habitat Abundance

There is about 4,250 acres of hardwood species associated habitat in the Beaver fire area. This doesn't mean that these species will not enter a hardwood stand that burned with high severity effects to retrieve their food caches but the lack of canopy cover in these areas doesn't provide much escape cover to avoid predation. Plus, these species rely on the acorn mast as a food source; without live hardwoods, these species may need to move to other areas in search of food. However, some of the hardwoods do re-sprout after a fire and may produce a mast in about ten years. Hardwood re-sprouting is already evident in the Project area.

Survey and Manage

Habitat Protection

The Beaver project area prior to the 2014 fires contained a patchwork of conifer habitat, but due to previous fires, most of the older forest was greatly fragmented and connected by younger conifer forest, oak woodland, or chaparral. The 2014 fires resulted in the loss of many acres of various habitat types due to the loss of canopy cover, decaying large coarse woody debris, and leaf litter to provide micro-site conditions. These changes mean habitat conditions are less favorable for these species.

Habitat within pre-fire habitat that burned at very low and low severity may contain the micro-site conditions associated with the Survey and Manage species analyzed for this Project. However, the habitat affected by moderate and high severity may not provide the needed micro-site conditions for these species given the lack of canopy cover and

understory vegetation. Moderate and high severity fire kills most, if not all the trees and consumes most of the small vegetation resulting in little to no canopy cover. These changes in conditions can create a hot, dry condition that is not conducive habitat for mollusk or salamander species, these conditions may change as vegetation regenerates. Even if a site experiences moderate or high fire severity, it is difficult to confirm a site not occupied so we are assuming all known sites are occupied. Therefore, standards and guidelines are applied to all known sites.

Big Game

Forage and cover are important attributes of quality deer and elk habitat. These conditions have been removed on the short term in the areas that experienced high fire severity. The conditions have been degraded in areas with moderate fire severity, but resprouting of hardwoods and existing shrubs will recover quickly to provide cover and forage (2-5 years). If deer or elk are present in areas with high or moderate fire severity, they may use the areas along the periphery that still contain some vegetation cover.

Project Area B: Happy Camp Complex

Wildlife Biological Evaluation

Northern Spotted Owl

Risk to Reproduction

The Happy Camp analysis area contains 57 activity centers; eight of these activity centers are completely outside the fire perimeter or are only affected on the far outside portions of their home ranges. The remaining 49 activity centers have varying levels of fire effects. Given the existing habitat in the activity centers analyzed in the Happy Camp analysis area, 2 activity centers have very low, 11 activity centers have low, 39 activity centers have moderate, and 5 activity centers have high risk to reproduction. Therefore, without any treatments, the five activity centers in the “high” category, a pair of owls occupying the site will likely have a difficult time finding enough resources to support themselves plus any offspring.

Changes to Critical Habitat

The overall affected environment is described in the Beaver fire area section. The Happy Camp analysis area contains about 38,733 acres and about 9,273 acres of fire affected critical habitat within three critical habitat subunits (KLE6, KLE7, and KLW7). The estimated amount of critical habitat for each habitat type summarized in Table 3-19.

Table 3-19: The current acres of Northern Spotted Owl Critical Habitat for Happy Camp fire area.

Critical Habitat Subunit	Critical Habitat area in Analysis Area (acres)	Northern Spotted Owl Critical Habitat			
		Nesting/roosting (acres)*	Foraging (acres)*	Dispersal (acres)*	Fire-Affected Critical Habitat (acres)
KLE6	287	73	16	117	0
KLE7	39,962	7,606	6,864	6,480	8,434
KLW7	28,876	2,619	8,027	6,931	839

Bald Eagle

There are three Bald Eagle nests in this fire area. These are Fryingpan, Muck-a-Muck and Caroline Creek (named for the drainages in which they are located). They are all along the Klamath River. These nests have a low risk to future nest tree sites.

Northern Goshawk

There are nine potentially occupied territories in the Happy Camp fire area. These are the China, East Fork Elk, Elk, Kelsey, Kuntz, Middle, O'Neil, Stanza and Walker territories. China, Kelsey and Kuntz territories have a moderate risk to reproduction as a result of past events including the 2014 wildfires. The remaining potentially occupied territories have a high risk to reproduction.

Fisher, Marten, and Wolverine

Level of Habitat Connectivity

The Happy Camp analysis area contains 26 watersheds with moderate level of connectivity while the remaining 10 watersheds had a low level of connectivity.

Change in Fisher Home Range

The Happy Camp analysis area contains 18 out of the 36 watersheds that may support a fisher home range.

Pallid Bat, Townsend's Big-eared Bat, and Fringed myotis

There are twenty-eight potential hibernacula/maternities in the Happy Camp fire area.

Willow Flycatcher

There are thirty-eight watersheds with potential willow flycatcher habitat in the Happy Camp fire area.

Siskiyou Mountain Salamander

The Siskiyou Mountains salamander has a narrow species range that generally covers the area from Applegate Valley to the Klamath River. The southern portion of the range overlaps with the Happy Camp project area. Depending on the species range map, the Happy Camp project area could overlap up to 25 percent of the species range.

There are 48 known sites within the project area and many of these sites occur in areas with smaller sized talus with dense conifer canopy cover that creates cool, moist conditions. Most of these sites have experienced high and moderate severity fire from the 2014 fires that removed all or most of the tree canopy cover. The lack of canopy will likely create conditions at the sites that are hotter and drier. The change in temperature and moisture will likely make conditions difficult for the salamanders to persist, but any vegetation and large woody debris may offset these conditions. These sites are likely still occupied.

Tehama Chaparral Snail

There are three known sites in the Project area which are all in the Happy Camp fire area. Generally, the known sites inside and outside the Project area are located on southerly aspects close to riparian areas. The area outside the riparian areas around the known sites is much drier and the riparian areas are likely important for this species. However, the general area that appears to fit the habitat description best burned mostly at low and moderate severity in the riparian area during the 2014 fire. Given this species possible

association with riparian habitat, the species may have pockets of remaining high quality habitat.

Western Bumble Bee

Level of Habitat Disturbance

The affected environment is the same as described in the Beaver fire area. There are twenty-six watersheds that have potential Bumble Bee habitat (meadows) in this fire area.

Management Indicator Species

Snag Species Association

Changes in Snag Habitat Abundance

There is about 146,700 acres of snag species associated habitat in the Happy Camp fire area. Many of the cavity-nesting, snag-associated species that potentially occur in the Project area have interdependent and complex life cycles that rely specifically on this habitat type. The abundant selection of snags can provide primary cavity nesters the opportunity to construct several cavities that will in turn provide secondary cavity nesters more potential nest sites.

Hardwood Species Association

Changes in Hardwood Habitat Abundance

There is about 4,070 acres of hardwood species associated habitat in the Happy Camp fire area. This doesn't mean that these species will not enter a hardwood stand that burned with high severity effects to retrieve their food caches but the lack of canopy cover in these areas doesn't provide much escape cover to avoid predation. Plus, these species rely on the acorn mast as a food source; without live hardwoods, these species may need to move to other areas in search of food. However, some of the hardwoods do re-sprout after a fire and may produce a mast in about ten years. Hardwood re-sprouting is already evident in the Project area.

Survey and Manage

Habitat Protection

The affected environment is similar to that described in the Beaver fire area. The difference is that the Happy Camp fire area contained larger patches of mid- to late-successional habitat mostly connected by young forest prior to the fire.

Big Game

The affected environment is the same as described in the Beaver fire area.

Project Area C: Whites Fire

Wildlife Biological Evaluation

Northern Spotted Owl

Risk to Reproduction

The Whites analysis area contains 15 activity centers; two of these activity centers are completely outside the fire perimeter or are only affected on the far outside portions of their home ranges. The remaining 13 activity centers have varying levels of fire effects. Given the existing habitat in the activity centers analyzed in the Whites analysis area, 11

activity centers have low and four activity centers have moderate risks to reproduction; there is no activity center with a very low or high level of risk to reproduction.

Changes to Critical Habitat

The overall affected environment is described in the Beaver fire area section. The Happy Camp analysis area contains about 20,518 acres of critical habitat and about 2,217 acres of fire affected critical habitat within one critical habitat subunits (KLW8). The estimated amount of critical habitat for each habitat type is summarized in Table 3-20.

Table 3-20: Current Northern Spotted Owl Critical Habitat acres for Whites fire area.

Critical Habitat Subunit	Critical Habitat area in Analysis Area (acres)	Northern Spotted Owl Critical Habitat			
		Nesting/roosting (acres)*	Foraging (acres)*	Dispersal (acres)*	Fire-Affected Critical Habitat (acres)
KLW8	30,148	6,703	7,393	6,422	2,217

Bald Eagle

There are no known Bald Eagle nest sites in the Whites fire area.

Northern Goshawk

There are three Northern Goshawk potentially occupied territories in the Whites fire area. These are the Hickory, Sixmile and West Whites territories. Hickory has a high risk to reproduction. Sixmile and West Whites have moderate risk to reproduction. The risk levels are a result of past events including the 2014 wildfires.

Fisher, Marten, and Wolverine

Level of Habitat Connectivity

The Happy Camp analysis area contains 6 watersheds with moderate level of connectivity. There are eight and four watersheds with low and very low connectivity respectively.

Change in Fisher Home Range

The Whites analysis area contains 14 out of 21 watersheds that may contain a fisher home range.

Pallid Bat, Townsend's Big-eared Bat, and Fringed myotis

There are thirteen potential hibernacula/maternity in the Whites fire area.

Willow Flycatcher

Level of Habitat Alteration

There are eighteen watersheds with potential willow flycatcher habitat in the Whites fire area.

Siskiyou Mountain Salamander

The Happy Camp fire area is within the range of the Siskiyou Mountain Salamander, but the Beaver and Whites fire areas are outside the known range of this species.

Tehama Chaparral Snail

There are no known sites in the Whites fire area. Generally, the known sites inside and outside the Project area are located on southerly aspects close to riparian areas. The area outside the riparian areas around the known sites is much drier and the riparian areas are likely important for this species. However, the general area that appears to fit the habitat description best burned mostly at low and moderate severity in the riparian area during the 2014 fire. Given this species possible association with riparian habitat, the species may have pockets of remaining high quality habitat.

Western Bumble Bee

Level of Habitat Disturbance

The general affected environment is the same as described in the Beaver fire area. There are eleven watersheds that have potential Bumble Bee habitat (meadows) in this fire area.

Management Indicator Species

Snag Species Association

Changes in Snag Habitat Abundance

There is about 49,200 acres of snag species associated habitat in the Whites fire area. Many of the cavity-nesting, snag-associated species that potentially occur in the Project area have interdependent and complex life cycles that rely specifically on this habitat type. The abundant selection of snags can provide primary cavity nesters the opportunity to construct several cavities that will in turn provide secondary cavity nesters more potential nest sites.

Hardwood Species Association

Changes in Hardwood Habitat Abundance

There is about 700 acres of hardwood species associated habitat in the Whites fire area. This doesn't mean that these species will not enter a hardwood stand that burned with high severity effects to retrieve their food caches but the lack of canopy cover in these areas doesn't provide much escape cover to avoid predation. Plus, these species rely on the acorn mast as a food source; without live hardwoods, these species may need to move to other areas in search of food. However, some of the hardwoods do re-sprout after a fire and may produce a mast in about ten years. Hardwood re-sprouting is already evident in the Project area.

Survey and Manage

Habitat Protection

The affected environment is the same as described in the Happy Camp fire area.

Big Game

The affected environment is the same as described in the Beaver fire area.

Environmental Consequences

Alternative 1

Project Area A: Beaver Fire

Wildlife Biological Evaluation
Northern Spotted Owl
Direct Effects and Indirect Effects
Risk to Reproduction

Alternative 1 will not directly affect this indicator because there are no treatments to remove or degrade any northern spotted owl habitat. Almost all the activity centers analyzed in this Project will continue to accumulate fuels resulting from the burned trees falling over. Regeneration of habitat will likely take more than 100 years to develop into high quality northern spotted owl habitat as long as high severity fire doesn't interrupt forest development. A delay in habitat development is especially difficult for the activity centers that were heavily affected by the 2014 fires. The loss of suitable habitat can affect Northern Spotted Owl reproduction.

Most of the activity centers in the Beaver analysis area were affected by the 2014 fires. The two activity centers that have a very low risk to reproduction are just outside the fire area but are within the Project area. There are six activity centers with a low risk to reproduction, eight with moderate and 7 with high risk to reproduction. Without treatment, the remaining owl pairs may stay at the current location or move to a new location where the habitat may be more conducive to fulfilling their needs.

Changes to Critical Habitat

Critical habitat for the northern spotted owl overlaps a large portion of the 2014 fires; a large number of critical habitat acres were burned at high severity. Critical habitat units typically contain high quality habitat or sites that are capable of producing high quality habitat therefore the loss of critical habitat often coincides with the loss of the better owl habitat. Alternative 1 will not affect northern spotted owl critical habitat. The lack of treatment will retain all the remaining habitat and important legacy structures to aid in the development of owl habitat by providing physical structure as the stand regenerates. Since northern spotted owls and their prey rely on these structures to fulfill their needs for survival and reproduction, the maintenance of large trees and large woody debris will increase the quality of future owl habitat.

Cumulative Effects

Risk to Reproduction

The Beaver analysis area is a checkerboard distribution of land ownership primarily between the Forest and private forest companies. Given the fire effects to both ownerships, private land has many acres of fire-affected habitat that are likely to be removed or have already been removed. Although private land is not held to the same rules as the Forest, we are assuming the salvage harvest on private land is limited to moderate and high fire severity affected areas. Deviations from this assumption could affect the magnitude of effects for activity centers within the Beaver analysis area given the proportion and distribution of private land ownership. Despite these uncertainties, one activity center is identified with an increased risk to reproduction as a result of the cumulative effects; cumulative effects are the result of adding the direct and indirect effects of Alternative 1 to effects of other actions on private and public lands. The activity center activity center went from low risk to moderate risk level.

Changes to Critical Habitat

The cumulative effects of Alternative 1 in Beaver analysis area will result in no change in the amount of critical habitat affected. Since there is no direct or indirect effect to critical habitat there are no cumulative effects. Critical habitat doesn't occur on private land.

Bald Eagle

Direct Effects and Indirect Effects

Level of Disturbance to Nest Sites

There will be no disturbance to nest sites as a result of Alternative 1. Any nesting eagles will likely nest without any disturbance created by helicopters or other equipment that would be used to implement this Project.

Risk to Future Potential Nest Trees

The eagle nests that may be affected by this Project will likely continue to provide nesting opportunity without treatment. The current nesting tree will likely continue to stand, but other possible nesting trees that are available near the current nest site will not be affected. In the long-term, the nest tree may still be standing, but other possible nest trees will be available as they occur on the landscape.

Cumulative Effects

Level of Disturbance to Nest Sites

There are no direct or indirect effects to this indicator so there are no cumulative effects.

Risk to Future Potential Nest Trees

The only action considered for cumulative effects that affect the Dona nest site is Timber Harvest Plan number 87. This Project will occur in about 10 acres where there are potential nest trees. This will not decrease the current risk to future potential nest trees when added to the effects of this alternative.

Northern Goshawk

Direct Effects and Indirect Effects

Level of Disturbance to Nest Sites

The Alternative 1 will not disturb any of the goshawk territories. Any active nests in the Project will not be disturbed by heavy equipment and increased road activity. In the long-term, the lack of disturbance is expected to continue without action.

Risk to Reproduction

The risk to reproduction will be the same as described in the affected environment. Without treatment, the high risk territories will continue to struggle to support reproduction. Over the long-term, the high risk nests will remain in poor condition until habitat can regenerate which may take several decades, but this is dependent on several factors including fire. Moderate risk territories will likely be occupied, but conditions will make reproduction more difficult when compared to low risk level sites. Low risk level sites have habitat levels that are conducive to reproduction and the lack of treatment will retain the existing habitat.

Cumulative Effects

Level of Disturbance to Nest Sites

There are no direct or indirect disturbance to Northern Goshawks so there is no cumulative effect.

Risk to Reproduction

The actions that have the potential for cumulative effects for Northern Goshawks is private land salvage for Beaver fire area. The salvage downgrades some habitat in the Woodchopper and Kohl territories. These territories already have a high risk to reproduction so the risk is not increased by the effects of cumulative actions.

Woodchopper and Kohl will likely have more difficulty supporting reproduction as a result of the cumulative effects even though the risk level didn't change.

Fisher, Marten, and Wolverine

Direct Effects and Indirect Effects

Level of Habitat Connectivity

The Project area had a large proportion of habitat affected by moderate and high fire severity during the 2014 fires which created conditions that are less desirable for fisher, marten, and wolverine connectivity. These species are closely associated with forested habitat that has a high proportion of overhead cover. Moderate and high fire severity removes most, if not all, vegetation in the understory and kills most of the overstory thus leaving mostly standing dead trees and possibly stems of dead shrubs. The time between the fire and regeneration of the vegetation may take as little as one growing season to provide some cover for fisher and marten, but early seral vegetation may not provide sufficient cover until the shrubs or trees grow to about 4feet in height. The time needed for the vegetation to reach this height is typically dependent on several factors like site conditions, but generally, the Project area is capable of regenerating vegetation quickly.

In the short-term, fisher, marten, and wolverine (to a much lesser degree) may have some challenges moving through the watersheds largely affected by moderate and high fire severity, but the actual level of connectivity is more related to the connectivity level prior to the fire and the amount and distribution of the remaining denning/resting and foraging habitat. Watersheds with existing denning/resting and foraging habitat are more likely to provide opportunities for these species to find food, water, and resting opportunities with adequate cover during their travels through the watershed as compared to watersheds that currently contain a small amount of habitat that may or may not be a result of the 2014 fires.

The Beaver analysis area currently contains seven watersheds with a moderate level of connectivity, five with a low and one with a very low level of connectivity. The lack of treatment in this alternative will result in these watershed regenerating without the interruption of treatment and many, if not all, of the treatment units will grow herbaceous and shrub vegetation quickly. In the short-term, watersheds with low and very low habitat connectivity will likely create conditions where an individual may have challenges moving through a watershed while the watersheds with a moderate level of connectivity will likely still provide these species to move through the watershed. In the long-term, tall shrubs and possibly small trees that regenerate in fire affected areas may be large enough to provide sufficient cover for marten, fisher, or to a lesser degree, wolverine thus increasing connectivity.

Change in Fisher Home Range

Although tall shrubs and woody debris likely provide structure for fisher and marten to move across openings, one of the most important factors for fisher and marten home ranges is sufficient denning/resting and foraging habitat. Denning/resting and foraging habitat affected by the 2014 fires will take many years to regenerate; any additional assistance to accelerate the regeneration process is likely to help. In the short-term, protection of existing denning/resting habitat from future high severity fire is important to conserve viable home ranges. Alternative 1 will not reduce the risk of high severity fire. Fuels created by the 2014 fires will continue to accumulate and will create conditions that increase the likelihood of future high severity fire (see the fire and fuels resource report

for more detailed information). This accumulation of fuels will threaten denning/resting and foraging habitat that may increase fragmentation of home ranges. Alternative 1 will allow the forest to regenerate and if high severity fire doesn't interrupt the regeneration, denning/resting habitat may regenerate in about 100 years. Nine of the thirteen watersheds in the Project area do not meet the home range potential criteria. The watersheds that are not meeting the home range potential criteria are Buckhorn Creek, Buckhorn Gulch, Doggett Creek, Dona Creek, Dutch Creek, Kohl Creek, Lumgrey Creek, Miller Gulch, and Quigleys Creek.

Cumulative Effects

Level of Habitat Connectivity

The Beaver analysis area is a checkerboard distribution of land ownership primarily between the Forest and private forest companies. Given the fire effects to both ownerships, private land has many acres of fire-affected forested habitat that are likely to be removed or have already been removed. Although private land is not held to the same rules as the Forest, we are assuming the salvage harvest on private land is limited to moderate and high fire severity affected areas. Deviations from this assumption could affect the magnitude of effects on connectivity in the analysis area given the proportion and distribution of private land ownership.

The cumulative effects reduced the habitat connectivity in 9 of the 13 watersheds analyzed in the Beaver analysis area. Two "moderate" level watersheds were reduced in connectivity to a "very low" level and two other "moderate" level watersheds were reduced in connectivity to a "low" level. Five watersheds went from "low" to "very low" habitat connectivity.

Change in Fisher Home Range

The cumulative actions considered in the fire area (private land salvage and timber harvest plans) decreased habitat enough in one watershed (Jaynes Canyon) to keep it from not meeting the home range potential criteria. The addition of Jaynes Canyon results in a total of ten watersheds that do not meet the home range potential criteria.

Pallid Bat, Townsend's Big-eared Bat, and Fringed myotis

Direct Effects and Indirect Effects

Any roost sites that retained the micro-climate condition necessary to support a hibernaculum or maternity colony will continue to provide those services. For Alternative 1, the lack of action will not affect bats. The rate of forest regeneration will be slow without treatment but bats will be able to continue to use the abundant source of snags. The lack of disturbance created by treatment will maintain any hibernacula or maternity sites. Therefore, for this analysis indicator, there is no effect on disturbance to bats.

Cumulative Effects

There are no direct or indirect effects resulting from Alternative 1, thus no cumulative effects.

Willow Flycatcher

Direct Effects and Indirect Effects

Level of Habitat Alteration

Willow flycatchers are dependent on live riparian vegetation; the loss of this vegetation is likely to affect the number of possible areas for nesting. Alternative 1 will not change the

current condition of the habitat. The remaining areas of habitat will continue to provide nesting opportunity to flycatchers. Burned forest is not likely to be beneficial to flycatchers so the retention of these snags will likely not affect this species. In the long-term, the habitat will regenerate and possibly produce willow or alder patches for flycatchers. For this analysis indicator, the lack of action will have no effect on habitat alteration from the current condition.

Cumulative Effects

Level of Habitat Alteration

There are no direct or indirect effects resulting from Alternative 1, thus no cumulative effects.

Siskiyou Mountains Salamander

Direct Effects and Indirect Effects

Alternative 1 will not change the existing cool, moist talus habitat typically created by dense conifer canopy on northerly slopes associated with Siskiyou Mountains salamander. Habitat burned by the 2014 fires at moderate to high severity is likely to have little to no canopy cover; the small amount of canopy cover left after the fires will be retained in this alternative. In addition, the small spaces between pieces of talus needed by the salamander to move deeper or shallower in the talus profile to reach desired temperature and moisture will not be disturbed by activities that may compact the talus. For this analysis indicator, there is no effect on risk of habitat disturbance.

Cumulative Effects

There are no direct or indirect effects resulting from Alternative 1, thus there are no cumulative effects.

Tehama Chaparral Snail

Direct Effects and Indirect Effects

Alternative 1 will not affect any talus in conifer and hardwood mixed habitat near riparian reserves in Project area. There are likely to be some patches of habitat where canopy cover and micro-site conditions will provide for the needs of several individuals remaining after the 2014 fires. The pre-fire woody debris which is likely to be supplemented by the abundant post-fire dead trees will provide small areas of possible refugia for dispersing snails. The lack of habitat disturbance will allow remaining habitat to provide habitat. For this analysis indicator, there is no effect on snails dispersing.

Cumulative Effects

There are no direct or indirect effects resulting from Alternative 1, thus no cumulative effects.

Western Bumble Bee

Direct Effects and Indirect Effects

Alternative 1 will not affect bumble bee habitat, most of which is in meadows that provide nesting and foraging opportunity for bees. According the vegetation burn severity data, most of the 4,000 acres of meadows in the Project area burned at low severity in the 2014 fires; therefore, it is likely that many of the meadows still contain vegetation which can provide basic structure for a bumble bee nest site and will produce flowering plants this spring. Retaining snags outside meadows will not affect the ability of bumble bees to

survive or reproduce. For this analysis indicator, there is no effect on bumble bee nest disturbance.

Cumulative Effects

There are no direct or indirect effects resulting from Alternative 1, thus no cumulative effects.

Management Indicator Species

Snag Species Association

Direct Effects and Indirect Effects

In this alternative, there will be no removal of trees, road construction, or any other activities associated with the Project. Potential negative effects of no action would be high fuel loads and risk of future high severity fire adjacent to remaining forest habitat or within regenerating habitat. Positive effects would include the total retention of snags which are important habitat features within remaining late seral closed canopy coniferous habitat.

Snag-associated species have abundant source and variety of snags. Black-backed woodpeckers, if present, would have the maximum available habitat produced by the high intensity fire. Other snag-associated species like the Vaux's swift and downy woodpecker would have a possible increase in more open stands of snags or creation of new snag habitat. Secondary cavity nesters, however, may have a reduction in older, decaying snags with cavities as those tend to burn up in the fires but, in the long-term, these species will likely have an abundant source of previously excavated snags.

Cumulative Effects

Other projects in the analysis area are expected to affect habitat to the point that it may not function as snag-associated habitat. Overall, about 2,786 acres of the 105,410 acres of snag habitat in the analysis area will be affected by actions considered for cumulative effects (appendix C of the final EIS). These acres represent the footprint of habitat for snag-associated species because habitat for some species overlaps. Affected acres represent about 2 percent of the habitat within the analysis area.

Hardwood Species Association

Direct Effects and Indirect Effects

Changes in Hardwood Habitat Abundance

Alternative 1 does not have any direct effects on hardwood-associated species. Hardwood stands burned with moderate or high severity effects in the 2014 fires are not likely to meet the needs of these species because they are completely or partly dependent on hardwood mast as a food source. Without a food source, the species are likely to leave this fire-affected habitat to occupy areas with live trees. In the long-term, some of the hardwoods will re-sprout and provide future habitat for these species assuming wildfire doesn't return in the near future. An indirect effect of Alternative 1 comes from the large fuel loads within or adjacent to the hardwood stands that are likely to contribute to another wildfire occurring that will prevent these stands from developing into a hardwood forest.

Cumulative Effects

For hardwood associated species, the effects of other actions in the analysis area will result in removing about 327 acres of the habitat in the Project area. Therefore, the

cumulative effects of adding the non-quantified indirect effects of this alternative to the 590 acres of hardwood habitat that will be removed in other actions will result in less habitat available in the future for hardwood-associated species.

Survey and Manage

Direct Effects and Indirect Effects

Habitat Protection

Alternative 1 will not have any direct effects on survey and manage species. The lack of treatment will not affect important habitat components such as current canopy cover, coarse woody debris, or leaf litter/duff. In the short term, the snags and limited down wood in high fire severity affected habitat will continue to provide hot, dry conditions for these species. In the moderate fire severity affected habitat, the small amount of canopy cover will likely decrease in the short-term with delayed tree mortality, thus creating even hotter and drier conditions that may be similar to the high severity fire affected habitat.

In the long term, the abundant source of snags will provide a source of woody debris (an important habitat component for the species, especially for the blue-gray tail dropper) for many years. Large woody debris in conjunction with regenerating trees may provide micro-site conditions for these species in the long term (20 years) but the regeneration of habitat will take much more time (beyond the long-term time span for this analysis).

Cumulative Effects

The only cumulative actions within the analysis bounds are Forest projects. These projects all have project design features to avoid effects to known sites for survey and manage species so there are no cumulative effects from Alternative 1 to known sites.

Migratory Bird

Direct Effects and Indirect Effects

This alternative will have no direct or indirect effect on the compliance with the Memorandum of Understanding between the USDA Forest Service and USDI Fish and Wildlife Service. Migratory birds affected by the 2014 fires will continue to be threatened by the possible re-occurring wildfires that may affect unburned habitat. Bird species associated with snags and early seral habitat will have abundant habitat and predicted future wildfires will add to this already abundant habitat.

Cumulative Effects

This alternative will have no direct or indirect effect on complying with the Memorandum of Understanding, thus no cumulative effects.

Big Game

Direct Effects and Indirect Effects

Forage will recover quickly in most areas due to shrub and hardwood re-sprouting and the recolonization of grasses in areas that now have an open canopy as a result of tree mortality. Cover and thermal refugia, however, will take longer to recovery. This is especially true in areas that experienced high and moderate fire severity. The increase in forage opportunities will be limited by the availability of adjacent cover. The no action alternative will not affect the understory browse and cover species for deer and elk.

Cumulative Effects

The private land salvage in the Beaver fire area will limit the availability of both cover and foraging on more than 9,900 of the fire area. The private land salvage is focused on reforestation for timber production so efforts will likely be made to discourage shrub and hardwood resprouting which would provide both forage and cover. When added to the effects of Alternative 1 the recovery of understory browse and cover species will be primarily limited to Forest Service lands in the Beaver fire area.

Project Area B: Happy Camp Complex

Wildlife Biological Evaluation

Northern Spotted Owl

Direct Effects and Indirect Effects

Risk to Reproduction

The overall direct and indirect effects of no action in the Happy Camp analysis area are the same as those described in the Beaver section above. There are two activity centers that have a very low risk to reproduction because they were not in the fire perimeter. There are fourteen, thirty-seven and four activity centers that have low, moderate or high risk to reproduction as a result of the 2014 wildfires.

Changes to Critical Habitat

The overall direct and indirect effects are the same as those described in the Beaver section above. There will be no change in acres of suitable habitat or fire affected habitat in any activity centers as a result of Alternative 1.

Cumulative Effects

Risk to Reproduction

The cumulative effects of Alternative 1 in the Happy Camp analysis area will result in no change in the activity center's level of reproduction risk because adding the effects of this alternative to the effects of other projects in the analysis area and within the relevant temporal boundaries will not change the level of reproduction risk.

Changes to Critical Habitat

The cumulative effects of Alternative 1 in the Happy Camp analysis area will result in about 225 acres of nesting/roosting and foraging habitat being downgraded to dispersal habitat in KLE7. There are no changes in the other two critical habitat subunits.

Bald Eagle

Direct Effects and Indirect Effects

Level of Disturbance to Nest Sites

There will be no disturbance to nest sites as a result of Alternative 1.

Risk to Future Potential Nest Trees

The effects are the same as described in the Beaver fire area.

Cumulative Effects

Level of Disturbance to Nest Sites

There are no direct or indirect effects to this indicator so there are no cumulative effects.

Risk to Future Potential Nest Trees

Thom Seider and Happy Camp Fire Protection Phase 2 project intersect the Caroline nest site and the Fryingpan nest site respectively. These projects have project design features

that will limit the removal of potential nest trees. The effects of these actions are small and will not add to the risk to potential nest tree sites.

Northern Goshawk

Direct Effects and Indirect Effects

Level of Disturbance to Nest Sites

Alternative 1 will not disturb any of the goshawk nests. Any active nests in the project will not be disturbed by heavy equipment. In the long-term, the lack of disturbance is expected to continue without action.

Risk to Reproduction

Without treatment, the high risk nests will continue to struggle to support reproduction. Over the long-term, the high risk nests will remain in poor condition and will not provide habitat. The risk to reproduction is the same as described in the affected environment.

Cumulative Effects

Level of Disturbance to Nest Sites

There are no direct or indirect disturbance to Northern Goshawks so there is no cumulative effect.

Risk to Reproduction

The Lovers Canyon project will increase the risk of the Kelsey territory from a moderate risk to a high risk. This is likely an overestimate of effects but since the Lovers Canyon project is still in early stages of planning the worst case (habitat removal) was assumed in this analysis. All other territories will remain at their current risk levels as described in the affected environment.

Fisher, Marten, and Wolverine

Direct Effects and Indirect Effects

Level of Habitat Connectivity

The direct and indirect effects of no treatment in the Happy Camp analysis area are similar to the Beaver analysis area except the Happy Camp analysis area has a different number of watersheds and distribution of habitat connectivity for each watershed.

Happy Camp contains 26 moderate and 10 low level of habitat connectivity for a total of 36 watersheds.

Change in Fisher Home Range

The direct and indirect effects for Happy Camp are the same as those described in the Beaver section above. There are 18 watersheds that do not meet the home range criteria.

The watersheds that do not meet the home range potential criteria are Bear Creek, Big Ferry Swanson, Bishop Creek, China Creek, Deep Creek, Doolittle Creek, Headwaters Elk Creek, Lower East Fork Elk Creek, Lower Grider Creek, McCarthy Creek, Middle Creek, Middle Elk Creek, North Fork Kelsey Creek, Rancheria Creek, Tom Martin Creek, Tompkins Creek, Upper Grider Creek, and Walker Creek.

Cumulative Effects

Level of Habitat Connectivity

The cumulative effects of Alternative 1 in this analysis area will result in the level of habitat connectivity for one watershed (Big Ferry –Swanson) to decrease from “low” to

"very low" habitat connectivity. This reduction in habitat connectivity in Big Ferry-Swanson is primarily a result of proposed treatment and potential salvage on private land.

Change in Fisher Home Range

Thom Seider and Elk Thin projects move Upper East Fork Elk Creek and Upper Elk Creek from meeting the home range potential criteria to not meeting the criteria. Private land salvage and Timber Harvest Plans move Franklin Gulch, Horse Creek, and Schutts Gulch from meeting the home range potential criteria to not meeting it when combined with the affected environment and the effects of Alternative 1.

Pallid Bat, Townsend's Big-eared Bat, and Fringed myotis
Direct Effects and Indirect Effects
Risk of Disturbance

The effects are the same as for the Beaver fire area.

Cumulative Effects
Risk of Disturbance

The effects are the same as for the Beaver fire area.

Willow Flycatcher
Direct Effects and Indirect Effects
Level of Habitat Alteration

The effects are the same as for the Beaver fire area.

Cumulative Effects
Level of Habitat Alteration

The effects are the same as for the Beaver fire area.

Siskiyou Mountain Salamander
Direct Effects and Indirect Effects
Risk of Habitat Disturbance

The effects are the same as for the Beaver fire area.

Cumulative Effects
Risk of Habitat Disturbance

The effects are the same as for the Beaver fire area.

Tehama Chaparral Snail
Direct Effects and Indirect Effects
Likelihood of Dispersal

The effects are the same as for the Beaver fire area.

Cumulative Effects
Likelihood of Dispersal

The effects are the same as for the Beaver fire area.

Western Bumble Bee
Direct Effects and Indirect Effects
Level of Habitat Disturbance

The effects are the same as for the Beaver fire area.

Cumulative Effects
Level of Habitat Disturbance

The effects are the same as for the Beaver fire area.

Management Indicator Species
Snag Species Association
Direct Effects and Indirect Effects
Changes in Snag Habitat Abundance

The effects are the same as for the Beaver fire area.

Cumulative Effects
Changes in Snag Habitat Abundance

The effects are the same as for the Beaver fire area.

Hardwood Species Association
Direct Effects and Indirect Effects
Changes in Hardwood Habitat Abundance

The effects are the same as for the Beaver fire area.

Cumulative Effects
Changes in Hardwood Habitat Abundance

The effects are the same as for the Beaver fire area.

Survey and Manage
Direct Effects and Indirect Effects
Habitat Protection

The effects are the same as for the Beaver fire area.

Cumulative Effects

The effects are the same as for the Beaver fire area.

Migratory Bird
Direct Effects and Indirect Effects

The effects are the same as for the Beaver fire area.

Cumulative Effects

The effects are the same as for the Beaver fire area.

Big Game
Direct Effects and Indirect Effects

The effects are the same as for the Beaver fire.

Cumulative Effects

The private land Timber Harvest Plans and small amount of private land salvage is focused on timber production so re-sprouting shrubs and hardwoods are discouraged in these areas. Forest Service projects will have a limited effect on big game species because they are mainly fuels reduction and thinning from below actions. There is only 700 acres of private Timber Harvest Plans and private land salvage in the Happy Camp fire area so the effects to browse and cover recovery will be localized and small.

Project Area C: Whites Fire

Wildlife Biological Evaluation
Northern Spotted Owl
Direct Effects and Indirect Effects
Risk to Reproduction

The overall direct and indirect effects of no action in the Whites analysis area are the same as those described in the Beaver section above. There are 11 activity centers with low risk to reproduction and four with moderate risk.

Changes to Critical Habitat

The direct and indirect effects of no action in the Whites analysis area are the same as those described in the Beaver section above.

Cumulative Effects

Risk to Reproduction

The cumulative effects of Alternative 1 in the Whites analysis area will result in no change in the activity center's level of reproduction risk because adding the effects of this alternative to the effects of other projects in the analysis area and within the relevant temporal boundaries will not change the level of reproduction risk.

Changes to Critical Habitat

The cumulative effects of Alternative 1 in the Whites analysis area will result in about 214 acres of nesting/roosting and foraging habitat being downgraded to dispersal habitat in the KLW8 critical habitat subunit.

Bald Eagle
Direct Effects/Indirect and Cumulative Effects

There are no known eagle nest sites in the Whites project area so there are no effects to bald eagles from this alternative.

Northern Goshawk
Direct Effects and Indirect Effects

Level of Disturbance to Nest Sites

Alternative 1 will not disturb any of the goshawk nests. Any active nests in the Project will not be disturbed by heavy equipment. In the long-term, the lack of disturbance is expected to continue without action.

Risk to Reproduction

The risk to reproduction will be the same as described in the affected environment. Without treatment, the high risk nests will continue to struggle to support reproduction. Over the long-term, the highly fire affected habitat will remain in poor condition and habitat will require many years to regenerate.

Cumulative Effects
Level of Disturbance to Nest Sites

There are no direct or indirect disturbance to Northern Goshawks so there is no cumulative effect.

Risk to Reproduction

The Eddy Late Successional Reserve project overlaps with the Six Mile territory. However, project design limits the effects to Northern Goshawk habitat and there is no change in the risk to reproduction as a result of the cumulative effect of the Eddy Late Successional Reserve project. All of the other territories have no cumulative effects to be added to the direct and indirect effects of the alternative.

Fisher, Marten, and Wolverine
Direct Effects and Indirect Effects
Level of Habitat Connectivity

Overall, the effects in the Whites analysis area is the same as those described in the Happy Camp section. However, the White analysis area contains four watersheds with very low habitat connectivity, eight with low connectivity and six with moderate connectivity.

Change in Fisher Home Range

Overall, the Whites analysis has the same effects described in the Beaver section above. There are four of the eighteen watersheds that do not meet the home range potential criteria.

The watersheds not meeting the home range potential criteria are Music Creek, Specimen Creek, Sugar Creek, and Upper French Creek.

Cumulative Effects
Level of Habitat Connectivity

The cumulative effects of Alternative 1 in this analysis area will result in the same level of habitat connectivity for two watersheds (Jessups Gulch and Music Creek) to increase from “moderate” to “low” habitat connectivity. This reduction in habitat connectivity in the Jessups Gulch watershed is primarily a result of proposed treatment in the Jess, Glassups, and Sawyers Bar Fuels Reduction projects. Music Creek watershed reduction in habitat connectivity is primarily a result of treatment and potential salvage occurring on private land.

Change in Fisher Home Range

The Jess project reduced the habitat enough to move Jessups Gulch from meeting the home range potential criteria to not meeting the criteria. Eddy Late Successional Reserve and Sawyers Bar Underburn move Robinson Gulch and Lower North Russian Creek from meeting the home range potential criteria to not meeting the criteria. When the effects of the these projects, which move Jessups Gulch, Robinson Gulch and Lower North Russian Creek from meeting the home range potential criteria to not meeting the criteria, are added to the effects of Alternative 1, the cumulative effects are to not meet the home range potential criteria.

Pallid Bat, Townsend’s Big-eared Bat, and Fringed myotis
Direct Effects and Indirect Effects
Risk of Disturbance

The effects are the same as for the Beaver fire area.

Cumulative Effects
Risk of Disturbance

The effects are the same as for the Beaver fire area.

Willow Flycatcher
Direct Effects and Indirect Effects
Level of Habitat Alteration

The effects are the same as for the Beaver fire area.

Cumulative Effects
Level of Habitat Alteration

The effects are the same as for the Beaver fire area.

Siskiyou Mountain Salamander
Direct Effects and Indirect Effects
Risk of Habitat Disturbance

The effects are the same as for the Beaver fire area.

Cumulative Effects
Risk of Habitat Disturbance

The effects are the same as for the Beaver fire area.

Tehama Chaparral Snail
Direct Effects and Indirect Effects
Likelihood of Dispersal

The effects are the same as for the Beaver fire area.

Cumulative Effects
Likelihood of Dispersal

The effects are the same as for the Beaver fire area.

Western Bumble Bee
Direct Effects and Indirect Effects
Level of Habitat Disturbance

The effects are the same as for the Beaver fire area.

Cumulative Effects
Level of Habitat Disturbance

The effects are the same as for the Beaver fire area.

Management Indicator Species
Snag Species Association
Direct Effects and Indirect Effects
Changes in Snag Habitat Abundance

The effects are the same as for the Beaver fire area.

Cumulative Effects
Changes in Snag Habitat Abundance

The effects are the same as for the Beaver fire area.

Hardwood Species Association
Direct Effects and Indirect Effects
Changes in Hardwood Habitat Abundance

The effects are the same as for the Beaver fire area.

Cumulative Effects
Changes in Hardwood Habitat Abundance

The effects are the same as for the Beaver fire area.

Survey and Manage
Direct Effects and Indirect Effects
Habitat Protection

The effects are the same as for the Beaver fire area.

Cumulative Effects

The effects are the same as for the Beaver fire area.

Migratory Bird
Direct Effects and Indirect Effects

The effects are the same as for the Beaver fire area.

Cumulative Effects

The effects are the same as for the Beaver fire area.

Big Game
Direct Effects and Indirect Effects

The effects are the same as described in the Beaver fire area.

Cumulative Effects

The primary action considered for cumulative effects within the fire area that may affect big game habitat is the Eddy Late Successional Reserve. The other projects considered for cumulative effects have a very small footprint in the fire area. The Eddy Late Successional Reserve project is intended to promote, protect and connect old growth habitat which includes openings, brush component and multi-layered understory. These are compatible with browse and cover species big game use. The areas in the Eddy Late Successional Reserve project treatment units will provide browse and cover conditions.

Alternative 2

Project Area A: Beaver Fire
Wildlife Biological Evaluation
Northern Spotted Owl
Direct Effects and Indirect Effects
Risk to Reproduction

The number of activity centers within each risk level did not change as a result of the proposed activities in Alternative 2. This alternative has the greatest level of effect on habitat when compared to the other action alternatives. About half of the treatment in the Beaver area will degrade habitat or occur within areas that didn't contain habitat before the 2014 fires. The other half of the treatment will downgrade habitat; the effects are distributed over a large area, primarily because of the distribution of land ownership in the Beaver analysis area. Therefore, the distribution of effects resulted in spreading out the effects across several activity centers but the effects are not large enough to change the level of risk to reproduction for any of the activity centers. Therefore, the level of risk for the activity centers in Beaver are the same level of risk as described before treatment even though treatment in this alternative did affect habitat.

Changes to Critical Habitat

The Beaver project area contains small portion of Northern Spotted Owl critical habitat subunit KLE6 but the analysis area for Beaver includes a small portion of KLE7, but this portion of KLE7 doesn't contain proposed activities. Therefore, this alternative affects about 87 acres of critical habitat and about 152 acres of fire affected critical habitat.

Cumulative Effects
Risk to Reproduction

The direct and indirect effects of Alternative 2 plus the effects resulting from other actions (including private land salvage and private timber harvest plans) within the

analysis area change the risk level for two activity centers (0283 and 4143). One activity center (4143) went from low to moderate risk level, primarily as a result of the effects resulting from other projects. The second activity center (0283) went from moderate to high risk level primarily as a result of the proposed activities of this alternative.

The high risk category is intended to identify activity centers that are likely to have difficulty supporting reproduction based on the amount of habitat. Activity centers with a high level of risk will continue to have a high level risk to reproduction regardless of treatment but any additional effects to these high risk level activity centers will likely further reduce these activity centers ability to support reproduction.

Changes to Critical Habitat

For this analysis indicator, the cumulative effects of adding the effects of Alternative 2 to those of other projects (including private land salvage and private timber harvest plans) will result in additional acres of critical habitat being removed. The direct and indirect effect of this alternative (about 63 acres of nesting/roosting and foraging) plus the effect of actions from other projects will remove the same number of acres of critical habitat (nesting/roosting, foraging, and dispersal) and about 152 acres of fire affected critical habitat.

Bald Eagle

Direct Effects and Indirect Effects

Level of Disturbance to Nest Sites

The level of disturbance to the Dona nest site is mitigated by a limited operating period and will be low.

Risk to Future Potential Nest Trees

The risk to future potential nest trees will remain low for the Dona Creek nest site when the effects of the alternative are added to the existing condition.

Cumulative Effects

Level of Disturbance to Nest Sites

The only action considered for cumulative effects that affect the Dona nest site is Timber Harvest Plan number 87. The proposed activities will follow the limited operating period design feature. The design feature is intended to limit disturbance to active Bald Eagle nests during the nesting period. Even though a private timber company is not subject to the Forest's limited operating period, it is highly likely that the private timber company will minimize disturbance to this eagle nest. There will be no cumulative effect to the Dona nest as a result of cumulative effects.

Risk to Future Potential Nest Trees

The only action considered for cumulative effects that affect the Dona nest site is Timber Harvest Plan number 87. This project will occur in about 10 acres where there are potential nest trees. This will not decrease the current risk to future potential nest trees when added to the effects of this alternative.

Northern Goshawk

Direct Effects and Indirect Effects

Level of Disturbance to Nest Sites

A project design feature will be used to avoid disturbance of these nests through the sensitive part of nesting. Therefore, this alternative will have a low risk of disturbing known goshawk nests.

Risk to Reproduction

All three of the potentially occupied territories have activities proposed in them in this alternative. The risk to reproduction is not increased for any of the potentially occupied territories by this alternative. Beaver will remain at a moderate risk and Kohl and Woodchopper will remain at a high risk.

Cumulative Effects
Level of Disturbance to Nest Sites

Since there is no direct or indirect disturbance to nest sites there is no cumulative effects.

Risk to Reproduction

Actions considered for cumulative effects for the Beaver fire area are private land salvage and timber harvest plans. When the effects of the alternative are added to the effects from actions considered for cumulative effects there is no change in risk levels for any of the three territories.

Fisher, Marten, and Wolverine
Direct Effects and Indirect Effects
Level of Habitat Connectivity

Alternative 2 will reduce habitat connectivity in 5 watersheds. Three watersheds (Buckhorn Creek, Dona Creek-Klamath River, and Dutch Creek) went from “moderate” to “low” habitat connectivity while the remaining 2 watersheds (Buckhorn Gulch-Beaver Creek and Doggett Creek) went from “low” to “very low” habitat connectivity. The combination of pre-fire habitat conditions and the 2014 fires (to varying degrees for each watershed) resulted in almost half of the watershed to currently have “low” or “very low” habitat connectivity. The two watersheds with moderate level of habitat connectivity were near the level of “low” habitat connectivity so even small amount of treatment was likely to push these two watersheds into the “low” level. Even though Alternative 2 resulted in 5 watersheds to have a reduced level of connectivity, the 2 watersheds with “moderate” connectivity had a small amount of affected habitat compared to the other 3 watersheds that were reduced in the level of habitat connectivity from “low” to “very low”.

Change in Fisher Home Range

The number of watersheds not meeting the home range criteria is the same as described in Alternative 1.

Cumulative Effects
Level of Habitat Connectivity

The Beaver analysis area is a checkerboard distribution of land ownership primarily between the Forest and private forest companies. Given the fire effects to both ownerships, private land has many acres of fire-affected forested habitat that are likely to be removed or have already been removed. Although private land is not held to the same rules as the Forest, we are assuming the salvage harvest on private land is limited to moderate and high fire severity affected areas. Deviations from this assumption could

affect the magnitude of effects on connectivity in this analysis area given the proportion and distribution of private land ownership.

The direct and indirect effects of this alternative plus the estimated cumulative effects reduced the habitat connectivity in 7 of the 13 watersheds analyzed in the Beaver analysis area. One "moderate" level watershed was reduced in connectivity to a "low" level and 6 "low" level watersheds were reduced in connectivity to a "very low" level.

Change in Fisher Home Range

Just as in Alternative 1, none of the cumulative actions considered in the fire area (private land salvage and timber harvest plans) reduce the habitat enough to move any watersheds from meeting the home range potential criteria to not meeting the criteria.

Pallid Bat, Townsend's Big-eared Bat, and Fringed myotis

Direct Effects and Indirect Effects

Risk of Disturbance

There are five, seven, and five potential hibernacula with high, moderate and low risk of disturbance respectively. The treatments are not likely to overlap with times of hibernation but may overlap with the use of maternities. Although unlikely, the watersheds with moderate risk of disturbance could affect a maternity, but more realistically, treatment greater than 250 feet is only likely to disrupt foraging bats. Therefore, the sites with potential cave or cave like structures with a high risk of disturbance are likely the most vulnerable to abandonment. Maternities are not common because bats need specific cave environment conditions and although there are several possible caves or cave like structures, very few meet the criteria.

Cumulative Effects

Risk of Disturbance

Cumulatively there will be thirteen, two and two potential hibernacula with a high, moderate and low risk of disturbance respectively. Adding the effects of this alternative to the effects of private lands salvage and other timber harvest plans move many of the potential hibernacula from a moderate risk to a high risk. The majority of this effect is because of the uncertainty of mitigations occurring on private land. Therefore, the cumulative effects may be an overestimate, especially if private lands are implementing mitigation to minimize the negative effects on roost sites.

Willow Flycatcher

Direct Effects and Indirect Effects

Level of Habitat Alteration

Nine of the eleven watersheds in the Beaver fire area have a low level of habitat alteration. Buckhorn Gulch has a high level of habitat alteration and Miller Gulch has a moderate level of alteration. Project design features intended to protect water quality, including ground-based equipment exclusion zones and harvest restrictions, will mitigate this effect but not enough to reduce the level of habitat alteration.

Cumulative Effects

Level of Habitat Alteration

Cumulatively the risk level is the same for seven of the watersheds in the Beaver fire area. Adding the effects of this alternative to those of private land salvage increases the level of disturbance from low to high in Doggett and Kohl Creeks, low to moderate in Dutch Creek, and moderate to high in Quigley's Cove.

Siskiyou Mountain Salamander
Direct Effects and Indirect Effects
Risk of Habitat Disturbance

The Beaver fire area is outside of the Siskiyou Mountain Salamander's range and, therefore, there will be no direct or indirect effect of the alternative on the species.

Cumulative Effects
Risk of Habitat Disturbance

There are no direct or indirect effects to Siskiyou Mountain Salamander as a result of the treatments in the Beaver fire area so there are no cumulative effects.

Tehama Chaparral Snail
Direct Effects and Indirect Effects
Likelihood of Dispersal

Tehama chaparral snail dispersal habitat which consists of some type of physical structure to provide cooler and moisture conditions during dispersal. Providing this structure is most important for snails that are dispersing across areas without canopy cover. Project design features provide varying sizes of woody debris of trees equal to or greater than12 inches in diameter after fuels treatments so that treatment units have sufficient woody debris. In addition, project design features will retain live and dead trees in the treatment units to provide future woody debris, and the known sites of Tehama chaparral snails will not be treated so that remaining habitat will be retained. Therefore, given the project design features, the likelihood of dispersal will be high for Alternative 2.

Cumulative Effects
Likelihood of Dispersal

There are no other actions that will affect snail dispersal because no known sites in the project area overlap with any other project. Therefore, there will be no cumulative effects to snail dispersal or to risk of habitat alteration.

Western Bumble Bee
Direct Effects and Indirect Effects
Level of Habitat Disturbance

Four of the five watersheds in the fire area with potential western Bumble Bee habitat will have a low level of disturbance as a result of this alternative. Collins Creek has a high level of disturbance with more than five acres of potential habitat being disturbed by ground-based equipment.

Cumulative Effects
Level of Habitat Disturbance

The cumulative effect on level of disturbance moves three of the 7th field watersheds from a low level of disturbance to a high level of disturbance. These watersheds are Buckhorn Gulch, Dutch Creek and Kohl creek. The increase in level of disturbance is a result of adding the effects of this alternative to those of the private land salvage harvest in the fire area.

Management Indicator Species
Snag Species Association
Direct Effects and Indirect Effects
Changes in Snag Habitat Abundance

The percent of snag-associated species habitat affected by Alternative 2 varies between individual species but about 9 percent of snag-associated species habitat will be affected by roadside hazard and salvage treatments. The other treatments in this alternative are likely to have minor effects on snag-associated species habitat. With implementation of project design features, salvage treatment units will not provide five snags on every acre but the project will meet the Forest Plan standard of five snags per acre averaged over 100 acres. Therefore, Alternative 2 is likely to provide a sufficient number of snags of varying decay classes to provide a habitat level of "good" snag-associated habitat.

Cumulative Effects

Changes in Snag Habitat Abundance

Snag retention in the private land salvage will likely be incidental and it isn't likely to provide any current or habitat in the near future. Even though private land isn't required to follow the same requirements of the Forest, the Forest Plan standards for snag retention will be met on Forest land. The reported total habitat affected for all alternatives and fire areas is a summation of habitat for all snag associated species chosen for the analysis. The species within snag association occupy habitat that may overlap with another species in the association; this results in overlapping acres of habitat affected so the estimated acres affected is an overestimate. The cumulative effects of Alternative 2 are 2,171 acres of snag habitat will be affected by the project; 2,786 acres will be affected by actions considered for cumulative effects. This is a total of 4,957 acres affected.

Hardwood Species Association

Direct Effects and Indirect Effects

Changes in Hardwood Habitat Abundance

Alternative 2 will affect 201 acres of hardwood habitat. This is about 5 percent of the hardwood habitat in the project area. Estimates of effects are likely overestimated because roadside hazard treatments are likely to retain most of the hardwoods and the hardwoods in the salvage units may be damaged but are likely to remain in the units after treatment. The treatments are focused on conifer removal and maintaining hardwoods were possible but the hardwoods may be damaged during implementation.

Cumulative Effects

Changes in Hardwood Habitat Abundance

The cumulative effects of Alternative 2 are 201 acres of hardwood habitat will be affected by the project; 327 acres will be affected by actions considered for cumulative effects. This is a total of 528 acres affected.

Survey and Manage

Direct Effects and Indirect Effects

Habitat Protection

The sites affected by moderate and high fire severity are likely to have little or no canopy cover. Canopy cover is an important habitat characteristic for these species because tree canopy cover can increase relative humidity and lower temperatures at the microsite scale. Despite the loss of tree canopy cover, these sites may still provide habitat for all or most of the survey and manage species likely to occur in the project area. In order to avoid potential effects to known sites, a protection buffer will be applied to known sites using a project design features thus mitigating potential effects. These protection buffers will retain any existing tree canopy cover within and around known sites. If the trees are fire killed, these snags will still provide woody debris in these known sites.

Cumulative Effects

Since the project will use protection buffers around known sites, there will be no direct or indirect effects from the alternative so there are no cumulative effects.

Migratory Birds

Direct Effects and Indirect Effects

Action alternatives for this project will not adversely impact migratory species or their associated habitats. The habitat affected by the project will still provide habitat for many migratory bird species. Potential impacts to migratory species will be minimized through the adherence to Forest Plan standards and guidelines for snags and downed woody debris, riparian reserve buffers, limited ground disturbance, and maintenance of canopy closure. Specific project design features will be used to minimize negative impacts include retaining snags within treatment units which include riparian reserves, and retaining legacy components and snags mixed in with green trees. Any soft (snags existing prior to the fires) snags (greater than14 inches in diameter) felled for safety reasons will be left on site as downed woody debris. Additional cull logs will be left on site from the operation as well. The project complies with the Migratory Bird Treaty Act Memorandum of Understanding.

Cumulative Effects

All U.S. Forest Service projects considered for cumulative effects comply or are assumed to comply (if analysis is not complete) with the Migratory Bird Memorandum of Understanding. There may be additional effects to migratory birds from private land activities including Bald Eagle, Northern Goshawk, Willow Flycatcher and Management Indicator Species. The general finding is that, while there are effects, they will not cumulatively prevent the compliance with the Migratory Bird Memorandum of Understanding.

Big Game

Direct Effects and Indirect Effects

Browse species will passively regenerate in this alternative as described in Alternative 1. Cover in areas with high and moderate vegetation severity burn with salvage or site preparation and planting will recovery more quickly than under the no action alternative. This is because planting will increase the speed at which conifer forest is recovered on the landscape. This along with the re-sprouting of shrubs and hardwoods will more quickly recover browse species and adjacent cover needed by big game.

Cumulative Effects

The private land salvage in the Beaver fire area will limit the availability of both cover and foraging on more than 9,900 acres of the fire area. The private land salvage is focused on reforestation for timber production so efforts will likely be made to discourage shrub and hardwood re-sprouting which would provide both forage and cover. When added to the effects of Alternative 1 the recovery of understory browse and cover species will be primarily limited to Forest Service lands in the Beaver fire area.

Project Area B: Happy Camp Complex

Wildlife Biological Evaluation

Northern Spotted Owl

Direct Effects and Indirect Effects

Risk to Reproduction

Alternative 2 will result in an increase in risk to reproduction for nine activity centers; seven activity centers (0241, 1030, 1121, 1130, 1214, 1266, 4099, and 9991) went from low risk to moderate risk while the remaining two activity centers (4133 and 9992) went from moderate to high risk. The seven activity centers that went from low to moderate risk are a result of salvage, roadside hazard, and fuels treatments; each of these treatments will affect each activity center at different proportions but the combination of treatments will affect many acres of habitat. The two activity centers that went from moderate to high risk have different levels and types of treatment but both activity centers have a resulting increase in risk; one activity center had mostly salvage and roadside hazard while the other activity center had mostly fuels treatments. Regardless of the treatment, the estimate of risk to reproduction is based on the effects to habitat within each activity center.

Generally, activity centers with very low or low risk to reproduction are likely to have enough resources based on habitat to support reproduction without much difficulty; an activity center in the moderate risk category has less habitat, and that is likely more fragmented, than an activity center with low risk. Therefore, moderate risk activity centers can still support reproduction but resources are likely less abundant and more effort may be required for an owl pair to find enough resources to support themselves and their offspring. The high risk category represents the activity centers with very little habitat; reproduction will be very difficult and possibly not occur. However, an owl pair can move to a nearby location, typically within the activity center home range, where the distribution, quality, and quantity of habitat is better and possibly improve the probability of successful reproduction.

All reproductively-active activity centers, or activity centers that provide enough habitat to support reproduction but are not currently active, are important for maintaining Northern Spotted Owl populations. The increased risk for the nine activity centers in the Happy Camp analysis area is likely to affect reproduction. The effects to the seven low risk activity centers may be more critical to the local population as compared to the moderate and high risk activity centers. Low risk activity centers are more likely to persist despite small natural disturbances because these activity centers typically have excess habitat to possibly absorb small changes in habitat while still retaining enough habitat to continue to support reproduction over the long term as compared to moderate risk activity centers. Even though moderate risk activity centers typically contain habitat conditions that may support reproduction, any change in habitat will likely diminish the possibility of reproduction; moderate risk activity centers are still important for Northern Spotted Owl populations. The two activity center that are estimated to have an increase in risk from moderate to high will receive treatment that will reduce habitat; this will likely result in these activity centers having difficulty providing sufficient resources for reproduction as a result of Alternative 2.

Changes to Critical Habitat

The change to critical habitat on the Happy Camp analysis area is 844 acres of nesting/roosting and foraging being downgraded or removed. The net number of dispersal habitat acres increased to 495 acres while the fire affected critical habitat was reduced by 3,306 acres.

Cumulative Effects

Risk to Reproduction

The direct and indirect effects of Alternative 2 plus cumulative effects resulting from other actions within the Happy Camp analysis area will not change the risk level for any of the activity centers.

Changes to Critical Habitat

The direct and indirect effects of Alternative 2 plus cumulative effects resulting from other actions within the Happy Camp analysis area will result in 1,071 acres of nesting/roosting and foraging habitat being downgraded or removed and a net increase of 721 acres of dispersal habitat. However, the fire affected critical habitat didn't change from the acres presented in the direct and indirect effects.

Bald Eagle

Direct Effects and Indirect Effects

Level of Disturbance to Nest Sites

The level of disturbance to the Fryingpan, Muck-a-Muck and Caroline Creek nest sites is mitigated by a limited operating period and will be low.

Risk to Future Potential Nest Trees

The risk to future potential nest trees is low for Fryingpan and Muck-a-Muck nest sites. The risk for the Caroline Creek nest site would be high but the snag retention requirements mitigate the risk and it becomes a moderate risk.

Cumulative Effects

Level of Disturbance to Nest Sites

Thom Seider and Happy Camp Fire Protection Phase 1 have a limited operating period design feature. The design feature is intended to limit disturbance to active Bald Eagle nests during the nesting period. There will be no cumulative effect to the Dona nest as a result of cumulative effects. Project design features will be used to avoid disturbance of these nests through the sensitive part of nesting for all actions considered for cumulative effects. Therefore, this alternative will have a low risk of disturbing known goshawk nests.

Risk to Future Potential Nest Trees

Thom Seider and Happy Camp Fire Protection Phase 2 project intersect the Caroline nest site and the Fryingpan nest site respectively. These projects have project design features that will limit the removal of potential nest trees. The effects of these actions are small and will not add to the risk to potential nest tree sites.

Northern Goshawk

Direct Effects and Indirect Effects

Level of Disturbance to Nest Sites

Project design features will be used to avoid disturbance of these nests through the sensitive part of nesting. Therefore, this alternative will have a low risk of disturbing known goshawk nests.

Risk to Reproduction

The project has activities proposed in all nine of the potentially occupied territories in the fire area. The effects to habitat are not enough to increase the risk of any of the territories over existing conditions.

Cumulative Effects

Level of Disturbance to Nest Sites

Since there is no direct or indirect disturbance of nest sites there are no cumulative effects.

Risk to Reproduction

The Lovers Canyon project will increase the risk of the Kelsey territory from a moderate risk to a high risk. This is likely an overestimate of effects but since the Lovers Canyon project is still in early stages of planning worst case was assumed in this analysis. All other territories will remain at their current risk levels as described in the affected environment.

Fisher, Marten, and Wolverine

Direct Effects and Indirect Effects

Level of Habitat Connectivity

Alternative 2 will affect the level of habitat connectivity within 14 of the 36 watersheds analyzed. Thirteen watersheds were reduced in the level of habitat connectivity from "moderate" (Caroline, Cougar, China, Horse, Lower Grider, Middle, O'Neil, Schutts Gulch, Tompkins, Upper East Fork Elk, Upper Elk, Upper Grider, and Walker Creeks) to "low" (9) or "very low" (4). The remaining watershed (Lower East Fork Elk Creek) had reduced level of habitat connectivity from "low" to "very low".

Change in Fisher Home Range

Alternative 2 will result in reducing the number of home ranges by 7 in the Happy Camp analysis area (Cougar Creek, Franklin Gulch, Horse Creek, O'Neil Creek, Schutts Gulch, Upper East Fork Elk and Upper Elk Creek). There are twenty-five watersheds that do not meet the home range potential criteria.

Cumulative Effects

Level of Habitat Connectivity

The direct, indirect, and cumulative effects resulted in reducing the habitat connectivity of one watershed (Big Ferry – Swanson) from "low" to "very low" habitat connectivity. Private land Timber Harvest Plans are the reason for the downgrade in connectivity.

Change in Fisher Home Range

None of the cumulative actions considered in the fire area, which include Happy Camp Fuels Reduction Phase 2, Lovers Canyon or private land salvage, reduce the habitat enough move any additional watersheds from meeting the home range potential criteria to not meeting the criteria when added to the effects of the alternative.

Pallid Bat, Townsend's Big-eared Bat, and Fringed myotis

Direct Effects and Indirect Effects

Risk of Disturbance

The overall effects of the alternative are described in the Beaver fire area. There are five, five, and eighteen potential hibernacula with a high, moderate and low risk of disturbance as a result of the alternative.

Cumulative Effects

Risk of Disturbance

Adding the effects of this alternative to those of the actions considered for cumulative effects moved one low risk potential hibernacula to a high risk, one low risk potential

hibernacula to a moderate risk, and one moderate risk to a high risk. The majority of this effect is because of the uncertainty of mitigations occurring on private land. Therefore, the cumulative effects may be an overestimate, especially if private lands are implementing mitigation to minimize the negative effects on roost sites.

Willow Flycatcher

Direct Effects and Indirect Effects

Level of Habitat Alteration

There are twenty-six watersheds with a low level of habitat alteration as a result of Alternative 2. There are three with a moderate level of habitat alteration. These are Deep Creek, Hoop and Devil Creek and Schutts Creek. The nine with a high level of habitat alteration are Caroline, China, Cougar, Doolittle, Lower East Fork Elk, O'Neil, Upper East Fork, Upper Elk, and Walker Creeks. Project design features intended to protect water quality, including ground-based equipment exclusion zones and harvest restrictions will mitigate this effect but not enough to reduce the level of habitat alteration.

Cumulative Effects

Level of Habitat Alteration

When adding the effects of this alternative to those of other projects to predict cumulative effects, the level of habitat alteration remains the same for all of the watersheds except Rancheria Creek. The amount of potential habitat in Rancheria Creek is less than 30 acres, so the small amount of private land salvage that overlaps about five acres of Riparian Reserves leads to about 17 percent of potential habitat altered; this is a high level of alteration.

Siskiyou Mountains Salamander

Direct Effects and Indirect Effects

Risk of Habitat Disturbance

There are fourteen known Siskiyou Mountains Salamander sites in the project area that are in treatment units with the potential for ground disturbance. There are no known sites in salvage units with proposed ground-based harvest. Eleven of the sites are in hazard tree removal units and three are in site preparation units where mechanical preparation is proposed. In order to minimize effects to these known sites, a project design feature is incorporated into the alternative that will buffer the sites and maintain live or dead trees within the buffer. This project design feature will make the risk of habitat disturbance of known sites low.

Cumulative Effects

Risk of Habitat Disturbance

Adding the direct and indirect effects of this alternative to the effects of actions on private land that may affect talus habitat will result in four known sites potentially being cumulatively affected. The level of risk of disturbing a known site is cumulatively low and the cumulative effects may be overestimated if mitigations to reduce effects are used on private land projects.

Tehama Chaparral Snail

Direct Effects and Indirect Effects

Likelihood of Dispersal

Tehama chaparral snail dispersal habitat consists of some type of physical structure to provide cooler and moisture conditions during dispersal. Providing this structure is most

important for snails that are dispersing across areas without canopy cover. Project design features provide varying sizes of woody debris of trees equal to or greater than12 inches in diameter after fuels treatments so that treatment units have sufficient woody debris. In addition, project design features will retain live and dead trees in the treatment units to provide future woody debris, and the known sites of Tehama chaparral snails will not be treated so that remaining habitat will be retained. Therefore, given the project design features, the likelihood of dispersal will be a high for Alternative 2.

Cumulative Effects
Likelihood of Dispersal

There are no other actions that will affect snail dispersal because no known sites in the project area overlap with any other project. Therefore, there will be no cumulative effects to snail dispersal or risk of habitat alteration.

Western Bumble Bee
Direct Effects and Indirect Effects
Level of Habitat Disturbance

There are eighteen watersheds in the fire area that will have a low level of disturbance as a result of this alternative. Lower East Fork Elk, Middle Creek, Rancheria and Upper Grider Creek will have a moderate level of disturbance. China, Cliff Valley, Tom Martin and Tompkins Creeks will have a high level of disturbance.

Cumulative Effects
Level of Habitat Disturbance

None of the levels of disturbance change as a result of adding the effects of this alternative to those of the other actions considered for cumulative effects in the fire area.

Management Indicator Species
Snag Species Association
Direct Effects and Indirect Effects
Changes in Snag Habitat Abundance

The percent of snag-associated species habitat affected by Alternative 2 varies between individual species but about 14 percent of snag-associated species habitat will be affected by roadside hazard and salvage treatments. The other treatments in this alternative are likely to have minor effects on snag-associated species habitat. With implementation of project design features, salvage treatment units will not provide five snags on every acre but the project will meet the Forest Plan standard of five snags per acre averaged over 100 acres. Therefore, Alternative 2 is likely to provide a sufficient number of snags of varying decay classes to provide a habitat level of “good” snag-associated habitat.

Cumulative Effects
Changes in Snag Habitat Abundance

All of the removal will occur on private lands where snag retention is likely to be incidental. The actions considered for cumulative effects are assumed to downgrade snag habitat but not remove it because of the requirements to meet the Forest Plan standards for snag retention. The cumulative effects of Alternative 2 are 19,873 acres of snag habitat will be affected by the project; 217 acres will be affected by actions considered for cumulative effects. This is a total of 20,090 acres affected.

Hardwood Species Association
Direct Effects and Indirect Effects

Changes in Hardwood Habitat Abundance

Alternative 2 will affect 443 acres of hardwood habitat. This is about 11 percent of the hardwood habitat in the project area. Estimates of effects are likely overestimated because roadside hazard treatments are likely to retain most of the hardwoods and the hardwoods in the salvage units may be damaged but are likely to remain in the units after treatment. The treatments are focused on conifer removal and maintaining hardwoods were possible but they may be damaged during implementation.

Cumulative Effects
Changes in Hardwood Habitat Abundance

The cumulative effects of Alternative 2 are 443 acres of hardwood habitat will be affected by the project; 10 acres will be affected by actions considered for cumulative effects. This is a total of 453 acres affected.

Survey and Manage
Direct Effects and Indirect Effects

The effects to survey and manage species are the same as described for the Beaver Fire area.

Cumulative Effects

The cumulative effects to survey and manage species are the same as described for the Beaver Fire area.

Migratory Birds
Direct Effects and Indirect Effects

The effects are the same as described in the Beaver Fire area.

Cumulative Effects

The effects are the same as described in the Beaver Fire area.

Big Game
Direct Effects and Indirect Effects

The direct and indirect effects are the same as described in the Beaver Fire area.

Cumulative Effects

The private land Timber Harvest Plans and small amount of private land salvage is focused on timber production so re-sprouting shrubs and hardwoods are discouraged in these areas. Forest Service projects will have a limited effect on big game species because they are mainly fuels reduction and thinning from below actions. There is only 700 acres of private Timber Harvest Plans and private land salvage in the Happy Camp fire area so the effects to browse and cover recovery will be localized and small.

Project Area C: Whites Fire

Wildlife Biological Evaluation
Northern Spotted Owl
Direct Effects and Indirect Effects
Risk to Reproduction

There are nine and six activity centers with low and moderate risk to reproduction in the Whites fire area. Alternative 2 will result in an increase in risk to reproduction for two activity centers (1030 and 99912); both activity centers are estimated to go from low risk to moderate risk. Although the effects result in the same level of risk for these two

activity centers, the level of effects in each activity center is very different. One activity center (1030) contains habitat levels close to the minimum amount in the low risk category before treatment and Alternative 2 affects a small amount of habitat that results in an increase in risk level. The other activity center (99912) is well above the habitat minimums for the low risk category but treatment downgrades or removes many acres of habitat, thus resulting in an increase risk level. Despite the differences in amount of habitat acres affected by Alternative 2, these two activity centers are likely to have difficulty providing enough resources to support Northern Spotted Owl reproduction.

Changes to Critical Habitat

The change to critical habitat on the Whites analysis area is 357 acres of nesting/roosting and foraging being downgraded or removed. The net number of dispersal habitat acres increased to 320 acres while the fire affected critical habitat was reduced by 784 acres.

Cumulative Effects
Risk to Reproduction

The direct and indirect effects of Alternative 2 plus cumulative effects resulting from other actions within the Whites analysis area will not change the risk level for any of the activity centers.

Changes to Critical Habitat

The direct and indirect effects of Alternative 2 plus cumulative effects resulting from other actions within the Whites analysis area will result in 580 acres of nesting/roosting and foraging habitat being downgraded or removed and a net increase of 543 acres of dispersal habitat. However, the fire affected critical habitat didn't change from the acres presented in the direct and indirect effects.

Bald Eagle
Direct Effects/Indirect and Cumulative Effects

There are no known eagle nest sites in the Whites project area so there are no effects to bald eagles from this alternative.

Northern Goshawk
Direct Effects and Indirect Effects
Level of Disturbance to Nest Sites

Project design features will be used to avoid disturbance of these nests through the sensitive part of nesting. Therefore, this alternative will have a low risk of disturbing known goshawk nests.

Risk to Reproduction

The project has activities proposed in all three of the potentially occupied territories in the fire area. The effects to habitat are not enough to increase the risk of any of the territories over existing conditions.

Cumulative Effects
Level of Disturbance to Nest Sites

There is no direct or indirect disturbance to any of the nest sites so there are not cumulative effects.

Risk to Reproduction

None of the actions considered for cumulative effects overlap in space with the potentially occupied territories in the White Fire area.

Fisher, Marten, and Wolverine

Direct Effects and Indirect Effects

Level of Habitat Connectivity

There are six, seven, and five watersheds with moderate, low, and very low connectivity respectively. Alternative 2 will affect the level of habitat connectivity within 1 of the 18 watersheds analyzed. One watershed (Whites Gulch) was reduced in the level of habitat connectivity from "low" to "very low".

Change in Fisher Home Range

Alternative 2 will result in a reduction of 5 home ranges in the Whites analysis area. Nine of the eighteen watersheds do not meet the home range potential criteria.

The alternative moves Lower North Russian Creek, Lower South Russian Creek, Robinson Gulch, Upper North Russian Creek and Upper South Russian Creek from meeting the home range potential criteria to not meeting the criteria.

Cumulative Effects

Level of Habitat Connectivity

Direct, indirect, and cumulative effects resulted in 2 watersheds (Jessups Gulch and Music Creek) being reduced in habitat connectivity from "moderate" to "low." Jessups Gulch has a downgrade in connectivity because of the estimated effects of the Jess project and Music Creek from the private land salvage in the watershed.

Change in Fisher Home Range

When the effects of the Jess project, which moves Jessups Gulch from meeting the home range potential criteria to not meeting the criteria, and private land salvage in the Music Creek watershed are added to the effects of Alternative 2, the cumulative effects are to not meet the home range potential criteria for these watersheds.

Pallid Bat, Townsend's Big-eared Bat, and Fringed myotis

Direct Effects and Indirect Effects

Risk of Disturbance

The overall effects are the same as described in the Beaver fire area. There are three potential hibernacula with a high risk of disturbance. There are three and seven potential hibernacula with a moderate and low risk respectively.

Cumulative Effects

Risk of Disturbance

Adding the effects of this alternative to those of actions considered for cumulative effects moved one low risk potential hibernacula to a high risk, and low risk potential hibernacula to a moderate risk. The majority of this effect is because of the uncertainty of mitigations occurring on private land. Therefore, the cumulative effects may be an overestimate, especially if private lands are implementing mitigation to minimize the negative effects on roost sites.

Willow Flycatcher

Direct Effects and Indirect Effects

Level of Habitat Alteration

There are twelve watersheds that have a low level of alteration as a result of Alternative 2. There are no moderate levels of risk. The six watersheds with a high level of alteration are Lower North Russian Creek, Lower South Russian Creek, Robinson Gulch, Upper North Russian, Whites Gulch and Yellow Dog Creek. Project design features intended to protect water quality, including ground-based equipment exclusion zones and harvest restrictions will mitigate this effect but not enough to reduce the level of habitat alteration.

Cumulative Effects
Level of Habitat Alteration

None of the levels of habitat alteration are changed by the addition of actions considered for cumulative effects in the Whites fire area.

Siskiyou Mountain Salamander
Direct Effects and Indirect Effects
Risk of Habitat Disturbance

The Whites fire area is outside of the Siskiyou Mountain Salamander's range and, therefore, there are no direct or indirect effects on this species.

Cumulative Effects
Risk of Habitat Disturbance

There are no direct or indirect effects to Siskiyou Mountain Salamander as a result of the treatments in the Whites fire area so there are no cumulative effects.

Tehama Chaparral Snail
Direct Effects and Indirect Effects
Likelihood of Dispersal

Tehama chaparral snail dispersal habitat which consists of some type of physical structure to provide cooler and moisture conditions during dispersal. Providing this structure is most important for snails that are dispersing across areas without canopy cover. Project design features provide varying sizes of woody debris of trees equal to or greater than12 inches in diameter after fuels treatments so that treatment units have sufficient woody debris. In addition, project design features will retain live and dead trees in the treatment units to provide future woody debris, and the known sites of Tehama chaparral snails will not be treated so that remaining habitat will be retained. Therefore, given the project design features, the likelihood of dispersal will be a high for Alternative 2.

Cumulative Effects
Likelihood of Dispersal

There are no other actions that will affect snail dispersal because no known sites in the project area overlap with any other project. Therefore, there will be no cumulative effects to snail dispersal.

Western Bumble Bee
Direct Effects and Indirect Effects
Level of Habitat Disturbance

Nine of the watersheds in the fire area with Bumble Bee habitat will have a low level of disturbance as a result of this alternative. Music Creek and Robinson Gulch will have a moderate level of disturbance. There are no watersheds with a high level of disturbance in this fire area.

Cumulative Effects
Level of Habitat Disturbance

None of the levels of disturbance change as a result of adding the effects of the actions considered for cumulative effects in the fire area.

Management Indicator Species
Snag Species Association
Direct Effects and Indirect Effects
Changes in Snag Habitat Abundance

The percent of snag-associated species habitat affected by Alternative 2 varies between individual species but about 9 percent of snag-associated species habitat will be affected by roadside hazard and salvage treatments. The other treatments in this alternative are likely to have minor effects on snag-associated species habitat. With implementation of project design features, salvage treatment units will not provide five snags on every acre but the project will meet the Forest Plan standard of five snags per acre averaged over 100 acres. Therefore, Alternative 2 is likely to provide a sufficient number of snags of varying decay classes to provide a habitat level of "good" snag-associated habitat.

Cumulative Effects
Changes in Snag Habitat Abundance

All of the removal will occur on private lands where snag retention is likely to be incidental. The actions considered for cumulative effects are assumed to downgrade snag habitat but not remove it because of the requirements to meet the Forest Plan standards for snag retention. The cumulative effects of Alternative 2 are 4,347 acres of snag habitat will be affected by the project; 194 acres will be affected by actions considered for cumulative effects. This is a total of 4,541acres affected.

Hardwood Species Association
Direct Effects and Indirect Effects
Changes in Hardwood Habitat Abundance

Alternative 2 will affect 23 acres of hardwood habitat. This is about 3 percent of the hardwood habitat in the project area. Estimates of effects are likely overestimated because roadside hazard treatments are likely to retain most of the hardwoods and the hardwoods in the salvage units may be damaged but are likely to remain in the units after treatment. The treatments are focused on conifer removal and maintaining hardwoods were possible but they may be damaged during implementation.

Cumulative Effects
Changes in Hardwood Habitat Abundance

The cumulative effects of Alternative 2 are 23 acres of hardwood habitat will be affected by the project; 4 acres will be affected by actions considered for cumulative effects. This is a total of 27 acres affected.

Survey and Manage
Direct Effects and Indirect Effects

The effects are the same as described in the Beaver Fire area.

Cumulative Effects

The effects are the same as described in the Beaver Fire area.

Migratory Birds

Direct Effects and Indirect Effects

The effects are the same as described in the Beaver Fire area.

Cumulative Effects

The effects are the same as described in the Beaver Fire area.

Big Game

Direct Effects and Indirect Effects

The direct and indirect effects are the same as described in the Beaver fire area.

Cumulative Effects

The primary action considered for cumulative effects within the fire area that may affect big game habitat is the Eddy Late Successional Reserve. The other projects considered for cumulative effects have a very small footprint in the fire area. The Eddy Late Successional Reserve project is intended to promote, protect and connect old growth habitat which includes openings, brush component and multi-layered understory. These are compatible with browse and cover species big game use. The areas in the Eddy Late Successional Reserve project treatment units will provide browse and cover conditions.

Alternative 3

Project Area A: Beaver Fire

Wildlife Biological Evaluation

Northern Spotted Owl

Direct Effects and Indirect Effects

Risk to Reproduction

There are two activity centers with very low risk to reproduction. There are six, eight and seven activity centers with a low, moderate and high risk to reproduction respectively. Although salvage is removed in the Beaver project area for this alternative, the resulting level of risk for each activity center is the same as Alternative 2. Although the amount of habitat affected within five activity centers is less than Alternative 2, the resulting risk level doesn't display a difference between alternatives. This result is likely related to the dispersed habitat distribution and dispersed proposed activities.

Changes to Critical Habitat

The change to critical habitat on the analysis area is 63 acres of nesting/roosting and foraging being downgraded or removed. The net number of dispersal habitat acres decrease of 24 acres while the fire affected critical habitat was reduced by 152 acres.

Cumulative Effects

Risk to Reproduction

Unlike Alternative 2, the direct and indirect effects resulting from Alternative 3 plus the effects resulting from other projects are expected to result in one activity center (4143) having an increase in risk from the low to moderate risk level.

Changes to Critical Habitat

The direct and indirect effects of Alternative 3 plus cumulative effects resulting from other actions within the analysis area will result in 63 acres of nesting/roosting and foraging habitat being downgraded or removed and a net decrease 152 acres of dispersal habitat. However, the fire affected critical habitat didn't change from the acres presented in the direct and indirect effects.

Bald Eagle
Direct Effects and Indirect Effects
Level of Disturbance to Nest Sites

The level of disturbance to the Dona nest site is mitigated by a limited operating period and will be low.

Risk to Future Potential Nest Trees

The effects are the same as for Alternative 2.

Cumulative Effects
Level of Disturbance to Nest Sites

The cumulative effects are the same as for Alternative 2.

Risk to Future Potential Nest Trees

The cumulative effects are the same as for Alternative 2.

Northern Goshawk
Direct Effects and Indirect Effects
Level of Disturbance to Nest Sites

The effects are the same as for Alternative 2.

Risk to Reproduction

The effects are the same as for Alternative 2.

Cumulative Effects
Level of Disturbance to Nest Sites

The effects are the same as for Alternative 2.

Risk to Reproduction

The effects are the same as for Alternative 2.

Fisher, Marten, and Wolverine
Direct Effects and Indirect Effects
Level of Habitat Connectivity

There are four, six and three watersheds with moderate, low and very low connectivity respectively. Although the number of acres affected in Alternative 3 is different from Alternative 2, the effects didn't rise to the level to result in a reduction of the level of connectivity. The watersheds and the associated level of connectivity is the same as Alternative 2.

Change in Fisher Home Range

The direct and indirect effects of Alternative 3 resulted in the same effects as described in Alternative 2 for this analysis area. The watersheds not meeting the home range potential criteria are the same as for Alternative 1.

Cumulative Effects
Level of Habitat Connectivity

The direct, indirect, and cumulative effects resulted in the same watersheds and associated level of habitat connectivity as those presented in Alternative 2.

Change in Fisher Home Range

Just as in Alternative 1, none of the cumulative actions considered in the fire area (private land salvage and timber harvest plans) reduce the habitat enough move any watersheds from meeting the home range potential criteria to not meeting the criteria.

Pallid Bat, Townsend's Big-eared Bat, and Fringed myotis
Direct Effects and Indirect Effects
Risk of Disturbance

The effects are the same as for Alternative 2.

Cumulative Effects
Risk of Disturbance

The cumulative effects are the same as for Alternative 2.

Willow Flycatcher
Direct Effects and Indirect Effects
Level of Habitat Alteration

The effects to willow flycatcher are the same as for alterative 2.

Cumulative Effects
Level of Habitat Alteration

The cumulative effects to willow flycatcher are the same as for alterative 2.

Siskiyou Mountain Salamander
Direct Effects and Indirect Effects
Risk of Habitat Disturbance

The Beaver fire area is outside of the Siskiyou Mountain Salamander's range and, therefore, there are no direct or indirect effects of the alternative on these species.

Cumulative Effects
Risk of Habitat Disturbance

There are no direct or indirect effects to Siskiyou Mountain Salamander as a result of the treatments in the Beaver fire area so there are no cumulative effects.

Tehama Chaparral Snail
Direct Effects and Indirect Effects
Likelihood of Dispersal

The effects to the Tehama Chaparral Snail are the same as for Alternative 2.

Cumulative Effects
Likelihood of Dispersal

The cumulative effects to the Tehama Chaparral Snail are the same as for Alternative 2.

Western Bumble Bee
Direct Effects and Indirect Effects
Level of Habitat Disturbance

The effects are the same as for Alternative 2.

Cumulative Effects
Level of Habitat Disturbance

The cumulative effects are the same as for Alternative 2.

Management Indicator Species
Snag Species Association
Direct Effects and Indirect Effects

Changes in Snag Habitat Abundance

The percent of snag-associated species habitat affected by Alternative 3 varies between individual species but about 8 percent of snag-associated species habitat will be affected by roadside hazard and salvage treatments. The other treatments in this alternative are likely to have minor effects on snag-associated species habitat. With implementation of project design features, salvage treatment units will not provide five snags on every acre but the project will meet the Forest Plan standard of five snags per acre averaged over 100 acres. Therefore, Alternative 3 is likely to provide a sufficient number of snags of varying decay classes to provide a habitat level of "good" snag-associated habitat.

Cumulative Effects
Changes in Snag Habitat Abundance

All of the removal will occur on private lands where snag retention is likely to be incidental. The actions considered for cumulative effects are assumed to downgrade snag habitat but not remove it because of the requirements to meet the Forest Plan standards for snag retention. The cumulative effects of Alternative 3 are 1,834 acres of snag habitat will be affected by the project; 2,786 acres will be affected by actions considered for cumulative effects. This is a total of 4,620 acres affected.

Hardwood Species Association
Direct Effects and Indirect Effects
Changes in Hardwood Habitat Abundance

Alternative 3 will affect 196 acres of hardwood habitat. This is about 5 percent of the hardwood habitat in the project area. Estimates of effects are likely overestimated because roadside hazard treatments are likely to retain most of the hardwoods and the hardwoods in the salvage units may be damaged but are likely to remain in the units after treatment. The treatments are focused on conifer removal and maintaining hardwoods were possible but they may be damaged during implementation.

Cumulative Effects
Changes in Hardwood Habitat Abundance

The cumulative effects of Alternative 3 are 196 acres of hardwood habitat will be affected by the project; 327 acres will be affected by actions considered for cumulative effects. This is a total of 523 acres affected.

Survey and Manage
Direct Effects and Indirect Effects

The effects are the same as for Alternative 2.

Cumulative Effects

The cumulative effects are the same as for Alternative 2.

Migratory Birds
Direct Effects and Indirect Effects

This is the same as described in Alternative 2.

Cumulative Effects

This is the same as described in Alternative 2.

Big Game
Direct Effects and Indirect Effects

The effects are the same as for Alternative 2.

Cumulative Effects

The effects are the same as for Alternative 2.

Project Area B: Happy Camp Complex

Wildlife Biological Evaluation

Northern Spotted Owl

Direct Effects and Indirect Effects

Risk to Reproduction

There are two, nine, forty-one and five activity centers with very low, low, moderate and high risk to reproduction respectively. Alternative 3 will result in an increase in risk to reproduction for six activity centers; five activity centers (0241, 1121, 1214, 1266, and 4099) went from low risk to moderate while the remaining activity center (9992) went from moderate to high risk. Alternative 3 has two fewer activity centers (4133 and 9991) with an increase in risk level when compared to Alternative 2; Alternative 3 has one less activity center (9991) going from low to moderate and one activity center (4133) going from moderate to high risk level.

Changes to Critical Habitat

The change to critical habitat in the analysis area is 844 acres of nesting/roosting and foraging being downgraded or removed. The net number of dispersal habitat acres increased to 501 acres while the fire affected critical habitat was reduced by 3,129 acres.

Cumulative Effects

Risk to Reproduction

Adding the direct and indirect effects of this alternative to the effects resulting from other projects is not expected to increase the cumulative risk to reproduction for any of the activity centers in the Happy Camp analysis area. The direct and indirect effects of this alternative plus cumulative effects resulting from other actions within the analysis area will not change the risk level for any of the activity centers.

Changes to Critical Habitat

The direct and indirect effects of this alternative plus cumulative effects resulting from other actions within the analysis area will result in 1,071 acres of nesting/roosting and foraging habitat being downgraded or removed and a net increase of 727 acres of dispersal habitat. However, the fire affected critical habitat didn't change from the acres presented in the direct and indirect effects.

Bald Eagle

Direct Effects and Indirect Effects

Level of Disturbance to Nest Sites

The effects are the same as for Alternative 2.

Risk to Future Potential Nest Trees

The effects are the same as for Alternative 2.

Cumulative Effects

Level of Disturbance to Nest Sites

The cumulative effects are the same as described in Alternative 2.

Risk to Future Potential Nest Trees

The cumulative effects are the same as described in Alternative 2.

Northern Goshawk

Direct Effects and Indirect Effects

Level of Disturbance to Nest Sites

The effects are the same as for Alternative 2.

Risk to Reproduction

The effects are the same as for Alternative 2.

Cumulative Effects

Level of Disturbance to Nest Sites

The effects are the same as for Alternative 2.

Risk to Reproduction

The effects are the same as for Alternative 2.

Fisher, Marten, and Wolverine

Direct Effects and Indirect Effects

Level of Habitat Connectivity

Even though Alternative 3 typically affects fewer acres of habitat within each watershed when compared to Alternative 2, the watersheds and the associated level of connectivity is the same as Alternative 2.

Change in Fisher Home Range

The direct and indirect effects of Alternative 3 resulted in the same effects as described in Alternative 2 for this analysis area.

Cumulative Effects

Level of Habitat Connectivity

The direct, indirect, and cumulative effects resulted in the same watersheds and associated level of habitat connectivity as those presented in Alternative 2.

Change in Fisher Home Range

The cumulative effects are the same as for Alternative 2.

Pallid Bat, Townsend's Big-eared Bat, and Fringed myotis

Risk of Disturbance

The effects are the same as for Alternative 2.

Cumulative Effects

Risk of Disturbance

The cumulative effects are the same as for Alternative 2.

Willow Flycatcher

Direct Effects and Indirect Effects

Level of Habitat Alteration

The effects to willow flycatcher are the same as for alterative 2.

Cumulative Effects

Level of Habitat Alteration

The cumulative effects to willow flycatcher are the same as for alterative 2.

Siskiyou Mountain Salamander

Direct Effects and Indirect Effects
Risk of Habitat Disturbance

The effects of this alternative are the same as for Alternative 2.

Cumulative Effects
Risk of Habitat Disturbance

The cumulative effects of this alternative are the same as for Alternative 2.

Tehama Chaparral Snail
Direct Effects and Indirect Effects
Likelihood of Dispersal

The effects to the Tehama Chaparral Snail are the same as for Alternative 2.

Cumulative Effects
Likelihood of Dispersal

The cumulative effects to the Tehama Chaparral Snail are the same as for Alternative 2.

Western Bumble Bee
Direct Effects and Indirect Effects
Level of Habitat Disturbance

The effects are the same as for Alternative 2.

Cumulative Effects
Level of Habitat Disturbance

The cumulative effects are the same as for Alternative 2.

Management Indicator Species
Snag Species Association
Direct Effects and Indirect Effects
Changes in Snag Habitat Abundance

The percent of snag-associated species habitat affected by Alternative 3 varies between individual species but about 13 percent of snag-associated species habitat will be affected by roadside hazard and salvage treatments. The other treatments in this alternative are likely to have minor effects on snag-associated species habitat. With implementation of project design features, salvage treatment units will not provide five snags on every acre but the project will meet the Forest Plan standard of five snags per acre averaged over 100 acres. Therefore, Alternative 3 is likely to provide a sufficient number of snags of varying decay classes to provide a habitat level of “good” snag-associated habitat.

Cumulative Effects
Changes in Snag Habitat Abundance

All of the removal will occur on private lands where snag retention is likely to be incidental. The cumulative effects of Alternative 3 are 18,463 acres of snag habitat will be affected by the project; 217 acres will be affected by actions considered for cumulative effects. This is a total of 18,680 acres affected..

Hardwood Species Association
Direct Effects and Indirect Effects
Changes in Hardwood Habitat Abundance

Alternative 3 will affect 437 acres of hardwood habitat. This is about 11 percent of the hardwood habitat in the project area. Estimates of effects are likely overestimated because roadside hazard treatments are likely to retain most of the hardwoods and the

hardwoods in the salvage units may be damaged but are likely to remain in the units after treatment. The treatments are focused on conifer removal and maintaining hardwoods were possible but they may be damaged during implementation.

Cumulative Effects
Changes in Hardwood Habitat Abundance

The cumulative effects of Alternative 3 are 437 acres of hardwood habitat will be affected by the project; 10 acres will be affected by actions considered for cumulative effects. This is a total of 447 acres affected.

Survey and Manage
Direct Effects and Indirect Effects

The effects are the same as for Alternative 2.

Cumulative Effects

The effects are the same as for Alternative 2.

Migratory Birds
Direct Effects and Indirect Effects

This is the same as described in Alternative 2.

Cumulative Effects

This is the same as described in Alternative 2.

Big Game
Direct Effects and Indirect Effects

The effects are the same as for Alternative 2.

Cumulative Effects

The effects are the same as for Alternative 2.

Project Area C: Whites Fire

Wildlife Biological Evaluation
Northern Spotted Owl
Direct Effects and Indirect Effects
Risk to Reproduction

There will be nine and six activity centers with a low and moderate risk to reproduction respectively. Like Alternative 2, Alternative 3 will result in an increase risk to reproduction for two activity centers (1030 and 99912); both activity centers are estimated to go from low risk to moderate risk. The proposed activities for Alternatives 2 and 3 are very similar in the Whites analysis area; thus, the estimated effects are the same for these two activity centers. As a result of this alterative, these two activity centers are likely to have difficulty providing enough resources to support Northern Spotted Owl reproduction.

Changes to Critical Habitat

The change to critical habitat in the analysis area is 357 acres of nesting/roosting and foraging being downgraded or removed. The net number of dispersal habitat acres increased to 320 acres while the fire affected critical habitat was reduced by 320 acres.

Cumulative Effects
Risk to Reproduction

The direct and indirect effects of this alternative plus cumulative effects resulting from other actions within the analysis area will not change the risk level for any of the activity centers.

Changes to Critical Habitat

The direct and indirect effects of this alternative plus cumulative effects resulting from other actions within the analysis area will result in 580 acres of nesting/roosting and foraging habitat being downgraded or removed and a net increase of 543 acres of dispersal habitat. However, the fire affected critical habitat didn't change from the acres presented in the direct and indirect effects.

Bald Eagle
Direct Effects/Indirect and Cumulative Effects

There are no known eagle nest sites in the Whites project area so there are no effects to bald eagles from this alternative.

Northern Goshawk
Direct Effects and Indirect Effects
Level of Disturbance to Nest Sites

The effects are the same as for Alternative 2.

Risk to Reproduction

The effects are the same as for Alternative 2.

Cumulative Effects
Level of Disturbance to Nest Sites

The effects are the same as for Alternative 2.

Risk to Reproduction

The effects are the same as for Alternative 2.

Fisher, Marten, and Wolverine
Direct Effects and Indirect Effects
Level of Habitat Connectivity

Even though Alternative 3 generally affects fewer acres of habitat within each watershed when compared to Alternative 2, the watersheds and the associated level of connectivity is the same as Alternative 2.

Change in Fisher Home Range

The direct and indirect effects of Alternative 3 resulted in the same effects as described in Alternative 2 for this analysis area.

Cumulative Effects
Level of Habitat Connectivity

The direct, indirect, and cumulative effects resulted in the same watersheds and associated level of habitat connectivity as those presented in Alternative 2.

Change in Fisher Home Range

The direct, indirect, and cumulative effects of this alternative resulted in the same effects as described in Alternative 2.

Pallid Bat, Townsend's Big-eared Bat, and Fringed myotis

Risk of Disturbance

The effects are the same as for Alternative 2.

Cumulative Effects
Risk of Disturbance

The cumulative effects are the same as for Alternative 2.

Willow Flycatcher
Direct Effects and Indirect Effects
Level of Habitat Alteration

The effects to willow flycatcher are the same as for alterative 2.

Cumulative Effects
Level of Habitat Alteration

The cumulative effects to willow flycatcher are the same as for alterative 2.

Siskiyou Mountain Salamander
Direct Effects and Indirect Effects
Risk of Habitat Disturbance

The Whites fire area is outside of the Siskiyou Mountain Salamander's range and, therefore, there are no direct or indirect effects on this species or habitat.

Cumulative Effects
Risk of Habitat Disturbance

There are no direct or indirect effects to Siskiyou Mountain Salamander as a result of the treatments in the Whites fire area so there are no cumulative effects.

Tehama Chaparral Snail
Direct Effects and Indirect Effects
Likelihood of Dispersal

The effects to the Tehama Chaparral Snail are the same as for Alternative 2.

Cumulative Effects
Likelihood of Dispersal

The cumulative effects to the Tehama Chaparral Snail are the same as for Alternative 2.

Western Bumble Bee
Direct Effects and Indirect Effects
Level of Habitat Disturbance

The effects are the same as for Alternative 2.

Cumulative Effects
Level of Habitat Disturbance

The cumulative effects are the same as for Alternative 2.

Management Indicator Species
Snag Species Association
Direct Effects and Indirect Effects
Changes in Snag Habitat Abundance

The percent of snag-associated species habitat affected by Alternative 3 varies between individual species but about 8 percent of snag-associated species habitat will be affected by roadside hazard and salvage treatments. The other treatments in this alternative are likely to have minor effects on snag-associated species habitat. With implementation of

project design features, salvage treatment units will not provide five snags on every acre but the project will meet the Forest Plan standard of five snags per acre averaged over 100 acres. Therefore, Alternative 3 is likely to provide a sufficient number of snags of varying decay classes to provide a habitat level of "good" snag-associated habitat.

Cumulative Effects

Changes in Snag Habitat Abundance

All of the removal will occur on private lands where snag retention is likely to be incidental. The actions considered for cumulative effects are assumed to downgrade snag habitat but not remove it because of the requirements to meet the Forest Plan standards for snag retention. The cumulative effects of Alternative 3 are 4000 acres of snag habitat will be affected by the project; 194 acres will be affected by actions considered for cumulative effects. This is a total of 4,194 acres affected.

Hardwood Species Association

Direct Effects and Indirect Effects

Changes in Hardwood Habitat Abundance

Alternative 3 will affect 23 acres of hardwood habitat. This is about 3 percent of the hardwood habitat in the project area. Estimates of effects are likely overestimated because roadside hazard treatments are likely to retain most of the hardwoods and the hardwoods in the salvage units may be damaged but are likely to remain in the units after treatment. The treatments are focused on conifer removal and maintaining hardwoods were possible but they may be damaged during implementation.

Cumulative Effects

Changes in Hardwood Habitat Abundance

The cumulative effects of Alternative 3 are 23 acres of hardwood habitat will be affected by the project; 4 acres will be affected by actions considered for cumulative effects. This is a total of 27 acres affected.

Survey and Manage

Direct Effects and Indirect Effects

Habitat Protection

The effects are the same as for Alternative 2.

Cumulative Effects

The effects are the same as for Alternative 2.

Migratory Birds

Direct Effects and Indirect Effects

This is the same as described in Alternative 2.

Cumulative Effects

This is the same as described in Alternative 2.

Big Game

Direct Effects and Indirect Effects

The effects are the same as for Alternative 2.

Cumulative Effects

The effects are the same as for Alternative 2.

Alternative 4

Project Area A: Beaver Fire

Wildlife Biological Evaluation

Northern Spotted Owl

Direct Effects and Indirect Effects

Risk to Reproduction

Like Alternative 2, Alternative 4 didn't change the level of risk for the activity centers in the Beaver analysis area. This result is likely related to the dispersed habitat distribution and dispersed proposed activities.

Changes to Critical Habitat

The change to critical habitat in the analysis area is 62 acres of nesting/roosting and foraging being downgraded or removed. The net number of dispersal habitat acres reduced by 24 acres while the fire affected critical habitat was reduced by 152 acres.

Cumulative Effects

Risk to Reproduction

The direct and indirect effects of this alternative plus cumulative effects resulting from other actions within the analysis area will change the risk level for two activity centers.

Changes to Critical Habitat

The direct and indirect effects of this alternative plus cumulative effects resulting from other actions within the analysis area will result in the same acres of critical habitat being downgraded or removed as presented in the direct and indirect effects. Additionally, the fire affected critical habitat didn't change from the acres presented in the direct and indirect effects.

Bald Eagle

Direct Effects and Indirect Effects

Level of Disturbance to Nest Sites

The effects are the same as for Alternative 2.

Risk to Future Potential Nest Trees

The effects are the same as for Alternative 2.

Cumulative Effects

Level of Disturbance to Nest Sites

The cumulative effects are the same as for Alternative 2.

Risk to Future Potential Nest Trees

The cumulative effects are the same as for Alternative 2.

Northern Goshawk

Direct Effects and Indirect Effects

Level of Disturbance to Nest Sites

The effects are the same as for Alternative 2.

Risk to Reproduction

The effects are the same as for Alternative 2.

Cumulative Effects

Level of Disturbance to Nest Sites

The effects are the same as for Alternative 2.

Risk to Reproduction

The effects are the same as for Alternative 2.

Fisher, Marten, and Wolverine
Direct Effects and Indirect Effects
Level of Habitat Connectivity

Even though Alternative 4 affects fewer acres when compared to Alternative 2, the watersheds and the associated level of connectivity is the same as Alternative 2.

Change in Fisher Home Range

The direct and indirect effects of Alternative 4 resulted in the same effects as described in Alternative 2 for this analysis area.

Cumulative Effects
Level of Habitat Connectivity

The direct, indirect, and cumulative effects resulted in the same watersheds and associated level of habitat connectivity as those presented in Alternative 2.

Change in Fisher Home Range

Just as in Alternative 1, none of the cumulative actions considered in the fire area (private land salvage and timber harvest plans) reduce the habitat enough move any watersheds from meeting the home range potential criteria to not meeting the criteria. The direct, indirect, and cumulative effects resulted in the same effects presented in Alternative 2.

Pallid Bat, Townsend's Big-eared Bat, and Fringed myotis
Risk of Disturbance

The effects are the same as for Alternative 2.

Cumulative Effects
Risk of Disturbance

The cumulative effects are the same as for Alternative 2.

Willow Flycatcher
Direct Effects and Indirect Effects
Level of Habitat Alteration

The effects to willow flycatcher are the same as for alterative 2.

Cumulative Effects
Level of Habitat Alteration

The cumulative effects to willow flycatcher are the same as for alterative 2.

Siskiyou Mountain Salamander
Direct Effects and Indirect Effects
Risk of Habitat Disturbance

The Beaver fire area is outside of the Siskiyou Mountain Salamander's range and, therefore, there will be no direct or indirect effects of this alternative on the species or habitat.

Cumulative Effects
Risk of Habitat Disturbance

There are no direct or indirect effects to Siskiyou Mountain Salamander as a result of the treatments in the Beaver fire area so there are no cumulative effects.

Tehama Chaparral Snail
Direct Effects and Indirect Effects
Likelihood of Dispersal

The effects to the Tehama Chaparral Snail are the same as for Alternative 2.

Cumulative Effects
Likelihood of Dispersal

The cumulative effects to the Tehama Chaparral Snail are the same as for Alternative 2.

Western Bumble Bee
Direct Effects and Indirect Effects
Level of Habitat Disturbance

The effects are the same as for Alternative 2.

Cumulative Effects
Level of Habitat Disturbance

The cumulative effects are the same as for Alternative 2.

Management Indicator Species
Snag Species Association
Direct Effects and Indirect Effects
Changes in Snag Habitat Abundance

The percent of snag-associated species habitat affected by Alternative 4 varies between individual species but about 8 percent of snag-associated species habitat will be affected by roadside hazard and salvage treatments. The other treatments in this alternative are likely to have minor effects on snag-associated species habitat. With implementation of project design features, salvage treatment units will not provide five snags on every acre but the project will meet the Forest Plan standard of five snags per acre averaged over 100 acres. Therefore, Alternative 4 is likely to provide a sufficient number of snags of varying decay classes to provide a habitat level of “good” snag-associated habitat.

Cumulative Effects
Changes in Snag Habitat Abundance

All of the removal will occur on private lands where snag retention is likely to be incidental. The actions considered for cumulative effects are assumed to downgrade snag habitat but not remove it because of the requirements to meet the Forest Plan standards for snag retention. The cumulative effects of Alternative 4 are 1,875 acres of snag habitat will be affected by the project; 2,786 acres will be affected by actions considered for cumulative effects. This is a total of 4,661 acres affected..

Hardwood Species Association
Direct Effects and Indirect Effects
Changes in Hardwood Habitat Abundance

Alternative 4 will affect 158 acres of hardwood habitat. This is about 4 percent of the hardwood habitat in the project area. Estimates of effects are likely overestimated because roadside hazard treatments are likely to retain most of the hardwoods and the hardwoods in the salvage units may be damaged but are likely to remain in the units after treatment. The treatments are focused on conifer removal and maintaining hardwoods were possible but they may be damaged during implementation.

Cumulative Effects
Changes in Hardwood Habitat Abundance

The cumulative effects of Alternative 4 are 158 acres of hardwood habitat will be affected by the project; 327 acres will be affected by actions considered for cumulative effects. This is a total of 485 acres affected.

Survey and Manage
Direct Effects and Indirect Effects
Habitat Protection

The effects are the same as described in Alternative 2.

Cumulative Effects

The cumulative effects are the same as described in Alternative 2.

Migratory Birds
Direct Effects and Indirect Effects

This is the same as described in Alternative 2.

Cumulative Effects

This is the same as described in Alternative 2.

Big Game
Direct Effects and Indirect Effects

The effects are the same as for Alternative 2.

Cumulative Effects

The effects are the same as for Alternative 2.

Project Area B: Happy Camp Complex

Wildlife Biological Evaluation
Northern Spotted Owl
Direct Effects and Indirect Effects
Risk to Reproduction

There are two, seven, forty-two and six activity centers with very low, low, moderate and high risk to reproduction respectively. Like Alternative 2, Alternative 4 will result in an increase in risk to reproduction for nine activity centers; seven activity centers (0241, 1121, 1130, 1214, 1266, 4099, and 9991) went from low risk to moderate risk while the remaining two activity centers (4133 and 9992) went from moderate to high risk. The seven activity centers that went from low to moderate risk are a result of salvage, roadside hazard, and fuels treatments that will affect each activity center at different proportions; the combination of treatments will affect many acres of habitat. The two activity centers that went from moderate to high risk have different levels and types of treatment but both activity centers have a resulting increase in risk; one activity center had mostly salvage and roadside hazard while the other activity center had mostly fuels treatments. Regardless of the treatment type, the estimate of risk to reproduction is based on the effects to habitat within each activity center.

Changes to Critical Habitat

The change to critical habitat in the analysis area is 698 acres of nesting/roosting and foraging being downgraded or removed. The net number of dispersal habitat acres increased to 387 acres while the fire affected critical habitat was reduced by 3,047 acres.

Cumulative Effects
Risk to Reproduction

The direct and indirect effects of this alternative plus cumulative effects resulting from other actions within the analysis area will not change the risk level for any of the activity centers.

Changes to Critical Habitat

The direct and indirect effects of this alternative plus cumulative effects resulting from other actions within the analysis area will result in 924 acres of nesting/roosting and foraging habitat being downgraded or removed and a net increase of 613 acres of dispersal habitat. However, the fire affected critical habitat didn't change from the acres presented in the direct and indirect effects.

Bald Eagle

Direct Effects and Indirect Effects
Level of Disturbance to Nest Sites

The effects are the same as for Alternative 2.

Risk to Future Potential Nest Trees

The effects are the same as for Alternative 2.

Cumulative Effects
Level of Disturbance to Nest Sites

The cumulative effect to the Dona nest site is the same as described in the draft EIS (page. 152).

Risk to Future Potential Nest Trees

The cumulative effect to the Dona nest site is the same as described in the draft EIS (page. 152).

Northern Goshawk
Direct Effects and Indirect Effects
Level of Disturbance to Nest Sites

The effects are the same as for Alternative 2.

Risk to Reproduction

The effects are the same as for Alternative 2.

Cumulative Effects
Level of Disturbance to Nest Sites

The effects are the same as for Alternative 2.

Risk to Reproduction

The effects are the same as for Alternative 2.

Fisher, Marten, and Wolverine
Direct Effects and Indirect Effects
Level of Habitat Connectivity

There are seventeen, fourteen and five watersheds with moderate, low and very low connectivity respectively. Alternative 4 has 4 fewer watersheds (China, Horse, Upper Elk, and Grider) that had a reduced level of connectivity when compared to Alternative 2.

These four watersheds will remain at a moderate level of connectivity despite the treatment.

Change in Fisher Home Range

The direct and indirect effects of Alternative 4 resulted in the same effects as described in Alternative 2 for this analysis area.

Cumulative Effects
Level of Habitat Connectivity

Like Alternative 2, the direct, indirect, and cumulative effects for Alternative 4 resulted in one watershed (Big Ferry-Swanson) to have a reduced level of connectivity. The rest of the watersheds did not change the level of connectivity.

Change in Fisher Home Range

The cumulative effects are the same as Alternative 2.

Pallid Bat, Townsend's Big-eared Bat, and Fringed myotis
Direct Effects and Indirect Effects
Risk of Disturbance

There are four, five and nineteen potential hibernacula with high, moderate and low risk of disturbance. Compared to Alternative 2, this alternative leads to one potential hibernacula moving from a high to a moderate risk of disturbance, and one that moves from a moderate to a low risk.

Cumulative Effects
Risk of Disturbance

Cumulatively there are six, five and seventeen potential hibernacula with a high, moderate and low risk of disturbance. The private lands salvage and other timber harvest plans move many of the potential hibernacula from a moderate risk to a high risk. The majority of this effect is because of the uncertainty of mitigations occurring on private land. Therefore, the cumulative effects may be an overestimate, especially if private lands are implementing mitigation to minimize the negative effects on roost sites.

Willow Flycatcher
Direct Effects and Indirect Effects
Level of Habitat Alteration

The effects to willow flycatcher are the same as for alterative 2.

Cumulative Effects
Level of Habitat Alteration

The cumulative effects to willow flycatcher are the same as for alterative 2.

Siskiyou Mountain Salamander
Direct Effects and Indirect Effects
Risk of Habitat Disturbance

The effects of this alternative are the same as for Alternative 2.

Cumulative Effects
Risk of Habitat Disturbance

The cumulative effects of this alternative are the same as for Alternative 2.

Tehama Chaparral Snail
Direct Effects and Indirect Effects

Likelihood of Dispersal

The effects to the Tehama Chaparral Snail are the same as for Alternative 2.

Cumulative Effects
Likelihood of Dispersal

The cumulative effects to the Tehama Chaparral Snail are the same as for Alternative 2.

Western Bumble Bee
Direct Effects and Indirect Effects
Level of Habitat Disturbance

The effects are the same as for Alternative 2.

Cumulative Effects
Level of Habitat Disturbance

The cumulative effects are the same as for Alternative 2.

Management Indicator Species
Snag Species Association
Direct Effects and Indirect Effects
Changes in Snag Habitat Abundance

The percent of snag-associated species habitat affected by Alternative 4 varies between individual species but about 13 percent of snag-associated species habitat will be affected by roadside hazard and salvage treatments. The other treatments in this alternative are likely to have minor effects on snag-associated species habitat. With implementation of project design features, salvage treatment units will not provide five snags on every acre but the project will meet the Forest Plan standard of five snags per acre averaged over 100 acres. Therefore, Alternative 4 is likely to provide a sufficient number of snags of varying decay classes to provide a habitat level of "good" snag-associated habitat.

Cumulative Effects
Changes in Snag Habitat Abundance

All of the removal will occur on private lands where snag retention is likely to be incidental. The actions considered for cumulative effects are assumed to downgrade snag habitat but not remove it because of the requirements to meet the Forest Plan standards for snag retention. The cumulative effects of Alternative 4 are 18,732 acres of snag habitat will be affected by the project; 217 acres will be affected by actions considered for cumulative effects. This is a total of 18,949 acres affected.

Hardwood Species Association
Direct Effects and Indirect Effects
Changes in Hardwood Habitat Abundance

Alternative 4 will affect 442 acres of hardwood habitat. This is about 11 percent of the hardwood habitat in the project area. Estimates of effects are likely overestimated because roadside hazard treatments are likely to retain most of the hardwoods and the hardwoods in the salvage units may be damaged but are likely to remain in the units after treatment. The treatments are focused on conifer removal and maintaining hardwoods were possible but they may be damaged during implementation.

Cumulative Effects
Changes in Hardwood Habitat Abundance

The cumulative effects of Alternative 4 are 442 acres of hardwood habitat will be affected by the project; 10 acres will be affected by actions considered for cumulative effects. This is a total of 452 acres affected.

Survey and Manage

Direct Effects and Indirect Effects

Habitat Protection

The effects are the same as for Alternative 2.

Cumulative Effects

The cumulative effects are the same as for Alternative 2.

Migratory Birds

Direct Effects and Indirect Effects

This is the same as described in Alternative 2.

Cumulative Effects

This is the same as described in Alternative 2.

Big Game

Direct Effects and Indirect Effects

The effects are the same as for Alternative 2.

Cumulative Effects

The effects are the same as for Alternative 2.

Project Area C: Whites Fire

Wildlife Biological Evaluation

Northern Spotted Owl

Direct Effects and Indirect Effects

Risk to Reproduction

Like Alternative 2, Alternative 4 will result in an increase in risk to reproduction for two activity centers (1030 and 99912); both activity centers are estimated to go from low risk to moderate risk.

Changes to Critical Habitat

The change to critical habitat in the analysis area is 329 acres of nesting/roosting and foraging being downgraded or removed. The net number of dispersal habitat acres increased to 292 acres while the fire affected critical habitat was reduced by 784 acres.

Cumulative Effects

Risk to Reproduction

The direct and indirect effects of this alternative plus cumulative effects resulting from other actions within the analysis area will not change the risk level for any of the activity centers.

Changes to Critical Habitat

The direct and indirect effects of this alternative plus cumulative effects resulting from other actions within the analysis area will result in 552 acres of nesting/roosting and foraging habitat being downgraded or removed and a net increase of 515 acres of

dispersal habitat. However, the fire affected critical habitat didn't change from the acres presented in the direct and indirect effects.

Bald Eagle
Direct Effects/Indirect and Cumulative Effects

There are no known eagle nest sites in the Whites project area so there are no effects to bald eagles from this alternative.

Northern Goshawk
Direct Effects and Indirect Effects
Level of Disturbance to Nest Sites

The effects are the same as for Alternative 2.

Risk to Reproduction

The effects are the same as for Alternative 2.

Cumulative Effects
Level of Disturbance to Nest Sites

The effects are the same as for Alternative 2.

Risk to Reproduction

The effects are the same as for Alternative 2.

Fisher, Marten, and Wolverine
Direct Effects and Indirect Effects
Level of Habitat Connectivity

Alternative 4 resulted in the same level of connectivity for each of the associated watersheds as Alternative 2. Even though Alternative 4 resulted in fewer number of affected habitat acres in several of the watersheds, the level of connectivity is the same as Alternative 2.

Change in Fisher Home Range

The direct and indirect effects of Alternative 4 resulted in the same effects as described in Alternative 2 for this analysis area.

Cumulative Effects
Level of Habitat Connectivity

The direct, indirect, and cumulative effects resulted in the same level of connectivity as described in Alternative 2.

Change in Fisher Home Range

The cumulative effects are the same as Alternative 2.

Pallid Bat, Townsend's Big-eared Bat, and Fringed myotis
Risk of Disturbance

The effects are the same as for Alternative 2.

Cumulative Effects
Risk of Disturbance

The cumulative effects are the same as for Alternative 2.

Willow Flycatcher
Direct Effects and Indirect Effects

Level of Habitat Alteration

The effects to willow flycatcher are the same as for alterative 2.

Cumulative Effects
Level of Habitat Alteration

The cumulative effects to willow flycatcher are the same as for alterative 2.

Siskiyou Mountain Salamander
Direct Effects and Indirect Effects
Risk of Habitat Disturbance

The Whites fire area is outside of the Siskiyou Mountain Salamander's range and, therefore, there will be no direct or indirect effects on the species or habitat from this alternative.

Cumulative Effects
Risk of Habitat Disturbance

There are no direct or indirect effects to Siskiyou Mountain Salamander as a result of the treatments in the Whites fire area so there are no cumulative effects.

Tehama Chaparral Snail
Direct Effects and Indirect Effects
Likelihood of Dispersal

The effects to the Tehama Chaparral Snail are the same as for Alternative 2.

Cumulative Effects
Likelihood of Dispersal

The cumulative effects to the Tehama Chaparral Snail are the same as for Alternative 2.

Western Bumble Bee
Direct Effects and Indirect Effects
Level of Habitat Disturbance

The effects are the same as for Alternative 2.

Cumulative Effects
Level of Habitat Disturbance

The cumulative effects are the same as for Alternative 2.

Management Indicator Species
Snag Species Association
Direct Effects and Indirect Effects
Changes in Snag Habitat Abundance

The percent of snag-associated species habitat affected by Alternative 4 varies between individual species but about 9 percent of snag-associated species habitat will be affected by roadside hazard and salvage treatments. The other treatments in this alternative are likely to have minor effects on snag-associated species habitat. With implementation of project design features, salvage treatment units will not provide five snags on every acre but the project will meet the Forest Plan standard of five snags per acre averaged over 100 acres. Therefore, Alternative 4 is likely to provide a sufficient number of snags of varying decay classes to provide a habitat level of "good" snag-associated habitat.

Cumulative Effects
Changes in Snag Habitat Abundance

All of the removal will occur on private lands where snag retention is likely to be incidental. The actions considered for cumulative effects are assumed to downgrade snag habitat but not remove it because of the requirements to meet the Forest Plan standards for snag retention. The cumulative effects of Alternative 4 are 4,236 acres of snag habitat will be affected by the project; 217acres will be affected by actions considered for cumulative effects. This is a total of 4,453 acres affected.

Hardwood Species Association
Direct Effects and Indirect Effects
Changes in Hardwood Habitat Abundance

Alternative 4 will affect 23 acres of hardwood habitat. This is about 3 percent of the hardwood habitat in the project area. Estimates of effects are likely overestimated because roadside hazard treatments are likely to retain most of the hardwoods and the hardwoods in the salvage units may be damaged but are likely to remain in the units after treatment. The treatments are focused on conifer removal and maintaining hardwoods were possible but they may be damaged during implementation.

Cumulative Effects
Changes in Hardwood Habitat Abundance

The cumulative effects of Alternative 4 are 23 acres of hardwood habitat will be affected by the project; 4 acres will be affected by actions considered for cumulative effects. This is a total of 27 acres affected.

Survey and Manage
Direct Effects and Indirect Effects
Habitat Protection

The effects are the same as for Alternative 2.

Cumulative Effects

The cumulative effects are the same as for Alternative 2.

Migratory Birds
Direct Effects and Indirect Effects

This is the same as described in Alternative 2.

Cumulative Effects

This is the same as described in Alternative 2.

Big Game
Direct Effects and Indirect Effects

The effects are the same as for Alternative 2.

Cumulative Effects

The effects are the same as for Alternative 2.

Alternative 5

Project Area A: Beaver Fire
Wildlife Biological Evaluation
Northern Spotted Owl
Direct Effects and Indirect Effects
Risk to Reproduction

Like Alternative 2, Alternative 5 didn't change the level of risk for the activity centers in the Beaver analysis area. This result is likely related to the dispersed habitat distribution and dispersed proposed activities.

Changes to Critical Habitat

The change to critical habitat in the analysis area is 188 acres of nesting/roosting and foraging being downgraded or removed. The net number of dispersal habitat acres increased to 102 acres while the fire affected critical habitat was reduced by 190 acres.

Cumulative Effects
Risk to Reproduction

The direct and indirect effects of this alternative plus cumulative effects resulting from other actions within the analysis area will change the risk level for one (0283) of the activity centers. The additional fuels treatments (compared to Alternative 2) in the Beaver project area increase the level of risk from moderate to high. The other activity centers in the Beaver project area didn't increase in risk level as a result of the cumulative effects.

Changes to Critical Habitat

The direct and indirect effects of this alternative plus cumulative effects resulting from other actions within the analysis area will result in the same acres of critical habitat being downgraded or removed as presented in the direct and indirect effects. Additionally, the fire affected critical habitat didn't change from the acres presented in the direct and indirect effects.

Bald Eagle
Direct Effects and Indirect Effects
Level of Disturbance to Nest Sites

The effects are the same as for Alternative 2.

Risk to Future Potential Nest Trees

The risk to future potential nest trees is low for Dona nest site.

Cumulative Effects
Level of Disturbance to Nest Sites

The cumulative effects are the same as Alternative 2.

Risk to Future Potential Nest Trees

The cumulative effects are the same as for Alternative 2.

Northern Goshawk
Direct Effects and Indirect Effects
Level of Disturbance to Nest Sites

The effects are the same as for Alternative 2.

Risk to Reproduction

The effects are the same as for Alternative 2.

Cumulative Effects
Level of Disturbance to Nest Sites

The effects are the same as for Alternative 2.

Risk to Reproduction

The effects are the same as for Alternative 2.

Fisher, Marten, and Wolverine
Direct Effects and Indirect Effects
Level of Habitat Connectivity

Alternative 5 overall affects less area than Alternative 2, but the Beaver project area contained similar amount of treatment as alterative 2. Therefore, the watersheds and the associated level of connectivity is the same as Alternative 2.

Change in Fisher Home Range

The direct and indirect effects of Alternative 5 resulted in the same effects as described in Alternative 2 for this analysis area.

Cumulative Effects
Level of Habitat Connectivity

The direct, indirect, and cumulative effects resulted in the same level of connectivity as presented in Alternative 2.

Change in Fisher Home Range

Just as in Alternative 1, none of the cumulative actions considered in the fire area (private land salvage and timber harvest plans) reduce the habitat enough move any watersheds from meeting the home range potential criteria to not meeting the criteria.

Pallid Bat, Townsend's Big-eared Bat, and Fringed myotis
Risk of Disturbance

The effects are the same as for Alternative 2.

Cumulative Effects
Risk of Disturbance

The cumulative effects are the same as for Alternative 2.

Willow Flycatcher
Direct Effects and Indirect Effects
Level of Habitat Alteration

The effects to willow flycatcher are the same as for alterative 2. The additional prescribed fire in this alternative in the Beaver fire area increases the percent of habitat disturbed in Doggett Creek and Soda Creek by less than 2 percent; this is not enough to increase the level of habitat alternation. The two watersheds remain in the low habitat alteration category.

Cumulative Effects
Level of Habitat Alteration

The cumulative effects to willow flycatcher are the same as for alterative 2.

Siskiyou Mountain Salamander
Direct Effects and Indirect Effects
Risk of Habitat Disturbance

The Beaver fire area is outside of the Siskiyou Mountain Salamander's range and, therefore, there are no direct or indirect effects on species or habitat from this alternative.

Cumulative Effects
Risk of Habitat Disturbance

There are no direct or indirect effects to Siskiyou Mountain Salamander as a result of the treatments in the Beaver fire area so there are no cumulative effects.

Tehama Chaparral Snail
Direct Effects and Indirect Effects
Likelihood of Dispersal

The effects to the Tehama Chaparral Snail are the same as for Alternative 2.

Cumulative Effects
Likelihood of Dispersal

The cumulative effects to the Tehama Chaparral Snail are the same as for Alternative 2.

Western Bumble Bee
Direct Effects and Indirect Effects
Level of Habitat Disturbance

The effects are the same as for Alternative 2.

Cumulative Effects
Level of Habitat Disturbance

The cumulative effects are the same as for Alternative 2.

Management Indicator Species
Snag Species Association
Direct Effects and Indirect Effects
Changes in Snag Habitat Abundance

The percent of snag-associated species habitat affected by Alternative 5 varies between individual species but about 8 percent of snag-associated species habitat will be affected by roadside hazard and salvage treatments. The other treatments in this alternative are likely to have minor effects on snag-associated species habitat. With implementation of project design features, salvage treatment units will not provide five snags on every acre but the project will meet the Forest Plan standard of five snags per acre averaged over 100 acres. Therefore, Alternative 5 is likely to provide a sufficient number of snags of varying decay classes to provide a habitat level of “good” snag-associated habitat.

Cumulative Effects
Changes in Snag Habitat Abundance

All of the removal will occur on private lands where snag retention is likely to be incidental. The actions considered for cumulative effects are assumed to downgrade snag habitat but not remove it because of the requirements to meet the Forest Plan standards for snag retention. The cumulative effects of Alternative 5 are 1,875 acres of snag habitat will be affected by the project; 2,786 acres will be affected by actions considered for cumulative effects. This is a total of 4,661 acres affected..

Hardwood Species Association
Direct Effects and Indirect Effects
Changes in Hardwood Habitat Abundance

Alternative 5 will affect 158 acres of hardwood habitat. This is about 4 percent of the hardwood habitat in the project area. Estimates of effects are likely overestimated because roadside hazard treatments are likely to retain most of the hardwoods and the hardwoods in the salvage units may be damaged but are likely to remain in the units after treatment. The treatments are focused on conifer removal and maintaining hardwoods were possible but they may be damaged during implementation.

Cumulative Effects
Changes in Hardwood Habitat Abundance

The cumulative effects of Alternative 5 are 158 acres of hardwood habitat will be affected by the project; 327 acres will be affected by actions considered for cumulative effects. This is a total of 485 acres affected.

Survey and Manage
Direct Effects and Indirect Effects
Habitat Protection

The effects are the same as for Alternative 2.

Cumulative Effects

The cumulative effects are the same as for Alternative 2.

Migratory Birds
Direct Effects and Indirect Effects

This is the same as described in Alternative 2.

Cumulative Effects

This is the same as described in Alternative 2.

Big Game
Direct Effects and Indirect Effects

The effects are the same as for Alternative 2.

Cumulative Effects

The effects are the same as for Alternative 2.

Project Area B: Happy Camp Complex

Wildlife Biological Evaluation
Northern Spotted Owl
Direct Effects and Indirect Effects
Risk to Reproduction

There are two, eleven, thirty-nine, and five activity centers with a very low, low, moderate, and high risk to reproduction respectively. Three activity centers (0239, 1214, and 4099) increased in risk level from low to moderate level and one activity center (9992) went from moderate to high level of risk. However, compared to Alternative 2, Alternative 5 has four fewer activity centers going from low risk to moderate risk and one fewer activity center going from moderate to high risk.

Changes to Critical Habitat

The change to critical habitat in the analysis area is 505 acres of nesting/roosting and foraging being downgraded or removed. The net number of dispersal habitat acres increased to 580 acres while the fire affected critical habitat was reduced by 1,056 acres.

Cumulative Effects
Risk to Reproduction

The direct and indirect effects of this alternative plus cumulative effects resulting from other actions within the analysis area will not change the risk level for any of the activity centers.

Changes to Critical Habitat

The direct and indirect effects of this alternative plus cumulative effects resulting from other actions within the analysis area will result in 731 acres of nesting/roosting and foraging habitat being downgraded or removed and a net increase of 806 acres of dispersal habitat. However, the fire affected critical habitat didn't change from the acres presented in the direct and indirect effects.

Bald Eagle

Direct Effects and Indirect Effects

Level of Disturbance to Nest Sites

The level of disturbance to the Fryingpan, Muck-a-Muck and Caroline Creek nest sites are mitigated by a limited operating period and will be low.

Risk to Future Potential Nest Trees

The risk to future potential nest trees is low for Fryingpan, Muck-a-Muck and Caroline Creek nest sites.

Cumulative Effects

Level of Disturbance to Nest Sites

The cumulative effects are the same as for Alternative 2.

Risk to Future Potential Nest Trees

The cumulative effects are the same as for Alternative 2.

Northern Goshawk

Direct Effects and Indirect Effects

Level of Disturbance to Nest Sites

The effects are the same as Alternative 2.

Risk to Reproduction

The effects are the same as Alternative 2.

Cumulative Effects

Level of Disturbance to Nest Sites

The effects are the same as Alternative 2.

Risk to Reproduction

The effects are the same as Alternative 2.

Fisher, Marten, and Wolverine

Direct Effects and Indirect Effects

Level of Habitat Connectivity

There are twenty, twelve, and four watersheds with moderate, low and very low connectivity respectively. Alternative 5 has less salvage harvest in the Happy Camp project area when compared to Alternative 2; consequently, this alternative has 7 fewer moderate level connectivity watersheds being reduced to low or very low habitat connectivity.

Change in Fisher Home Range

The direct and indirect effects of Alternative 5 resulted in the same effects as described in Alternative 2 for this analysis area.

Cumulative Effects

Level of Habitat Connectivity

The direct, indirect, and cumulative effects from private land Timber Harvest Plans resulted in reduced connectivity for one watershed (Big Ferry – Swanson).

Change in Fisher Home Range

The cumulative effects are the same as for Alternative 2.

Pallid Bat, Townsend's Big-eared Bat, and Fringed myotis
Risk of Disturbance

The effects are the same as for Alternative 2.

Cumulative Effects
Risk of Disturbance

The cumulative effects are the same as for Alternative 2.

Willow Flycatcher
Direct Effects and Indirect Effects
Level of Habitat Alteration

The effects to willow flycatcher are the same as for alterative 2.

Cumulative Effects
Level of Habitat Alteration

The cumulative effects to willow flycatcher are the same as for alterative 2.

Siskiyou Mountain Salamander
Direct Effects and Indirect Effects
Risk of Habitat Disturbance

There are twelve known Siskiyou Mountains Salamander sites in the project area that are in treatment units with the potential for ground disturbance. There are two fewer known sites in site preparation units with mechanical preparation proposed than in Alternative 2. However, the same project design feature used to mitigate effects to known sites is included in this alternative so the effects to the twelve sites are the same as for Alternative 2; the risk of habitat disturbance of known sites low.

Cumulative Effects
Risk of Habitat Disturbance

Adding the direct and indirect effects of this alternative to the effects of actions on private land that may affect talus habitat will result in four known sites potentially being cumulatively affected. The level of risk of disturbing a known site is cumulatively low and the cumulative effects may be overestimated if mitigations to reduce effects are used on private land projects.

Tehama Chaparral Snail
Direct Effects and Indirect Effects
Likelihood of Dispersal

The effects to the Tehama Chaparral Snail are the same as for Alternative 2.

Cumulative Effects
Likelihood of Dispersal

The cumulative effects to the Tehama Chaparral Snail are the same as for Alternative 2.

Western Bumble Bee
Direct Effects and Indirect Effects
Level of Habitat Disturbance

There are eighteen watersheds with potential Bumble Bee habitat that will have a low level of disturbance as a result of this alternative. Lower East Fork Elk, Middle Creek, Rancheria, Tom Martin and Upper Grider will have moderate levels of disturbance. China, Cliff Valley and Tompkins Creeks will have a high level of disturbance as a result of this alternative.

Cumulative Effects
Level of Habitat Disturbance

None of the levels of disturbance change as a result of the actions considered for cumulative effects in the fire area so there are no cumulative effects of this alternative.

Management Indicator Species
Direct Effects and Indirect Effects
Changes in Snag Habitat Abundance

The percent of snag-associated species habitat affected by Alternative 4 varies between individual species but about 13 percent of snag-associated species habitat will be affected by roadside hazard and salvage treatments. The other treatments in this alternative are likely to have minor effects on snag-associated species habitat. With implementation of project design features, salvage treatment units will not provide five snags on every acre but the project will meet the Forest Plan standard of five snags per acre averaged over 100 acres. Therefore, Alternative 4 is likely to provide a sufficient number of snags of varying decay classes to provide a habitat level of "good" snag-associated habitat.

Cumulative Effects
Changes in Snag Habitat Abundance

All of the removal will occur on private lands where snag retention is likely to be incidental. The actions considered for cumulative effects are assumed to downgrade snag habitat but not remove it because of the requirements to meet the Forest Plan standards for snag retention. The cumulative effects of Alternative 4 are 18,732 acres of snag habitat will be affected by the project; 217 acres will be affected by actions considered for cumulative effects. This is a total of 18,949 acres affected.

Hardwood Species Association
Direct Effects and Indirect Effects
Changes in Hardwood Habitat Abundance

Alternative 4 will affect 442 acres of hardwood habitat. This is about 11 percent of the hardwood habitat in the project area. Estimates of effects are likely overestimated because roadside hazard treatments are likely to retain most of the hardwoods and the hardwoods in the salvage units may be damaged but are likely to remain in the units after treatment. The treatments are focused on conifer removal and maintaining hardwoods were possible but they may be damaged during implementation.

Cumulative Effects
Changes in Hardwood Habitat Abundance

The cumulative effects of Alternative 4 are 442 acres of hardwood habitat will be affected by the project; 10 acres will be affected by actions considered for cumulative effects. This is a total of 452 acres affected.

Survey and Manage
Direct Effects and Indirect Effects
Habitat Protection

The effects are the same as for Alternative 2.

Cumulative Effects

The cumulative effects are the same as for Alternative 2.

Migratory Birds
Direct Effects and Indirect Effects

This is the same as described in Alternative 2.

Cumulative Effects

This is the same as described in Alternative 2.

Big Game
Direct Effects and Indirect Effects

The effects are the same as for Alternative 2.

Cumulative Effects

The effects are the same as for Alternative 2.

Project Area C: Whites Fire

Wildlife Biological Evaluation
Northern Spotted Owl
Direct Effects and Indirect Effects
Risk to Reproduction

There will be ten and five activity centers with low and moderate risk to reproduction respectively. Like Alternative 2, Alternative 5 will result in an increase in risk to reproduction for one activity center (1030) which is estimated to go from low risk to moderate risk. However, unlike Alternative 2, this is the only activity center that has a change in the level of risk to reproduction.

Changes to Critical Habitat

The change to critical habitat in the analysis area is 320 acres of nesting/roosting and foraging being downgraded or removed. The net number of dispersal habitat acres increased to 320 acres while the fire affected critical habitat was reduced by 743 acres.

Cumulative Effects
Risk to Reproduction

The direct and indirect effects of this alternative and the effects resulting from other projects are not expected to cumulatively increase the risk to reproduction for any of the activity centers in the Whites analysis area.

Changes to Critical Habitat

The direct and indirect effects of this alternative plus cumulative effects resulting from other actions within the analysis area will result in 543 acres of nesting/roosting and foraging habitat being downgraded or removed and a net increase of 543 acres of dispersal habitat. However, the fire affected critical habitat didn't change from the acres presented in the direct and indirect effects.

Bald Eagle
Direct Effects/Indirect and Cumulative Effects

There are no known eagle nest sites in the Whites project area so there are no effects to bald eagles from this alternative.

Northern Goshawk

Direct Effects and Indirect Effects

Level of Disturbance to Nest Sites

The effects are the same as Alternative 2.

Risk to Reproduction

The effects are the same as Alternative 2.

Cumulative Effects

Level of Disturbance to Nest Sites

The effects are the same as Alternative 2.

Risk to Reproduction

The effects are the same as Alternative 2.

Fisher, Marten, and Wolverine

Direct Effects and Indirect Effects

Level of Habitat Connectivity

There will be seven, six and five watersheds with moderate, low and very low connectivity respectively. Alternative 5 has one less watershed that had a reduced level of connectivity when compared to Alternative 2.

Change in Fisher Home Range

The direct and indirect effects of Alternative 3 resulted in the same effects as described in Alternative 2 for this analysis area.

Cumulative Effects

Level of Habitat Connectivity

The cumulative effects are the same as Alternative 2.

Change in Fisher Home Range

The cumulative effects are the same as for Alternative 2.

Pallid Bat, Townsend's Big-eared Bat, and Fringed myotis

Direct Effects and Indirect Effects

Risk of Disturbance

There are three, two and eight potential hibernacula with a high, moderate and low risk of disturbance respectively. Compared to Alternative 2, this alternative would result in one potential hibernacula moving from a moderate to a low risk.

Cumulative Effects

Risk of Disturbance

The private lands salvage and other timber harvest plans move many of the potential hibernacula from a moderate risk to a high risk. The majority of this effect is because of the uncertainty of mitigations occurring on private land. Therefore, the cumulative effects may be an overestimate, especially if private lands are implementing mitigation to minimize the negative effects on roost sites.

Willow Flycatcher

Direct Effects and Indirect Effects

Level of Habitat Alteration

The effects to willow flycatcher are the same as for alterative 2.

Cumulative Effects
Level of Habitat Alteration

The cumulative effects to willow flycatcher are the same as for alterative 2.

Siskiyou Mountain Salamander
Direct Effects and Indirect Effects
Risk of Habitat Disturbance

The Whites fire area is outside of the Siskiyou Mountain Salamander's range and, therefore, there will be no direct or indirect effects of this alternative on species or habitat.

Cumulative Effects
Risk of Habitat Disturbance

There are no direct or indirect effects to Siskiyou Mountain Salamander as a result of the treatments in the Whites fire area so there are no cumulative effects.

Tehama Chaparral Snail
Direct Effects and Indirect Effects
Likelihood of Dispersal

The effects to the Tehama Chaparral Snail are the same as for Alternative 2.

Cumulative Effects
Likelihood of Dispersal

The cumulative effects to the Tehama Chaparral Snail are the same as for Alternative 2.

Western Bumble Bee
Direct Effects and Indirect Effects
Level of Habitat Disturbance

The effects are the same as for Alternative 2.

Cumulative Effects
Level of Habitat Disturbance

The cumulative effects are the same as for Alternative 2.

Management Indicator Species
Snag Species Association
Direct Effects and Indirect Effects
Changes in Snag Habitat Abundance

The percent of snag-associated species habitat affected by Alternative 5 varies between individual species but about 9 percent of snag-associated species habitat will be affected by roadside hazard and salvage treatments. The other treatments in this alternative are likely to have minor effects on snag-associated species habitat. With implementation of project design features, salvage treatment units will not provide five snags on every acre but the project will meet the Forest Plan standard of five snags per acre averaged over 100 acres. Therefore, Alternative 5 is likely to provide a sufficient number of snags of varying decay classes to provide a habitat level of "good" snag-associated habitat.

Cumulative Effects
Changes in Snag Habitat Abundance

All of the removal will occur on private lands where snag retention is likely to be incidental. The actions considered for cumulative effects are assumed to downgrade snag habitat but not remove it because of the requirements to meet the Forest Plan standards

for snag retention. The cumulative effects of Alternative 5 are 4,236 acres of snag habitat will be affected by the project; 194 acres will be affected by actions considered for cumulative effects. This is a total of 4,430 acres affected.

Hardwood Species Association
Direct Effects and Indirect Effects
Changes in Hardwood Habitat Abundance

Alternative 5 will affect 23 acres of hardwood habitat. This is about 3 percent of the hardwood habitat in the project area. Estimates of effects are likely overestimated because roadside hazard treatments are likely to retain most of the hardwoods and the hardwoods in the salvage units may be damaged but are likely to remain in the units after treatment. The treatments are focused on conifer removal and maintaining hardwoods were possible but they may be damaged during implementation.

Cumulative Effects
Changes in Hardwood Habitat Abundance

The cumulative effects of Alternative 5 are 23 acres of hardwood habitat will be affected by the project; 4 acres will be affected by actions considered for cumulative effects. This is a total of 27 acres affected.

Survey and Manage
Direct Effects and Indirect Effects
Habitat Protection

The effects are the same as for Alternative 2.

Cumulative Effects

The cumulative effects are the same as for Alternative 2.

Migratory Birds
Direct Effects and Indirect Effects

This is the same as described in Alternative 2.

Cumulative Effects

This is the same as described in Alternative 2.

Big Game
Direct Effects and Indirect Effects

The effects are the same as for Alternative 2.

Cumulative Effects

The effects are the same as for Alternative 2.

Modified Alternative 2

Project Area A: Beaver Fire
Wildlife Biological Evaluation
Northern Spotted Owl
Direct Effects and Indirect Effects
Risk to Reproduction

The proposed activities in the Beaver project area for this alternative will result in the same distribution of activity centers in each risk level as Alternative 2, but the effects would be much less for one activity center located in Doggett Creek. Even though the

actual acres of affected habitat are not the same as Alternative 2, Alternative 2 Modified have much less salvage in the core of the Doggett Creek activity center which reduces the amount of disturbance and the amount of fire affected habitat being removed. However, the level of risk didn't change for any of the activity centers in the Beaver analysis area.

Changes to Critical Habitat

Modified Alternative 2 affects the same amount of Northern Spotted Owl critical habitat as in Alternative 2 in the Beaver project area. Modified Alternative 2 represents a reduced amount of treatment of modification of treatment prescription from Alternative 2. However, the changes to treatments reflected in modified Alternative 2 occurred outside of KLE6 or KLE7 critical habitat subunits (KLE6 and KLE7 are the only critical habitat subunits occurring in the Beaver analysis area). Therefore, the modified Alternative 2 treatment that occurred in the critical habitat in the Beaver analysis area resulted in the same number of acres of habitat being affected as in Alternative 2.

Cumulative Effects

Risk to Reproduction

The cumulative effects in the Beaver project area are extensive. The Beaver Fire burned many acres of Northern Spotted Owl habitat and the resulting salvage occurring on private land cover a large area. These cumulative effects are far reaching because of the size of the fire and the alternating land ownership (also known as checkerboard pattern ownership). This combination of land ownership and fire conditions created large scale salvage that resulted in islands of habitat. These islands present a challenge for Northern Spotted Owl to find sufficient resources given the low amount of habitat located in the islands on the Forest. However, private land management occurring in Beaver doesn't affect all 23 activity centers analyzed in this document; there are about 8 activity centers that contain large portions of possible salvage. Alternative 2 Modified has proposed treatment within these same 8 activity centers that are likely to receive salvage on private land thus the combination of treatment of this alternative plus private land salvage will further increase the amount of salvage and reduce the quality of habitat.

The cumulative effects resulted in two activity centers with an increased level of risk in the Beaver analysis area: 1) Doggett Creek (0283), and 2) Fishtrap Creek (4143). The Doggett Creek core is mostly located on Forest land but the home range is mostly located on private land that has been salvaged or is likely to be salvaged. The Doggett Creek activity center also had a male detected in the core from 2015 surveys (surveys are not complete at the time of writing this document). Consequently, Alternative 2 Modified has the salvage removed in the core of Doggett Creek activity center, but the cumulative effects still resulted in the activity center going from moderate risk to high risk. In addition, Fishtrap Creek activity center increased in risk from low to moderate. There are other activity centers that have many acres of habitat affected as result of the fire followed by salvage and the proposed activities of this alternative but these activity centers have a high risk and the additional effects are not reflected in the risk level since there is no level beyond high.

Changes to Critical Habitat

The Beaver project area contains small portion of Northern Spotted Owl critical habitat subunit KLE6 but the analysis area which is a larger area than the project area includes a small portion of KLE7, but this portion of KLE7 doesn't contain any proposed activities

in the Beaver portion of the project. In addition, critical habitat doesn't occur on private land thus activities occurring on private land are not counted in the critical habitat analysis. Therefore, cumulative effects of this alternative are about 87 acres of critical habitat and about 152 acres of fire affected critical habitat for the Beaver analysis area. The cumulative effects are the same number of acres presented in Alternative 2.

Bald Eagle

Direct Effects and Indirect Effects

Level of Disturbance to Nest Sites

The effect is the same as for Alternative 2.

Risk to Future Potential Nest Trees

The risk to future potential nest trees is the same as for Alternative 2, which is low.

Cumulative Effects

Level of Disturbance to Nest Sites

The cumulative effect on levels of disturbance is the same as for Alternative 2.

Risk to Future Potential Nest Trees

The cumulative effect on the risk to future potential nest trees is the same as for Alternative 2.

Northern Goshawk

Direct Effects and Indirect Effects

Level of Disturbance to Nest Sites

The effects are the same as for Alternative 2.

Risk to Reproduction

The effects are the same as for Alternative 2.

Cumulative Effects

Level of Disturbance to Nest Sites

The effects are the same as for Alternative 2.

Risk to Reproduction

The effects are the same as for Alternative 2.

Fisher, Marten, and Wolverine

Direct Effects and Indirect Effects

Level of Habitat Connectivity

Effects of modified Alternative 2 are the same as for Alternative 2.

Change in Fisher Home Range

The watersheds not meeting the home range potential criteria are the same as for Alternative 2.

Cumulative Effects

Level of Habitat Connectivity

There are six watersheds that move from a moderate or low connectivity to a very low connectivity when private land salvage is added to the effects of the alternative.

Change in Fisher Home Range

Just as in Alternative 1, none of the cumulative actions considered in the fire area (private land salvage and timber harvest plans) reduce the habitat enough move any watersheds from meeting the home range potential criteria to not meeting the criteria.

Pallid Bat, Townsend's Big-eared Bat, and Fringed myotis
Direct Effects and Indirect Effects
Risk of Disturbance

The risk of disturbance is the same as for Alternative 2.

Cumulative Effects
Risk of Disturbance

The cumulative risk of disturbance is the same as Alternative 2.

Willow Flycatcher
Direct Effects and Indirect Effects
Level of Habitat Alteration

The level of willow flycatcher habitat altered is the same as for Alternative 2.

Cumulative Effects
Level of Habitat Alteration

The cumulative level of willow flycatcher habitat altered is the same as for Alternative 2.

Siskiyou Mountain Salamander
Direct Effects and Indirect Effects
Risk of Habitat Disturbance

The Beaver fire area is outside of the Siskiyou Mountain Salamander's range and, therefore, there are no direct or indirect effects on the species from this alternative.

Cumulative Effects
Risk of Habitat Disturbance

There are no direct or indirect effects to Siskiyou Mountain Salamander as a result of the treatments in the Beaver fire area so there are no cumulative effects.

Tehama Chaparral Snail
Direct Effects and Indirect Effects
Likelihood of Dispersal

The effect to the Tehama Chaparral Snail is the same as for Alternative 2.

Cumulative Effects
Likelihood of Dispersal

The cumulative effect to the Tehama Chaparral Snail is the same as for Alternative 2.

Western Bumble Bee
Direct Effects and Indirect Effects
Level of Habitat Disturbance

The level of habitat disturbance as a result of the alternative is the same as for Alternative 2.

Cumulative Effects
Level of Habitat Disturbance

The cumulative level of habitat disturbance as a result of the alternative is the same as for Alternative 2.

Management Indicator Species

Direct Effects and Indirect Effects
Changes in Snag Habitat Abundance

The percent of snag-associated species habitat affected by modified Alternative 2 varies between individual species but about 8 percent of snag-associated species habitat will be affected by roadside hazard and salvage treatments. The other treatments in this alternative are likely to have minor effects on snag-associated species habitat. With implementation of project design features, salvage treatment units will not provide five snags on every acre but the project will meet the Forest Plan standard of five snags per acre averaged over 100 acres. Therefore, modified Alternative 2 is likely to provide a sufficient number of snags of varying decay classes to provide a habitat level of "good" snag-associated habitat.

Cumulative Effects
Changes in Snag Habitat Abundance

All of the removal will occur on private lands where snag retention is likely to be incidental. The actions considered for cumulative effects are assumed to downgrade snag habitat but not remove it because of the requirements to meet the Forest Plan standards for snag retention. The cumulative effects of modified Alternative 2 are 1875 acres of snag habitat will be affected by the project; 2786 acres will be affected by actions considered for cumulative effects. This is a total of 4661 acres affected.

Hardwood Species Association
Direct Effects and Indirect Effects
Changes in Hardwood Habitat Abundance

Modified Alternative 2 will affect 158 acres of hardwood habitat. This is about 4 percent of the hardwood habitat in the project area. Estimates of effects are likely overestimated because roadside hazard treatments are likely to retain most of the hardwoods and the hardwoods in the salvage units may be damaged but are likely to remain in the units after treatment. The treatments are focused on conifer removal and maintaining hardwoods were possible but they may be damaged during implementation.

Cumulative Effects
Changes in Hardwood Habitat Abundance

The cumulative effects of modified Alternative 2 are 158 acres of hardwood habitat will be affected by the project; 327 acres will be affected by actions considered for cumulative effects. This is a total of 485 acres affected.

Survey and Manage
Direct Effects and Indirect Effects
Habitat Protection

The effects are the same as for Alternative 2.

Cumulative Effects

The cumulative effects are the same as for Alternative 2.

Migratory Birds
Direct Effects and Indirect Effects

This is the same as described in Alternative 2.

Cumulative Effects

This is the same as described in Alternative 2.

Big Game

Direct Effects and Indirect Effects

The effects are the same as for Alternative 2.

Cumulative Effects

The effects are the same as for Alternative 2.

Project Area B: Happy Camp Complex

Wildlife Biological Evaluation

Northern Spotted Owl

Direct Effects and Indirect Effects

Risk to Reproduction

Alternative 2 Modified reduced the amount of salvage scattered over most of the Happy Camp project area. There are three Northern Spotted Owl activity centers located in the Walker, Grider, and Louie drainages that were mostly affected by moderate and high severity fire in the cores, but the home range contains habitat that may be more capable of supporting Northern Spotted Owl. Even though we don't know how Northern Spotted Owl will respond to the extensive fire effects in these three activity center cores, it is possible that these Northern Spotted Owl may move to an area in their home range that has better habitat. Given this possibility, we identified areas that provide more contiguous and higher quality habitat within the home range and dropped salvage in those areas. In addition, several small salvage units were removed from this alternative because these units occurred in Northern Spotted Owl cores that were identified as having "moderate level of habitat fitness" which is discussed in the Biological Assessment (the salvage occurring in the core of the activity center discovered during 2015 surveys is an exception to the design of this alternative because this activity center wasn't discovered until after this alternative design was completed; however, this newly discovered activity center was included in the Alternative 3 Modified design). However, despite the reduction of salvage in the core and home range in several activity centers compared to Alternative 2, the level of risk to reproduction is the same

Changes to Critical Habitat

The Happy Camp analysis area contains portions of KLE6, KLE7, and KLW8 critical habitat subunits, but only KLE7 and KLW8 contain treatment. The change in critical habitat in this alternative is similar to Alternative 2. Alternative 2 Modified effects about 135 fewer acres of foraging and 189 fewer acres of fire affected critical habitat fewer than Alternative 2. Most of the foraging habitat affected by this alternative occurs in KLW8, but most of the effects to fire affected critical habitat occurs in KLE7.

Cumulative Effects

Risk to Reproduction

The cumulative effects of the proposed activities in this alternative plus other projects within the analysis area will result in two activity centers with increased levels of risk to reproduction. activity center 1130 increased from "low" to "moderate" level of risk while activity center 4133 increased from "moderate" to "high".

Changes to Critical Habitat

The cumulative effects of modified Alternative 3 resulted in fewer acres (about 135 fewer acres of critical habitat and 189 fewer acres of fire affected critical habitat) of critical habitat being affected when compared to Alternative 2.

Bald Eagle

Direct Effects and Indirect Effects

Level of Disturbance to Nest Sites

The effects are the same as for Alternative 2.

Risk to Future Potential Nest Trees

The risk to future potential nest trees is the same as for Alternative 2.

Cumulative Effects

Level of Disturbance to Nest Sites

The cumulative effect on levels of disturbance is the same as for Alternative 2.

Risk to Future Potential Nest Trees

The cumulative effect on the risk to future potential nest trees is the same as for Alternative 2.

Northern Goshawk

Direct Effects and Indirect Effects

Level of Disturbance to Nest Sites

The effects are the same as for Alternative 2.

Risk to Reproduction

The effects are the same as for Alternative 2.

Cumulative Effects

Level of Disturbance to Nest Sites

The effects are the same as for Alternative 2.

Risk to Reproduction

The effects are the same as for Alternative 2.

Fisher, Marten, and Wolverine

Direct Effects and Indirect Effects

Level of Habitat Connectivity

There will be fourteen, seventeen and five watersheds respectively with moderate, low and very low connectivity. There is one more watershed with moderate connectivity, therefore one less watershed with a low connectivity, compared to Alternative 2.

Change in Fisher Home Range

The effects are the same as for Alternative 2.

Cumulative Effects

Level of Habitat Connectivity

The direct, indirect, and cumulative effects resulted in reducing the habitat connectivity of one watershed (Big Ferry – Swanson) from “low” to “very low” habitat connectivity. Private land Timber Harvest Plans are the reason for the downgrade in connectivity.

Change in Fisher Home Range

The cumulative effects are the same as for Alternative 2.

Pallid Bat, Townsend's Big-eared Bat, and Fringed myotis
Direct Effects and Indirect Effects
Risk of Disturbance

The risk of disturbance is the same as for Alternative 2.

Cumulative Effects
Risk of Disturbance

The cumulative risk of disturbance is the same as Alternative 2.

Willow Flycatcher
Direct Effects and Indirect Effects
Level of Habitat Alteration

The level of willow flycatcher habitat altered is the same as for Alternative 2.

Cumulative Effects
Level of Habitat Alteration

The cumulative level of willow flycatcher habitat altered is the same as for Alternative 2.

Siskiyou Mountain Salamander
Direct Effects and Indirect Effects
Risk of Habitat Disturbance

The effects of the alternative are the same as for Alternative 2.

Cumulative Effects
Risk of Habitat Disturbance

The cumulative effects of the alternative are the same as for Alternative 2.

Tehama Chaparral Snail
Direct Effects and Indirect Effects
Likelihood of Dispersal

The effect to the Tehama Chaparral Snail is the same as for Alternative 2.

Cumulative Effects
Likelihood of Dispersal

The cumulative effect to the Tehama Chaparral Snail is the same as for Alternative 2.

Western Bumble Bee
Direct Effects and Indirect Effects
Level of Habitat Disturbance

The level of habitat disturbance as a result of the alternative is the same as for Alternative 2.

Cumulative Effects
Level of Habitat Disturbance

The cumulative level of habitat disturbance as a result of the alternative is the same as for Alternative 2.

Management Indicator Species
Snag Species Association
Direct Effects and Indirect Effects
Changes in Snag Habitat Abundance

The percent of snag-associated species habitat affected by modified Alternative 2 varies between individual species but about 13 percent of snag-associated species habitat will be

affected by roadside hazard and salvage treatments. The other treatments in this alternative are likely to have minor effects on snag-associated species habitat. With implementation of project design features, salvage treatment units will not provide five snags on every acre but the project will meet the Forest Plan standard of five snags per acre averaged over 100 acres. Therefore, modified Alternative 2 is likely to provide a sufficient number of snags of varying decay classes to provide a habitat level of "good" snag-associated habitat.

Cumulative Effects

Changes in Snag Habitat Abundance

All of the removal will occur on private lands where snag retention is likely to be incidental. The actions considered for cumulative effects are assumed to downgrade snag habitat but not remove it because of the requirements to meet the Forest Plan standards for snag retention. The cumulative effects of modified Alternative 2 are 18,732 acres of snag habitat will be affected by the project; 217 acres will be affected by actions considered for cumulative effects. This is a total of 18,949 acres affected.

Hardwood Species Association

Direct Effects and Indirect Effects

Changes in Hardwood Habitat Abundance

Modified Alternative 2 will affect 442 acres of hardwood habitat. This is about 11 percent of the hardwood habitat in the project area. Estimates of effects are likely overestimated because roadside hazard treatments are likely to retain most of the hardwoods and the hardwoods in the salvage units may be damaged but are likely to remain in the units after treatment. The treatments are focused on conifer removal and maintaining hardwoods were possible but they may be damaged during implementation.

Cumulative Effects

Changes in Hardwood Habitat Abundance

The cumulative effects of modified Alternative 2 are 442 acres of hardwood habitat will be affected by the project; 10 acres will be affected by actions considered for cumulative effects. This is a total of 452 acres affected.

Survey and Manage

Direct Effects and Indirect Effects

Habitat Protection

The effects are the same as for Alternative 2.

Cumulative Effects

The cumulative effects are the same as for Alternative 2.

Migratory Birds

Direct Effects and Indirect Effects

This is the same as described in Alternative 2.

Cumulative Effects

This is the same as described in Alternative 2.

Big Game

Direct Effects and Indirect Effects

The effects are the same as for Alternative 2.

Cumulative Effects

The effects are the same as for Alternative 2.

Project Area C: Whites Fire

Wildlife Biological Evaluation

Northern Spotted Owl

Direct Effects and Indirect Effects

Risk to Reproduction

Modified Alternative 2 proposed activities have similar effects to the activity centers in the Whites project area. Despite the less salvage occurring in this alternative, the level of risk to reproduction is the same as Alternative 2.

Changes to Critical Habitat

The effects are the same as described in Alternative 2.

Cumulative Effects

Risk to Reproduction

The cumulative effects for this alternative resulted in the same level of risk for the activity centers within the Whites analysis areas as described in Alternative 2.

Changes to Critical Habitat

The cumulative effects are the same as for Alternative 2.

Bald Eagle

Direct Effects/Indirect and Cumulative Effects

There are no known eagle nest sites in the Whites project area so there are no effects to bald eagles from this alternative.

Northern Goshawk

Direct Effects and Indirect Effects

Level of Disturbance to Nest Sites

The effects are the same as for Alternative 2.

Risk to Reproduction

The effects are the same as for Alternative 2.

Cumulative Effects

Level of Disturbance to Nest Sites

The effects are the same as for Alternative 2.

Risk to Reproduction

The effects are the same as for Alternative 2.

Fisher, Marten, and Wolverine

Direct Effects and Indirect Effects

Level of Habitat Connectivity

The effects to connectivity are the same as for Alternative 2.

Change in Fisher Home Range

The effects of this alternative are the same as Alternative 2.

Cumulative Effects

Level of Habitat Connectivity

The cumulative effects are the same as for Alternative 2.

Change in Fisher Home Range

The cumulative effects are the same as in Alternative 2.

Pallid Bat, Townsend's Big-eared Bat, and Fringed myotis
Direct Effects and Indirect Effects
Risk of Disturbance

The risk of disturbance is the same as for Alternative 2.

Cumulative Effects
Risk of Disturbance

The cumulative risk of disturbance is the same as Alternative 2.

Willow Flycatcher
Direct Effects and Indirect Effects
Level of Habitat Alteration

The level of willow flycatcher habitat altered is the same as for Alternative 2.

Cumulative Effects
Level of Habitat Alteration

The cumulative level of willow flycatcher habitat altered is the same as for Alternative 2.

Siskiyou Mountain Salamander
Direct Effects and Indirect Effects
Risk of Habitat Disturbance

The Whites fire area is outside of the Siskiyou Mountain Salamander's range; therefore, there are no direct or indirect effects of this alternative on the species.

Cumulative Effects
Risk of Habitat Disturbance

There are no direct or indirect effects to Siskiyou Mountain Salamander as a result of the treatments in the Whites fire area so there are no cumulative effects.

Tehama Chaparral Snail
Direct Effects and Indirect Effects
Likelihood of Dispersal

The effect to the Tehama Chaparral Snail is the same as for Alternative 2.

Cumulative Effects
Likelihood of Dispersal

The cumulative effect to the Tehama Chaparral Snail is the same as for Alternative 2.

Western Bumble Bee
Direct Effects and Indirect Effects
Level of Habitat Disturbance

The level of habitat disturbance as a result of the alternative is the same as for Alternative 2.

Cumulative Effects
Level of Habitat Disturbance

The cumulative level of habitat disturbance as a result of the alternative is the same as for Alternative 2.

Management Indicator Species
Snag Species Association
Direct Effects and Indirect Effects
Changes in Snag Habitat Abundance

The percent of snag-associated species habitat affected by modified Alternative 2 varies between individual species but about 9 percent of snag-associated species habitat will be affected by roadside hazard and salvage treatments. The other treatments in this alternative are likely to have minor effects on snag-associated species habitat. With implementation of project design features, salvage treatment units will not provide five snags on every acre but the project will meet the Forest Plan standard of five snags per acre averaged over 100 acres. Therefore, modified Alternative 2 is likely to provide a sufficient number of snags of varying decay classes to provide a habitat level of "good" snag-associated habitat.

Cumulative Effects
Changes in Snag Habitat Abundance

All of the removal will occur on private lands where snag retention is likely to be incidental. The actions considered for cumulative effects are assumed to downgrade snag habitat but not remove it because of the requirements to meet the Forest Plan standards for snag retention. The cumulative effects of modified Alternative 2 are 4,236 acres of snag habitat will be affected by the project; 217 acres will be affected by actions considered for cumulative effects. This is a total of 4,453 acres affected.

Hardwood Species Association
Direct Effects and Indirect Effects
Changes in Hardwood Habitat Abundance

Modified Alternative 2 will affect 23 acres of hardwood habitat. This is about 3 percent of the hardwood habitat in the project area. Estimates of effects are likely overestimated because roadside hazard treatments are likely to retain most of the hardwoods and the hardwoods in the salvage units may be damaged but are likely to remain in the units after treatment. The treatments are focused on conifer removal and maintaining hardwoods were possible but they may be damaged during implementation.

Cumulative Effects
Changes in Hardwood Habitat Abundance

The cumulative effects of modified Alternative 2 are 23 acres of hardwood habitat will be affected by the project; 4 acres will be affected by actions considered for cumulative effects. This is a total of 27 acres affected.

Survey and Manage
Direct Effects and Indirect Effects
Habitat Protection

The effects are the same as for Alternative 2.

Cumulative Effects

The cumulative effects are the same as for Alternative 2.

Migratory Bird
Direct Effects and Indirect Effects

This is the same as described in Alternative 2.

Cumulative Effects

This is the same as described in Alternative 2.

Big Game
Direct Effects and Indirect Effects

The effects are the same as for Alternative 2.

Cumulative Effects

The effects are the same as for Alternative 2.

Modified Alternative 3

Project Area A: Beaver Fire

Wildlife Biological Evaluation
Northern Spotted Owl
Direct Effects and Indirect Effects
Risk to Reproduction

Modified Alternative 3 further reduced the effects to Northern Spotted Owl than those reductions presented in Alternative 3. When compared to Alternative 2, modified Alternative 3 resulted in the same level of risk for each activity center as Alternative 2 despite the removal of salvage from the Beaver project area.

Changes to Critical Habitat

Compared to Alternative 2, about 103 more acres of nesting/roosting and foraging critical habitat and 4 more acres of fire affected critical habitat will be affected in modified Alternative 3. However, modified alternative will affect fewer acres of dispersal habitat. Although salvage was removed from the Beaver project area for this alternative, several fuel treatments were added that resulted in a net increase in the number of critical habitat acres affected.

Cumulative Effects
Risk to Reproduction

The cumulative effects resulted in one less activity center going from “moderate” to “high” level of risk when compared to Alternative 2. However, Fishtrap Creek did change in risk level from “low” to ‘moderate” as a result of the cumulative effects. All the other activity centers in the Beaver analysis area didn’t change in risk level as a result of cumulative effects.

Changes to Critical Habitat

Compared to Alternative 2 cumulative effects, about 103 more acres of nesting/roosting and foraging critical habitat and 4 more acres of fire affected critical habitat will be affected in the cumulative effects for modified Alternative 3.

Bald Eagle
Direct Effects and Indirect Effects
Level of Disturbance to Nest Sites

The effects are the same as for Alternative 2.

Risk to Future Potential Nest Trees

The effects are the same as for Alternative 2.

Cumulative Effects

Level of Disturbance to Nest Sites

The effects are the same as for Alternative 2.

Risk to Future Potential Nest Trees

The effects are the same as for Alternative 2.

Northern Goshawk
Direct Effects and Indirect Effects
Level of Disturbance to Nest Sites

The effects are the same as for Alternative 2.

Risk to Reproduction

The effects are the same as for Alternative 2.

Cumulative Effects
Level of Disturbance to Nest Sites

The effects are the same as for Alternative 2.

Risk to Reproduction

The effects are the same as for Alternative 2.

Fisher, Marten, and Wolverine
Direct Effects and Indirect Effects
Level of Habitat Connectivity

The effects are the same as for Alternative 2.

Change in Fisher Home Range

The watersheds not meeting the home range potential criteria are the same as for Alternative 1.

Cumulative Effects
Level of Habitat Connectivity

The cumulative effects are the same as for Alternative 2.

Change in Fisher Home Range

Just as in Alternative 1, none of the cumulative actions considered in the fire area (private land salvage and timber harvest plans) reduce the habitat enough move any watersheds from meeting the home range potential criteria to not meeting the criteria.

Pallid Bat, Townsend's Big-eared Bat, and Fringed myotis
Direct Effects and Indirect Effects
Risk of Disturbance

The effects are the same as for Alternative 2.

Cumulative Effects
Risk of Disturbance

The effects are the same as for Alternative 2.

Willow Flycatcher
Direct Effects and Indirect Effects
Level of Habitat Alteration

The effects are the same as for Alternative 2.

Cumulative Effects
Level of Habitat Alteration

The effects are the same as for Alternative 2.

Siskiyou Mountain Salamander
Direct Effects and Indirect Effects
Risk of Habitat Disturbance

The effects are the same as for Alternative 2.

Cumulative Effects
Risk of Habitat Disturbance

The effects are the same as for Alternative 2.

Tehama Chaparral Snail
Direct Effects and Indirect Effects
Likelihood of Dispersal

The effects are the same as for Alternative 2.

Cumulative Effects
Likelihood of Dispersal

The effects are the same as for Alternative 2.

Western Bumble Bee
Direct Effects and Indirect Effects
Level of Habitat Disturbance

The effects are the same as for Alternative 2.

Cumulative Effects
Level of Habitat Disturbance

The effects are the same as for Alternative 2.

Management Indicator Species
Snag Species Association
Direct Effects and Indirect Effects
Changes in Snag Habitat Abundance

The percent of snag-associated species habitat affected by modified Alternative 3 varies between individual species but about 5 percent of snag-associated species habitat will be affected by roadside hazard and salvage treatments. The other treatments in this alternative are likely to have minor effects on snag-associated species habitat. With implementation of project design features, salvage treatment units will not provide five snags on every acre but the project will meet the Forest Plan standard of five snags per acre averaged over 100 acres. Therefore, Alternative 2 is likely to provide a sufficient number of snags of varying decay classes to provide a habitat level of “good” snag-associated habitat.

Cumulative Effects
Changes in Snag Habitat Abundance

All of the removal will occur on private lands where snag retention is likely to be incidental. The actions considered for cumulative effects are assumed to downgrade snag habitat but not remove it because of the requirements to meet the Forest Plan standards for snag retention. The cumulative effects of modified Alternative 3 are 1,182 acres of

snag habitat will be affected by the project; 2,786 acres will be affected by actions considered for cumulative effects. This is a total of 3,968 acres affected.

Hardwood Species Association
Direct Effects and Indirect Effects
Changes in Hardwood Habitat Abundance

Modified Alternative 3 will affect 106 acres of hardwood habitat. This is about 2 percent of the hardwood habitat in the project area. Estimates of effects are likely overestimated because roadside hazard treatments are likely to retain most of the hardwoods and the hardwoods in the salvage units may be damaged but are likely to remain in the units after treatment. The treatments are focused on conifer removal and maintaining hardwoods were possible but they may be damaged during implementation.

Cumulative Effects
Changes in Hardwood Habitat Abundance

The cumulative effects of modified Alternative 3 are 106 acres of hardwood habitat will be affected by the project; 327 acres will be affected by actions considered for cumulative effects. This is a total of 433 acres affected.

Survey and Manage
Direct Effects and Indirect Effects
Habitat Protection

This is the same as described in Alternative 2.

Cumulative Effects

This is the same as described in Alternative 2.

Migratory Bird
Direct Effects and Indirect Effects

This is the same as described in Alternative 2.

Cumulative Effects

This is the same as described in Alternative 2.

Big Game
Direct Effects and Indirect Effects

The effects are the same as for Alternative 2.

Cumulative Effects

The effects are the same as for Alternative 2.

Project Area B: Happy Camp Complex

Wildlife Biological Evaluation
Northern Spotted Owl
Direct Effects and Indirect Effects
Risk to Reproduction

There are two, nine, forty-one and five activity centers with very low, low, moderate and high risk to reproduction respectively. The reduction of treatment in modified Alternative 3 did reduce the number of activity centers changing in the level of risk. Compared to Alternative 2, modified Alternative 3 had 2 fewer activity centers changing in the risk level from “low” to “moderate” and one less activity center changing in risk level from “moderate” to “high”.

Changes to Critical Habitat

Compared to Alternative 2, about 68 fewer acres of nesting/roosting and foraging critical habitat and 721 fewer acres of fire affected critical habitat will be affected in modified Alternative 3.

Cumulative Effects
Risk to Reproduction

The cumulative effects didn't result in any of the activity centers changing in the level of risk within the Happy Camp analysis area.

Changes to Critical Habitat

Compared to Alternative 2 cumulative effects, about 68 fewer acres of nesting/roosting and foraging critical habitat and 721 fewer acres of fire affected critical habitat will be affected in the cumulative effects for modified Alternative 3.

Bald Eagle
Direct Effects and Indirect Effects
Level of Disturbance to Nest Sites

The effects are the same as for Alternative 2.

Risk to Future Potential Nest Trees

The effects are the same as for Alternative 2.

Cumulative Effects
Level of Disturbance to Nest Sites

The effects are the same as for Alternative 2.

Risk to Future Potential Nest Trees

The effects are the same as for Alternative 2.

Northern Goshawk
Direct Effects and Indirect Effects
Level of Disturbance to Nest Sites

The effects are the same as for Alternative 2.

Risk to Reproduction

The effects are the same as for Alternative 2.

Cumulative Effects
Level of Disturbance to Nest Sites

The effects are the same as for Alternative 2.

Risk to Reproduction

The effects are the same as for Alternative 2.

Fisher, Marten, and Wolverine
Direct Effects and Indirect Effects
Level of Habitat Connectivity

There are twenty watersheds with moderate level of connectivity. This is seven more watersheds with moderate connectivity compared to Alternative 2. There is fifteen watersheds with low connectivity. This is 3 more watersheds with low connectivity

(compared to very low connectivity) compared to Alternative 2. There is just one watershed with very low connectivity.

Change in Fisher Home Range

The effects are the same as for Alternative 2.

Cumulative Effects
Level of Habitat Connectivity

The direct, indirect, and cumulative effects resulted in reducing the habitat connectivity of one watershed (Big Ferry – Swanson) from "low" to "very low" habitat connectivity. Private land Timber Harvest Plans are the reason for the downgrade in connectivity.

Change in Fisher Home Range

The cumulative effects are the same as for Alternative 2.

Pallid Bat, Townsend's Big-eared Bat, and Fringed myotis
Direct Effects and Indirect Effects
Risk of Disturbance

The effects are the same as for Alternative 2.

Cumulative Effects
Risk of Disturbance

The effects are the same as for Alternative 2.

Willow Flycatcher
Direct Effects and Indirect Effects
Level of Habitat Alteration

The effects are the same as for Alternative 2.

Cumulative Effects
Level of Habitat Alteration

The effects are the same as for Alternative 2.

Siskiyou Mountain Salamander
Direct Effects and Indirect Effects
Risk of Habitat Disturbance

The effects are the same as for Alternative 2.

Cumulative Effects
Risk of Habitat Disturbance

The effects are the same as for Alternative 2.

Tehama Chaparral Snail
Direct Effects and Indirect Effects
Likelihood of Dispersal

The effects are the same as for Alternative 2.

Cumulative Effects
Likelihood of Dispersal

The effects are the same as for Alternative 2.

Western Bumble Bee
Direct Effects and Indirect Effects
Level of Habitat Disturbance

The effects are the same as for Alternative 2.

Cumulative Effects
Level of Habitat Disturbance

The effects are the same as for Alternative 2.

Management Indicator Species
Snag Species Association
Direct Effects and Indirect Effects
Changes in Snag Habitat Abundance

The percent of snag-associated species habitat affected by modified Alternative 3 varies between individual species but about 9 percent of snag-associated species habitat will be affected by roadside hazard and salvage treatments. The other treatments in this alternative are likely to have minor effects on snag-associated species habitat. With implementation of project design features, salvage treatment units will not provide five snags on every acre but the project will meet the Forest Plan standard of five snags per acre averaged over 100 acres. Therefore, Alternative 2 is likely to provide a sufficient number of snags of varying decay classes to provide a habitat level of "good" snag-associated habitat.

Cumulative Effects
Changes in Snag Habitat Abundance

All of the removal will occur on private lands where snag retention is likely to be incidental. The actions considered for cumulative effects are assumed to downgrade snag habitat but not remove it because of the requirements to meet the Forest Plan standards for snag retention. The cumulative effects of modified Alternative 3 are 12,551 acres of snag habitat will be affected by the project; 217 acres will be affected by actions considered for cumulative effects. This is a total of 12,768 acres affected.

Hardwood Species Association
Direct Effects and Indirect Effects
Changes in Hardwood Habitat Abundance

Modified Alternative 3 will affect 236 acres of hardwood habitat. This is about 6 percent of the hardwood habitat in the project area. Estimates of effects are likely overestimated because roadside hazard treatments are likely to retain most of the hardwoods and the hardwoods in the salvage units may be damaged but are likely to remain in the units after treatment. The treatments are focused on conifer removal and maintaining hardwoods were possible but they may be damaged during implementation.

Cumulative Effects
Changes in Hardwood Habitat Abundance

The cumulative effects of modified Alternative 3 are 236 acres of hardwood habitat will be affected by the project; 10 acres will be affected by actions considered for cumulative effects. This is a total of 246 acres affected.

Survey and Manage
Direct Effects and Indirect Effects
Habitat Protection

This is the same as described in Alternative 2.

Cumulative Effects

This is the same as described in Alternative 2.

Migratory Bird
Direct Effects and Indirect Effects

This is the same as described in Alternative 2.

Cumulative Effects

This is the same as described in Alternative 2.

Big Game
Direct Effects and Indirect Effects

The effects are the same as for Alternative 2.

Cumulative Effects

The effects are the same as for Alternative 2.

Project Area C: Whites Fire

Wildlife Biological Evaluation
Northern Spotted Owl
Direct Effects and Indirect Effects
Risk to Reproduction

Modified Alternative 3 will result in the number of activity centers within each level of risk as Alternative 2 in the Whites analysis area. The Whites analysis area had the least amount of change to treatment that would affect Northern Spotted Owl habitat thus these activity centers weren't expected to change in risk level.

Changes to Critical Habitat

The effects are the same as described in Alternative 2.

Cumulative Effects

Cumulative Effects
Risk to Reproduction

The cumulative effects will not result in a change in the level of risk to reproduction in the Whites analysis area.

Changes to Critical Habitat

The cumulative effects are the same as for Alternative 2.

Bald Eagle
Direct Effects/Indirect and Cumulative Effects

There are no known eagle nest sites in the Whites project area so there are no effects to bald eagles from this alternative.

Northern Goshawk
Direct Effects and Indirect Effects
Level of Disturbance to Nest Sites

The effects are the same as for Alternative 2.

Risk to Reproduction

The effects are the same as for Alternative 2.

Cumulative Effects
Level of Disturbance to Nest Sites

The effects are the same as for Alternative 2.

Risk to Reproduction

The effects are the same as for Alternative 2.

Fisher, Marten, and Wolverine
Direct Effects and Indirect Effects
Level of Habitat Connectivity

The effects are the same as for Alternative 2.

Change in Fisher Home Range

The effects of the alternative are the same as Alternative 2.

Cumulative Effects
Level of Habitat Connectivity

The cumulative effects are the same as Alternative 2.

Change in Fisher Home Range

The cumulative effects are the same as Alternative 2.

Pallid Bat, Townsend's Big-eared Bat, and Fringed myotis
Direct Effects and Indirect Effects
Risk of Disturbance

The effects are the same as for Alternative 2.

Cumulative Effects
Risk of Disturbance

The effects are the same as for Alternative 2.

Willow Flycatcher
Direct Effects and Indirect Effects
Level of Habitat Alteration

The effects are the same as for Alternative 2.

Cumulative Effects
Level of Habitat Alteration

The effects are the same as for Alternative 2.

Siskiyou Mountain Salamander
Direct Effects and Indirect Effects
Risk of Habitat Disturbance

The effects are the same as for Alternative 2.

Cumulative Effects
Risk of Habitat Disturbance

The effects are the same as for Alternative 2.

Tehama Chaparral Snail
Direct Effects and Indirect Effects
Likelihood of Dispersal

The effects are the same as for Alternative 2.

Cumulative Effects
Likelihood of Dispersal

The effects are the same as for Alternative 2.

Western Bumble Bee
Direct Effects and Indirect Effects
Level of Habitat Disturbance
Cumulative Effects
Level of Habitat Disturbance
Management Indicator Species
Snag Species Association
Direct Effects and Indirect Effects
Changes in Snag Habitat Abundance

The percent of snag-associated species habitat affected by modified Alternative 3 varies between individual species but about 8 percent of snag-associated species habitat will be affected by roadside hazard and salvage treatments. The other treatments in this alternative are likely to have minor effects on snag-associated species habitat. With implementation of project design features, salvage treatment units will not provide five snags on every acre but the project will meet the Forest Plan standard of five snags per acre averaged over 100 acres. Therefore, modified Alternative 3 is likely to provide a sufficient number of snags of varying decay classes to provide a habitat level of "good" snag-associated habitat.

Cumulative Effects
Changes in Snag Habitat Abundance

All of the removal will occur on private lands where snag retention is likely to be incidental. The actions considered for cumulative effects are assumed to downgrade snag habitat but not remove it because of the requirements to meet the Forest Plan standards for snag retention. The cumulative effects of modified Alternative 3 are 3708 acres of snag habitat will be affected by the project; 194 acres will be affected by actions considered for cumulative effects. This is a total of 3,902 acres affected.

Hardwood Species Association
Direct Effects and Indirect Effects
Changes in Hardwood Habitat Abundance

Modified Alternative 3 will affect 22 acres of hardwood habitat. This is about 3 percent of the hardwood habitat in the project area. Estimates of effects are likely overestimated because roadside hazard treatments are likely to retain most of the hardwoods and the hardwoods in the salvage units may be damaged but are likely to remain in the units after treatment. The treatments are focused on conifer removal and maintaining hardwoods were possible but they may be damaged during implementation.

Cumulative Effects
Changes in Hardwood Habitat Abundance

The cumulative effects of modified Alternative 3 are 22 acres of hardwood habitat will be affected by the project; 4 acres will be affected by actions considered for cumulative effects. This is a total of 26 acres affected.

Survey and Manage
Direct Effects and Indirect Effects
Habitat Protection

This is the same as described in Alternative 2.

Cumulative Effects

This is the same as described in Alternative 2.

Migratory Bird

Direct Effects and Indirect Effects

This is the same as described in Alternative 2.

Cumulative Effects

This is the same as described in Alternative 2.

Big Game

Direct Effects and Indirect Effects

The effects are the same as for Alternative 2.

Cumulative Effects

The effects are the same as for Alternative 2.

Compliance with Law, Regulation, Policy and the Forest Plan

All alternatives comply with the Endangered Species Act and other relevant laws, policies and regulations. Alternatives also comply with the Forest Plan as displayed on the Forest Plan consistency checklist, available on the project website.

Botany and Non-Native Invasive Species

The Project Botany Biological Assessment, Biological Evaluation, Survey and Manage Review, Noxious Weed Risk Assessment, and Pre-field documents: Appendices A-1, A-2, and A-3 are summarized in this section and are available in the Project Record and on the Project website. The purpose of this document is to evaluate the Project in sufficient detail to determine its effects on Endangered, Threatened, Proposed, Candidate, Sensitive, and Survey and Manage plant species as well as determine the risk of introducing or spreading Noxious Weed species. Unique botanical areas of concern are also addressed.

Methodology

An office pre-field review was conducted to determine if the Project is within the range of any Threatened, Endangered, Proposed, Candidate, Sensitive, or Survey and Manage botanical species for the Forest, and if suitable habitat is present within the proposed Project area. This review also indicated whether any known populations of species of concern are present within the Project area. All species listed for the Forest were considered in this review (USFWS 2104, USDA 2013).

Threatened, Endangered, and Proposed or Candidate Species

Suitable habitat within the project area will be surveyed for Threatened, Endangered, and Proposed or Candidate species prior to any Project implementation. Any populations of Threatened, Endangered, and Proposed or Candidate species that are located will be protected through the implementation of project design features.

Sensitive Species

Surveys to evaluate the status of known populations within Project activity areas will be conducted in the spring and summer of 2015, during appropriate times for identification.

If additional populations are located within treatment areas and the habitat in its current state is likely to be negatively impacted by the proposed action, a project design feature intended to protect Sensitive species populations from a declining trend in viability will be implemented. If suitable habitat is present at known locations but known occurrences cannot be found, habitat elements will be protected to maintain the viability of the site.

Due to the expedited Project time frame, need to conduct surveys during appropriate times for identification (typically when blooming), and the obligation to assess the condition of known populations, it was unfeasible to conduct unit surveys in search of unknown populations of Sensitive species at the time of this document. Forest plan Standard and Guideline 6-8 (page 4-23) states that "if surveys (for Sensitive species) cannot be conducted, project areas should be assessed for the presence and condition of Sensitive species habitat." A preliminary field review was conducted to determine the presence and condition of suitable habitat for Sensitive species within project activity units. Past surveys have occurred in all fire areas which have helped build the Forest's database of known occurrences and were used when determining where suitable habitat may still be present after the 2014 fires. Additionally, aerial photographs, Rapid Assessment of Vegetation Condition after Wildfire (RAVG) data, treatment unit selection criteria, site visits, and species distribution information were used to determine if suitable habitat for Sensitive species is present within treatment units.

Units identified for salvage harvest and site preparation and planting activities had high to moderate vegetation mortality due to the 2014 fires. These areas burned at such intensities that they no longer offer adequate canopy cover to provide the shade, moisture, humidity, and temperature characteristics required by most Sensitive species (this finding is currently being field verified).

Fuels treatment units are prescribed for areas that have a mosaic of burn intensities due to the 2014 fires and may contain areas that provide suitable habitat for Sensitive species. These activities are anticipated to have an overall beneficial effect to suitable habitat by reducing excessive fuel loading and the potential for another high severity wildfire in the future that would result in habitat loss. The beneficial effect would potentially result in an increasing trend in population viability through the maintenance and protection of suitable habitat. If fuels treatment activities are anticipated to negatively impact population viability (e.g. pile burning), then project design features will be implemented in order to protect Sensitive botanical populations and their surrounding habitat.

Roadside hazard tree units may provide habitat or support viable populations of Sensitive species. Once roadside hazard tree units are identified, viable Sensitive plant populations and their surrounding habitat will be protected through the implementation of project design features.

Due to the ephemeral and unpredictable appearance of fruiting structures, and the expedited time frame of the Project, surveys for unknown Sensitive fungal populations were not practical. Habitat assessments will be conducted in areas previously known to host Sensitive fungal species and if suitable habitat is still present it will be protected through the implementation of project design features. Additionally, large woody debris and soil cover characteristics of Sensitive fungi habitat in the Project area would be protected through the incorporation of project design features associated with Forest Plan Standards and Guidelines for the Aquatic Conservation Strategy and woody material

retention associated with wildlife habitat and soil stability and productivity. See the summary of the Aquatic Conservation Strategy Report at the end of this chapter of the EIS.

Survey and Manage Species

The Bureau of Land Management and Forest Service adopted standards and guidelines for the management of known sites, site-specific pre-habitat disturbing surveys, and/or landscape scale surveys for about 400 rare and/or isolated species in the Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines (2001 ROD). These rare or isolated species are grouped into six categories based on level of rarity, ability to reasonably and consistently locate occupied sites during pre-disturbance surveys, and the level of information known about the species or group (Table 3-21). The standards and guidelines for these mitigation measures are known as Survey and Manage.

Table 3-21: Requirements for Survey and Manage categories.

Category	Relative Rarity	Pre-disturbance surveys	Manage all known sites	Strategic surveys
A	Rare	Yes	Yes	Yes, not required for NEPA
B	Rare	No	Yes	Yes, NEPA requirement
C	Uncommon	Yes	High-priority only	Yes, not required for NEPA
D	Uncommon	No	High-priority only	Yes, not required for NEPA
E	Rare	No	Yes	Yes, not required for NEPA
F	Uncommon	No	No	Yes, not required for NEPA

To be in compliance with Survey and Manage direction, pre-disturbance surveys will be conducted for Category A and C species in project activity units where known sites and suitable habitat are still present after the 2014 fires. Pre-disturbance surveys are not required for routine maintenance which includes the falling of roadside hazard trees (2001 Survey and Manage Standards and Guidelines and Management Recommendations, page 22). Regardless, every effort will be made to protect suitable habitat and known populations occurring along roads being assessed for roadside hazard tree removal. Known occurrences within the Project area of Category B, D, and E species will be protected for continued persistence at the site. If suitable habitat is present at known locations but known occurrences cannot be found, habitat elements will be protected to maintain the viability of the site. Project design features incorporated into the Project for the protection of botanical species can be found in Chapter 2.

Non-Native Invasive Species (NNIS)

The Forest has a list of weeds that are being tracked and managed (Appendix B of the Botanical Resources and Non–native Invasive Species report). There are a total of 30 high priority weeds on the list and 15 species of moderate and low priority. A high priority weed species is one that is of important local management concern because of its currently limited distribution on the Forest, highly invasive nature, and demonstrated potential to displace large geographic areas of native plant communities. For this Project, the risk analysis will only evaluate the likelihood for introducing and spreading high and moderate priority species. The low priority species present in the Project area will not be

considered in the analysis because it is of lesser concern on the Forest and is not considered an issue locally.

The invasive species risk assessment was completed to determine the risk of introducing and/or spreading non-native invasive species associated with the Project. For projects having a moderate to high risk of introducing or spreading noxious weeds, the Project decision document must identify noxious weed control measures that must be undertaken during project implementation (FSM 2903.04).

Based on site visits and RAVG data, the following assumptions about habitat condition are made:

- areas characterized by high severity burns experienced 75 percent or greater vegetation mortality, loss of canopy and understory cover, and loss of duff layers and large woody debris;
- areas characterized by moderate severity burns experienced 50-75 percent vegetation mortality, substantial reduction in canopy and understory cover, as well as duff layers and large woody debris; and
- areas characterized by no or low severity burns experienced 0-50 percent vegetation mortality and a reduction in fuel loading.

Analysis Indicators

- Threatened, Endangered, Proposed, and Candidate Species: Likelihood of jeopardizing the continued existence of Threatened, Endangered, Proposed, or Candidate species populations.
- Sensitive Species: Trend of Sensitive species population viability measured as increasing, declining, or static.
- Survey and Manage Species: Compliance with Survey and Manage guidelines as defined by the 2001 Record of Decision.
- Non-native Invasive Species: Risk of introducing and/or spreading non-native invasive species measured by a rating of high, moderate or low risk.

Assumptions specific to Botanical Species of Concern

- Analysis is based on spatial population records only, field visits to known sites were not conducted prior to analysis;
- Botanical species of concern located in areas with moderate to high vegetation mortality, as indicated by RAVG data and salvage and site preparation and planting unit selection criteria, are assumed to be extirpated (assumption being field verified);
- Habitat located in areas with moderate to high vegetation mortality, as indicated by RAVG data and salvage unit criteria, are no longer expected to support viable populations of botanical species of concern (except *Thermopsis robusta* which prospers following disturbance);
- Strategic surveys for Survey and Manage Category B fungi are assumed to be complete (pending acceptance of the Draft Document by the Regional Ecosystem Office); and
- Survey and Manage guidelines will be used to analyze effects on botanical species that fall under both Sensitive and Survey and Manage categories because they provide for a more protective management strategy.

Assumptions specific to Non-native Invasive Species (NNIS)

- Analysis is based on spatial population records only, field visits to known sites were not conducted prior to analysis;
- Not all existing NNIS infestations are currently mapped;

- Existing NNIS infestations were spread during the 2014 fires and associated suppression efforts;
- It's likely that new NNIS infestations were introduced during the 2014 fires and associated suppression efforts that are presently undetected;
- Roadside NNIS infestations are expected to continue to spread along road systems regardless of Project activities;
- Inclusions of privately owned lands within the project boundary may contain infestations of NNIS that will spread to National Forest System lands regardless of Forest actions and/or efforts at prevention and control; and
- Once established, NNIS infestations are likely to persist long term.

Spatial and Temporal Context

The analysis area for botanical species of concern and non-native invasive species is the Project area because it is the most relevant to changes to population viability and the risk of spread within the Project area. The temporal bounding for botanical species of concern and non-native invasive species will be less than the eight years during which the project will be implemented for the short-term and greater than eight years for long-term effects. Temporal bounding was chosen to account for species recovery times, seed dormancy and germination requirements, and the difficulty of identifying biennial and perennial vegetative life stages (rosettes) in year one post-burn.

Affected Environment

The Project area is composed of the Beaver Fire (Subpart A), Happy Camp Complex (Subpart B), and Whites Fire of the July Complex (Subpart C) which all occurred on the Forest during the summer of 2014.

Modification of the Forest structure and composition as a result of fire intensity, duration, and suppression efforts has had a profound effect on microclimate characteristics such as air temperature, relative humidity, and soil temperature and moisture, which could, in turn, result in adverse impacts to native plant communities. In areas that experienced high to moderate vegetation mortality, microclimate characteristics commonly associated with habitat for species of concern have likely been lost. However, these areas also provide the opportunity for the unique and less frequent elements of the California flora, known as fire followers, to come to life and establish a seed bank that will persist while waiting for the next event. These areas are also more vulnerable to invasion by noxious weeds due to the lack of ground cover that often acts as a barrier to establishment of non-native invasive species. Areas that experienced no or low burn severity may provide refugia for native species, and act as a seed source from which dispersal into the more intensely burned areas can occur.

Project Area A: Beaver Fire

The Beaver fire area was severely burned during the 2014 fires, and large sections of private land within the boundary have been salvage logged.

Project Area B: Happy Camp Complex

The Happy Camp Complex fire area is characterized by a mixed severity burn due to the mixed vegetative conditions. Some areas, such as Grider and Walker Creek drainages, were severely burned during the 2014 fires.

Project Area C: Whites Fire

The Whites fire area is characterized by a mixed burn severity and is primarily within Late Successional Reserve management areas.

Species of Concern

Detailed species accounts can be found in the Botany and Non-native Invasive Species Report available in the Project Record and on the Project website.

Threatened, Endangered and Proposed Species

Project Area A: Beaver Fire

There are no known populations of any Threatened, Endangered, Proposed, or Candidate species present in the Beaver fire area. Suitable oak-chaparral habitat was surveyed for the Endangered *Fritillaria gentneri*; however, no populations were located.

Project Area B: Happy Camp Complex

There are no known populations of or suitable habitat present for any Threatened, Endangered, Proposed, or Candidate species in the Happy Camp Complex fire area.

Project Area C: Whites Fire

There are no known populations of or suitable habitat present for any Threatened, Endangered, or Proposed species in the Whites fire area.

Sensitive Species

Project Area A: Beaver Fire

No known sensitive botanical species are present in this fire area (excepting *Cypripedium fasciculatum* and *C. montanum* which are being analyzed following Survey and Manage guidelines) (Table 3.12).

Project Area B: Happy Camp Complex

There are three Sensitive botanical species known to occur in the Happy Camp Complex fire area. These include: *Eriogonum hirtellum* (6 populations), *Erythronium hendersonii* (2 populations), and *Thermopsis robusta* (1 population) (*Cypripedium fasciculatum* and *Cypripedium montanum* are also present in this fire area but are being analyzed following Survey and Manage guidelines) (Table 3.12).

Project Area C: Whites Fire

No known sensitive botanical species are present in the Whites fire area (excepting *Cypripedium fasciculatum* and *C. montanum* which are being analyzed following Survey and Manage guidelines) (Table 3.12).

Survey and Manage Species

Project Area A: Beaver Fire

There are five Survey and Manage botanical species that are known to occur in the Beaver fire area. These include: *Alpova olivaceotinctus* (1 population), *Choiromyces alveolatus* (1 population), *Cypripedium fasciculatum* (3 populations*), Cypripedium montanum* (2 populations*),* and *Ptilidium californicum* (1 population) (Table 3.13).

Project Area B: Happy Camp Complex

There are 11 Survey and Manage botanical species that are known to occur in the Happy Camp Complex fire area. These include: *Cantharellus subalbidus* (2 populations), *Cypripedium fasciculatum* (20 populations), *Cypripedium montanum* (14 populations), *Gomphus clavatus* (1 population), *Otidea leporina* (2 populations), *Phaeocollybia fallax* (1 population), *Phaeocollybia gregaria* (1 population), *Phaeocollybia olivacea* (2 populations), *Ptilidium californicum* (2 populations), *Ramaria abientina* (1 population), and *Tremiscus helvelloides* (2 populations) (Table 3.13).

Project Area C: Whites Fire

There are eight Survey and Manage botanical species that are known to occur in the Whites fire area. These include: *Albatrellus flettii* (1 population), *Cypripedium fasciculatum* (seven populations), *Cypripedium montanum* (seven populations), *Marasmius applanatipes* (1 population), *Mycena tenax* (1 population), *Phaeocollybia californica* (1 population), *Phaeocollybia olivacea* (1 population), and *Ptilidium californicum* (1 population) (Table 3.13).

Unique Botanical Areas of Concern

Project Area B: Happy Camp Complex

Lake Mountain Special Interest Area

This special interest area is composed of 100 acres and is the northern most known location of Foxtail pine. It is home to at least six different conifer species including western white pine, foxtail pine, Shasta red fir, white fir, mountain hemlock, and Jeffrey pine. Such assemblages of high-elevation conifers are rare throughout California and are restricted to the Klamath-Siskiyou Mountains. Project design features have been incorporated into this EIS to maintain foxtail pine snags within this Special Interest Area. The retention of foxtail pine snags is important in order to protect the unique features for which this Special Interest Area was designated.

Cultural Plant Collecting Area

The maintenance and perpetuation of cultural botanical resource is required by Forest Standard and Guidelines (6-21). The Cold Creek springs area within subpart B of the Project area (the Happy Camp Complex) is an important resource for *Adiantum aleuticum* which is frequently used by local tribes for basket weaving and botanical remedies (Lloyd 1964). There are six proposed treatment units located in the Cold Creek springs area that may affect the continued viability of this resource. Project design features have been incorporated into this EIS in order to continue to ensure its preservation and continuation.

Beargrass leaves are harvested by many tribal groups for basketry and other crafts. Beargrass is scattered across the Project area and may overlap proposed Project activity units along ridge tops, and in areas characterized by patches of open canopy and rocky ultramafic soils. Although beargrass responds favorably to low to moderate fire, high-intensity, duff-consuming fires will destroy the meristematic region, subsequently killing the plants (Crane 1990). Salvage and site preparation and planting units are proposed in areas that experienced moderate to high vegetation mortality, and, in general, the complete consumption of duff layers; therefore, these activities are not anticipated to

affect beargrass populations since they have likely been lost in these areas. Fuels treatments are aimed at reducing hazardous fuel loads and thinning dense stands while maintaining adequate duff layers and canopy cover. Beargrass responds favorably to low intensity fires which have historically been used by tribal groups to maintain optimum leaf strength for basketry (Hummel et al. 2012). Subsequently, fuel treatments are anticipated to have a positive effect on the viability of beargrass populations. On the Forest, beargrass can also be found growing in young plantations and along skid roads indicating that it responds favorably to disturbances that open canopy cover. Roadside hazard treatments are not anticipated to impact the continuation of beargrass populations in the Project area. However, minor impacts to individual beargrass plants may occur from roadside hazard treatments due to mechanical disturbance to the bulb and potential soil compaction.

Non-native Invasive Species

Project Area A: Beaver Fire

There are five NNIS that are known to occur in the Beaver fire area. These include: *Cardaria chalapensis* (four infested sites), *Cardaria draba* (1 infested site), *Centaurea solstitialis* (six infested sites), *Isatis tinctoria* (six infested sites), and *Tribulus terrestris* (one infested site, river access site) (Table 3.14).

Project Area B: Happy Camp Complex

There are eight NNIS known to occur in the Happy Camp Complex fire area. These include: *Centaurea maculosa* (nine infested sites), *Centaurea pratensis* (two infested sites, mainly river bar), *Centaurea solstitialis* (ten infested sites), *Centaurea squarrosa* (five infested sites, mainly river bar), *Cytisus scoparius* (eight18 infested sites), *Euphorbia esula* (55 infested sites, mainly river bar), *Isatis tinctoria* (38 infested sites), and *Lepidium latifolium* (11 infested sites) (Table 3.14).

Project Area C: Whites Fire

There are four NNIS known to occur in the Whites fire area. These include: *Centaurea maculosa* (13 infested sites, 12 of which have had no plants for over 10 years), *Centaurea solsitialis (*one infested site), *Cytisus scoparius* (three infested sites), and *Isatis tinctoria* (nine infested sites) (Table 3.14).

Environmental Consequences

Interactions between the Project activities and the potential effects to botanical resources are discussed in detail in the Project Botanical Resources and Non-native Invasive Species report (available on the Project website) and summarized here.

Table 3-22: Number of Sensitive botanical species populations that have the potential to be affected by project activities for each alternative.

Fire Area	Species	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 2 Mod	Alt 3 Mod
Beaver	NA	0	0	0	0	0	0	0
Happy Camp	Eriogonum hirtellum	6	5	5	3	5	5	2
	Erythronium hendersonii	2	2	2	2	2	2	2
	Thermopsis robusta	1	1	1	1	1	1	1
Whites	NA	0	0	0	0	0	0	0

Table 3-23: Number of Survey and Manage botanical populations that have the potential to be affected by project activities for each alternative.

Fire Area	Species	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 2 Mod	Alt 3 Mod
Beaver	*Alpova olivaceotinctus*	1	0	0	0	0	0	0
	Choiromyces alveolatus	1	0	0	0	0	0	0
	Cypripedium fasciculatum	3	2	2	2	3	2	2
	Cypripedium montanum	2	1	1	1	1	1	1
	Ptilidium californicum	1	1	1	1	1	1	0
Happy Camp	*Cantharellus subalbidus*	2	0	0	0	0	0	0
	Cypripedium fasciculatum	20	10	10	10	10	10	9
	Cypripedium montanum	14	7	7	7	7	7	7
	Gomphus clavatus	1	0	0	0	0	0	0
	Otidea leporina	2	1	1	1	1	1	1
	Phaeocollybia fallax	1	0	0	0	0	0	0
	Phaeocollybia gregeria	1	0	0	0	0	0	0
	Phaeocollybia olivacea	2	1	1	1	1	1	1
	Ptilidium californicum	2	1	1	1	1	1	1
	Rameria abientina	1	0	0	0	0	0	0
	Tremiscus helvelloides	2	1	1	1	1	1	1
Whites	*Albatrellus flettii*	1	1	1	1	1	1	1
	Cypripedium fasciculatum	7	6	6	6	6	6	6
	Cypripedium montanum	7	6	6	6	6	6	5
	Marasmius applanatipes	1	0	0	0	0	0	0
	Mycena tenax	1	0	0	0	0	0	0
	Phaeocollybia californica	1	1	1	1	1	1	1
	Phaeocollybia olivacea	1	1	1	1	1	1	1
	Ptilidium californicum	1	0	0	0	0	0	0

Table 3-24: Number of Non-native Invasive species populations that have the potential to be affected by project activities for each alternative.

Fire Area	Species	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 2 Mod	Alt 3 Mod
Beaver	*Cardaris chalapensis*	4	0	0	0	0	0	0
	Cardaria draba	1	1	1	1	1	1	0
	Centaurea solstitialis	6	6	6	6	6	6	5
	Isatis tinctoria	6	6	6	6	6	6	5

Fire Area	Species	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 2 Mod	Alt 3 Mod
	Tribulus terrestris	1	1	1	1	1	1	0
Happy Camp	*Centaurea maculosa*	9	5	5	5	5	5	2
	Centaurea pratensis	2	1	1	1	1	1	1
	Centaurea solstitialis	10	9	9	9	9	9	9
	Centaurea squarrosa	5	2	2	2	2	2	2
	Cytisus scoparius	18	14	14	14	14	14	11
	Euphorbia esula	55	24	24	24	24	24	6
	Isatis tinctoria	38	33	33	33	33	33	28
	Lepidium latifolium	11	4	4	4	4	4	1
Whites	*Centaurea maculosa*	13	13	13	13	13	13	12
	Centaurea solstitialis	1	1	1	1	1	1	1
	Cytisus scoparius	3	3	3	3	3	3	3
	Isatis tinctoria	9	9	9	9	9	9	8

Threatened, Endangered, Proposed and Candidate Plant Species

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

There will be no direct or indirect effects to Threatened, Endangered, Proposed, or Candidate species because no populations are currently known within the Beaver fire area. Suitable oak-chaparral habitat is present within the Beaver fire area and was surveyed for the Endangered *Fritillaria gentneri*; however, no populations were located.

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

There are no known populations of, or suitable habitat present for, any Threatened, Endangered, Proposed, or Candidate species in the Happy Camp Complex fire area. Therefore, there will be no direct or indirect effects to Threatened, Endangered, Proposed, or Candidate species in this subpart.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

There are no known populations of or suitable habitat present for any Threatened, Endangered, Proposed, or Candidate species in the Whites fire area. Therefore, there will be no direct or indirect effects to Threatened, Endangered, Proposed, or Candidate species in this subpart.

Sensitive Vascular Plant Species

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

No known sensitive vascular plant species are present in the Beaver fire area (excepting *Cypripedium fasciculatum* and *C. montanum* which are being analyzed following Survey and Manage guidelines). Therefore, there will be no direct or indirect effects to Sensitive Botanical Species in this subpart.

Project Area B: Happy Camp Complex Fire

Direct Effects and Indirect Effects

There would be no direct effect to the three Sensitive vascular plant species located in the Happy Camp Complex fire area: *Eriogonum hirtellum, Erythronium hendersonii*, and *Thermopsis robusta* (*Cypripedium fasciculatum* and *C. montanum* are being analyzed following Survey and Manage guidelines).

Indirect effects to *E. hirtellum* would be the adverse effects of increased competition from early-seral species that were stimulated to germinate by the fire. Added competition in the short term would cause a declining trend in population viability; however, the long-term trend in population viability would likely remain static as competition balances out.

Erythronium species have been reported to benefit from wildfire. An increase in size and vigor was recorded for populations of *E. hendersonii* located in burned areas during surveys in spring 2015. Populations located in unburned areas may be indirectly affected by not receiving the benefits fire provides this genus. The short-term trend in population viability would be increasing in areas that received fire and static in those that did not. Without a future disturbance event, stable environmental conditions may cause a declining trend in population viability in the long-term.

Disturbance is necessary for the spread and continued vigor of *T. robusta* populations. Specifically, disturbance that may scarify the seed coat and/or create openings can increase germination and vigor of *T. robusta* seedlings. Unfortunately, the known population in the Happy Camp Complex fire area received little disturbance during the 2014 fires. Indirect negative effects may occur from the further development of canopy cover and a stable environmental condition which would hinder seed germination and decrease suitable habitat in the short term. However, future human-caused or natural disturbance, especially fire in areas of fuel accumulation, would allow for the creation of new habitat in the long-term. Subsequently, there would be a declining trend in population viability until the next disturbance event which could create conditions that would allow for an increasing trend in population viability.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

No known sensitive vascular plant species are present in the Whites fire area (excepting *Cypripedium fasciculatum* and *C. montanum* which are being analyzed following Survey and Manage guidelines). Therefore, there will be no direct or indirect effects to Sensitive Botanical Species in this subpart.

Sensitive Bryophytes, Lichens, and Fungi

Project Area A, B, and C: Beaver Fire, Happy Camp Complex Fire, and Whites Fire

Direct Effects and Indirect Effects

No known sensitive bryophyte, lichens, and fungi species are present in the three fire areas. Therefore, there will be no direct effects to Sensitive bryophyte, lichens, and fungi species in this subpart. Suitable habitat within none to moderately burned areas may be present. Indirect effects to suitable habitat for Sensitive bryophytes, lichens, and fungi are described below.

Sedimentation of springs and headwater streams may have a negative indirect effect on the aquatic habitat for the sole Sensitive Lichen species causing a declining trend in potential population viability (see Hydrology report).

Heavy fuel loading from the accumulation of dead, burned snags and debris from the 2014 fires is likely to have an indirect negative effect on potential habitat for Sensitive bryophyte, lichen, and fungal species by creating conditions conducive to high severity wildfire in the future.

Sensitive ectomycorrhizal fungi rely on the presence of a live host trees for their continued existence; forest re-establishment in severely burned areas may be delayed due to the loss of cone-bearing trees, thereby indirectly postponing Sensitive ectomycorrhizal fungal re-colonization. This would cause a decline in potential population viability because the recovery time for suitable habitat would be hindered.

Survey and Manage Vascular Plants, Bryophytes, Lichens and Fungi

Project Area A, B and C: Beaver Fire, Happy Camp Complex Fire, and Whites Fire

Direct Effects and Indirect Effects

There would be no direct effects to Survey and Manage vascular plant, bryophyte, lichen and fungi species or habitat therefore the project would be in compliance with Survey and manage regulations.

Suitable habitat and known populations may be indirectly affected under Alternative 1; however, these indirect effects will not affect compliance with Survey and Manage regulations. Downed woody debris would provide protected safe site for seed germination indirectly benefiting plant community composition. Standing burned trees would provide perches for seed dispersing birds, but these trees may fall on populations, damaging them and blocking germinating seeds and emerging seedlings. Natural forest regeneration could be delayed in severely burned areas due to the loss of cone-bearing trees, thereby indirectly postponing Survey and Manage mycorrhizal fungal recolonization. Accumulation of dead trees would generate high fuel loads creating conditions conducive to high severity wildfire which would cause a negative indirect effect to Survey and Manage species.

Non-native Invasive Species

Project Area A, B and C: Beaver Fire, Happy Camp Complex Fire, and Whites Fire

Direct Effects and Indirect Effects

There would be no direct effect to Non-native Invasive species from Alternative 1.

Existing NNIS populations would continue to spread at their current or higher rates due to the disturbance from the 2014 fire and suppression efforts, the subsequent habitat vulnerability, and the numerous non-project dependent vectors that are present in or utilize the Project area.

The risk of introduction and/or spread of NNIS under this alternative is high due to the numerous NNIS populations present in and adjacent to the project area, the high level of disturbance from the 2014 fires which created habitat conditions that are extremely vulnerable to NNIS invasion, and the probability that the substantial use of the project area for recreation, wood-cutting, and hunting will vector NNIS propagules into these vulnerable areas.

Cumulative Effects

There are no cumulative effects for Threatened, Endangered, Proposed, or Candidate species, because there will be no direct or indirect effects.

All activities and factors listed in Appendix C could have additional effects to Sensitive, Survey and Manage, and Non-native invasive species populations in the project area when added to Alternative 1. On-going and future foreseeable Forest projects have been and will be evaluated for effects to Sensitive, Survey and Manage and Non-native Invasive species. Project design features have been incorporated into these past projects to limit their effects on Sensitive, Survey and Manage and Non-native Invasive species populations. It is expected that because of these evaluations and the inclusion of project design features, cumulative effects from Forest projects will have a neutral effect on population viability trends for Sensitive species, on Forest compliance with Survey and Manage regulations, and on the risk of introducing and/or spreading NNIS.

Projects on private lands are not required to protect Sensitive botanical species, and subsequently actions on private lands may lead to a localized downward trend in population viability for these species. If that is the case, on-going and future foreseeable projects on private lands would have a declining cumulative effect on population viability trends for Sensitive species. However, without knowing how many species and/or populations are present, how many may be effected, and how project activities will affect habitat conditions, it is difficult to determine how potential effects from private actions would cumulatively influence population viability trends for Sensitive botanical species.

Forest compliance with Survey and Manage regulations requires pre-disturbance surveys for habitat-disturbing projects (Category A and C species only), and the management of known and high-priority sites for continued persistence. On-going and future foreseeable Forest projects would not cumulatively affect Survey and Manage botanical species and would comply with regulations if project design features structured to protect Survey and Manage populations and associated habitats are implemented. Additionally, on-going and future foreseeable projects on private land that affect Survey and Manage botanical species would have no effect on whether the Project is in compliance with these regulations since they pertain only to Forest occurrences and lands. Therefore, the Project would continue to comply with Survey and Manage regulations regardless of cumulative actions on Forest or private lands.

There are eight grazing allotments that overlap treatment units and may contribute to the long-distance dispersal of NNIS infestations in the project area. Livestock mainly transport NNIS propagules on their fur or through ingestion. Many NNIS have barbed or prickly seeds that readily adhere to animal fur and may potentially be transported long-distance and/or fall off in areas that are currently weed-free. Since many NNIS seeds can pass through the stomach unaffected, ingested seeds may also introduce NNIS to new areas once they are expelled. The added cumulative effects of grazing to Alternative 1 would likely increase the risk of NNIS introduction and spread.

Projects on private lands are not required to mitigate for the spread and/or introduction of NNIS species which could also increase negative cumulative effects to NNIS populations and subsequently raise the risk rating.

The BAER team analyzed the Project area and prescribed emergency treatments to help limit the introduction and spread of NNIS from the 2014 fires and suppression activities. Emergency treatments will take place in the first year following the fires (2015) and will include additional surveys for NNIS within the fire footprints and contingency areas as well subsequent hand removal of newly located infestations. These treatments will help

control the introduction and spread of annual NNIS species, such as *Centaurea solstitialis.* Unfortunately, biennial and perennial species that have a rosette life stage are difficult to locate in the first year because of their short stature, and may not be found during these surveys. The Forest Noxious Weed Detection and Treatment program would also continue to survey for and treat new populations that may be introduced or spread onto Forest lands through on-going and future foreseeable Forest and Private land projects. However, the cumulative risk for the introduction and spread of NNIS would remain high due to the particularly vulnerable condition of the habitat.

Alternative 2

Threatened, Endangered, Proposed and Candidate Plant Species

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

There will be no direct or indirect effects to Threatened, Endangered, Proposed, or Candidate species because no populations are currently known within the Beaver fire area. Suitable oak-chaparral habitat is present within the Beaver fire area and was surveyed for the Endangered *Fritillaria gentneri*, however; no populations were located. If populations are located later, there would still be no direct or indirect effects because flag and avoid project design features will be incorporated that would protect newly discovered populations. Subsequently, there is no likelihood of jeopardizing the continued existence of TEPC species.

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

There are no known populations of or suitable habitat present for any Threatened, Endangered, Proposed, or Candidate species in the Happy Camp Complex fire area. Therefore, there will be no direct or indirect effects to Threatened, Endangered, Proposed, or Candidate species in this subpart.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

There are no known populations of or suitable habitat present for any Threatened, Endangered, Proposed, or Candidate species in the Whites fire area. Therefore, there will be no direct or indirect effects to Threatened, Endangered, Proposed, or Candidate species in this subpart.

Sensitive Vascular Plants

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

No known sensitive vascular plant species are present in the Beaver fire area (excepting *Cypripedium fasciculatum* and *C. montanum* which are being analyzed following Survey and Manage guidelines). Therefore, there will be no direct or indirect effects to Sensitive Botanical Species in this subpart.

Project Area B: Happy Camp Complex Fire

Direct Effects and Indirect Effects

There are three Sensitive vascular plant species located in the Happy Camp Complex fire area: *Eriogonum hirtellum, Erythronium hendersonii*, and *Thermopsis robusta* (*Cypripedium fasciculatum* and *C. montanum* are being analyzed following Survey and Manage guidelines) that may be affected by project activities. Effects to Sensitive vascular plants species known to be present in this subpart are described below.

Eriogonum hirtellum:

E. hirtellum populations within activity units occur in rocky, open serpentine outcroppings near Tom Martin Peak in the Happy Camp Complex fire area. Populations slightly overlap with roadside hazard tree removal, salvage, and site preparation and planting activities. These project activities are almost exclusively focused on the removal of conifers. Suitable habitat for *E. hirtellum* is characterized by open, rocky outcroppings that are often lacking in conifer cover, subsequently project activities are unlikely to occur in areas that currently support or may provide suitable habitat for *E. hirtellum.* Additionally, the proposed use of helicopter salvage yarding in the overlapping unit would limit the likelihood of damage to suitable habitat from equipment entry. Therefore, direct effects to these populations are anticipated to be extremely minimal in the short and long-term.

Indirect effects to *E. hirtellum* populations may occur due to increased competition from early seral species that were stimulated to germinate by the fire. In the short-term, this may have a declining effect on population viability as individuals are impacted. However, because effects would be minimal and to individuals and not the population as a whole, the long term trend in population viability would remain static.

Erythronium hendersonii:

Direct effects to *E. hendersonii* populations would be both beneficial and negative to population persistence. The removal of excess understory vegetation would provide a beneficial effect by opening up habitat and reducing light competition; and negative effects would occur to specific individuals and portions of the habitat where piles are burned. Project design features will mitigate effects to underground bulbs from pile burning; subsequently, this alternative would result in an increasing trend in population viability due to the beneficial impacts of fuels treatments on suitable habitat.

Thermopsis robusta:

Effects to this population would be both beneficial and negative. Use of the gravel pullout where this population occurs would provide a short term benefit by creating disturbance necessary for the creation of new suitable habitat and increased germination and subsequent population expansion by scarifying seed. However, vegetation recovery and encroachment would cause negative long-term effects on population viability. While there would be a short-term increasing trend in population viability due to use of the gravel pullout, overall there would be a declining trend in population viability until the next disturbance event that would again allow for an increasing trend in population viability.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

No known sensitive vascular plant species are present in the Whites fire area (excepting *Cypripedium fasciculatum* and *C. montanum* which are being analyzed following Survey

and Manage guidelines). Therefore, there will be no direct or indirect effects to Sensitive Botanical Species in this subpart.

Sensitive Bryophytes, Lichens and Fungi

Project Area A, B and C: Beaver Fire, Happy Camp Complex Fire, and Whites Fire

Direct Effects and Indirect Effects

There would be no direct or indirect effects to Sensitive bryophyte, lichen or fungi species as a result of Alternative 2 because none are known within the three fire areas. Suitable habitat within unburned to moderately burned areas may be present. Indirect effects to suitable habitat for Sensitive bryophytes, lichens, and fungi are described below.

Fuels treatments would provide an indirect, long-term benefit to suitable habitat by reducing excessive fuel loading and the potential for another high severity wildfire in the future which would cause an increasing trend in potential population viability through the maintenance and protection of suitable habitat.

Conifer planting associated with this alternative may indirectly benefit sensitive ectomycorrhizal fungi by increasing the speed at which severely burned areas are reforested. This would cause an increasing trend in potential population viability through the creation and restoration of suitable habitat.

Sedimentation of springs and headwater streams may have a negative indirect effect on the aquatic habitat for the sole Sensitive Lichen species. The risk of sedimentation would increase under this alternative in comparison to Alternative 1, causing a more precipitous decline in potential population viability because suitable habitat would have a higher risk of degradation. However, legacy site restoration will reduce the risk of sedimentation in the Elk creek watershed resulting in a static trend in potential population viability in that specific watershed (see the Hydrology report).

Survey and Manage Vascular Plants Species

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

There are two Survey and Manage vascular plant species located in the Beaver fire area:

Cypripedium fasciculatum and Cypripedium montanum:

Two *C. fasciculatum* and one *C. montanum* population are present within proposed activity units. These are both Category C species, and thus to be in compliance with Survey and Manage guidelines populations deemed high priority must be protected. No high priority sites have been designated on the Forest and therefore all populations (still assumed alive) within project activity units and on the Forest will be considered high priority and subsequently protected for site persistence. Implementation of flag and avoid protection measures would result in very minimal direct effects to *C. fasciculatum* and *C. montanum* populations as well as compliance with required guidelines. This alternative is expected to provide a long-term benefit to *C. fasciculatum* and *C. montanum* populations and suitable habitat by reducing excessive fuel loading and the potential for a high severity wildfire.

Project Area B: Happy Camp Complex Fire

Direct Effects and Indirect Effects

There are two Survey and Manage vascular plant species located in the Happy Camp Complex fire area:

Cypripedium fasciculatum and Cypripedium montanum:

Ten *C. fasciculatum* and seven *C. montanum* populations are present within proposed activity units. These are both Category C species, and thus to be in compliance with Survey and Manage guidelines populations deemed high priority must be protected. No high priority sites have been designated on the Forest and therefore all populations (still assumed alive) within project activity units and on the Forest will be considered high priority and subsequently protected for site persistence. Implementation of flag and avoid protection measures would result in very minimal direct effects to *C. fasciculatum* and *C. montanum* populations as well as compliance with required guidelines. This alternative is expected to provide a long-term benefit to *C. fasciculatum* and *C. montanum* populations and suitable habitat by reducing excessive fuel loading and the potential for a high severity wildfire.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

There are two Survey and Manage vascular plant species located in the Whites fire area:

Cypripedium fasciculatum and Cypripedium montanum:

Six *C. fasciculatum* and six *C. montanum* populations are present within proposed activity units. These are both Category C species, and thus to be in compliance with Survey and Manage guidelines populations deemed high priority must be protected. No high priority sites have been designated on the Forest and therefore all populations (still assumed alive) within project activity units and on the Forest will be considered high priority and subsequently protected for site persistence. Implementation of flag and avoid protection measures would result in very minimal direct effects to *C. fasciculatum* and *C. montanum* populations as well as compliance with required guidelines. This alternative is expected to provide a long-term benefit to *C. fasciculatum* and *C. montanum* populations and suitable habitat by reducing excessive fuel loading and the potential for a high severity wildfire.

Survey and Manage Bryophytes

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

There is one Survey and Manage Bryophyte species located in the Beaver fire area:

Ptilidium californicum:

There is one population of *P. californicum* located in a roadside hazard activity unit. *Ptilidium californicum* is a Category A species, and thus to be in compliance with Survey and Manage guidelines all known sites must be protected. Implementation of flag and avoid protection measures would result in no direct effects to populations ensuring compliance with required guidelines.

Roadside treatments may indirectly affect *P. californicum* by creating small canopy openings adjacent to the population that could increase air temperature and diminish shade. This would be a short-term effect as larger canopy elements would be maintained and shading to the habitat would not be significantly reduced for a long period. The

reduction in excessive fuels may indirectly benefit populations by reducing the risk of a future high severity wildfire.

Project Area B: Happy Camp Complex Fire

Direct Effects and Indirect Effects

There is one Survey and Manage Bryophyte species located in the Happy Camp Complex fire area:

Ptilidium californicum:

There is one population of *P. californicum* located in a roadside hazard activity unit. *Ptilidium californicum* is a Category A species, and thus to be in compliance with Survey and Manage guidelines all known sites must be protected. Implementation of flag and avoid protection measures would result in no direct effects to populations ensuring compliance with required guidelines.

Roadside treatments may indirectly affect *P. californicum* by creating small canopy openings adjacent to the population that could increase air temperature and diminish shade. This would be a short-term effect as larger canopy elements would be maintained and shading to the habitat would not be significantly reduced for a long period. The reduction in excessive fuels may indirectly benefit populations by reducing the risk of a future high severity wildfire.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

No known Survey and Manage Bryophyte species are present in the Whites fire area. Therefore, there will be no direct or indirect effects to Sensitive Bryophyte Species in this subpart.

Survey and Manage Fungi

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

No known Survey and Manage Fungi species are present in the Beaver fire area. Therefore, there will be no direct or indirect effects to Survey and Manage fungal species in this subpart.

Project Area B: Happy Camp Complex Fire

Direct Effects and Indirect Effects

There are three Survey and Manage Fungi species located in the Happy Camp Complex fire area:

Otidea leporina:

There is one *O. leporina* population located in an activity unit. *Otidea leporina* is a Category D species, and thus to be in compliance with Survey and Manage guidelines populations deemed high priority must be protected. Little is known about this species making it difficult to designate whether it is a high-priority population. If appropriate habitat components are present to support mycorrhizal and saprophytic fungi this population will be designated high-priority. Implementation of flag and avoid protection measures will result in no direct effects to this population as well as compliance with required guidelines.

Phaeocollybia olivacea:

There is one population of *P. olivacea* located in an activity unit. *Phaeocollybia olivacea* is a Category E species which requires the protection of all known sites in order to be in compliance with Survey and Manage guidelines. Implementation of flag and avoid protection measures would result in no direct effects to this population ensuring compliance with required guidelines. Project activities would beneficially affect suitable habitat by reducing excessive fuels, thereby decreasing the risk of a future high severity fire event that would kill host trees and moisture requirements necessary for survival.

Tremiscus helvelloides:

There is one population of *T. helvelloides* located in an activity unit. *Tremiscus helvelloides* is a Category D species and thus to be in compliance with Survey and Manage guidelines high-priority populations must be protected. No high priority sites have been designated on the Forest and therefore all populations (still assumed alive) within project activity units and on the Forest will be considered high priority and subsequently protected for site persistence. Implementation of flag and avoid protection measures will result in no direct effects to this population as well as compliance with required guidelines. Prescribed burn treatments would have a beneficial indirect effect on these populations by reducing excessive fuels, thereby decreasing the risk of a future high severity fire event.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

There are three Survey and Manage Fungi species located in the Whites fire area:

Albatrellus flettii:

There is one *A. flettii* population located in an activity unit. *Albatrellus flettii* is a Category B species, and thus to be in compliance with Survey and Manage guidelines all known sites must be protected. Implementation of flag and avoid protection measures would result in no direct effects to this population ensuring compliance with required guidelines. Subsequently, there would be no likelihood of effecting this population. However, there is the likelihood that project activities would beneficially affect suitable habitat by reducing excessive fuels, thereby decreasing the risk of a future high severity fire event that would kill host trees and moisture requirements necessary for survival.

Phaeocollybia californica

There is one population of *P. californica* located in an activity unit. *Phaeocollybia californica* is a Category B species which require the protection of all known sites in order to be in compliance with Survey and Manage guidelines. Implementation of flag and avoid protection measures would result in no direct effects to this population ensuring compliance with required guidelines. Project activities would beneficially affect suitable habitat by reducing excessive fuels, thereby decreasing the risk of a future high severity fire event that would kill host trees and moisture requirements necessary for survival.

Phaeocollybia olivacea:

There is one population of *P. olivacea* located in an activity unit. *Phaeocollybia olivacea* is a Category E species which requires the protection of all known sites in order to be in compliance with Survey and Manage guidelines. Implementation of flag and avoid

protection measures would result in no direct effects to this population ensuring compliance with required guidelines. Project activities would beneficially affect suitable habitat by reducing excessive fuels, thereby decreasing the risk of a future high severity fire event that would kill host trees and moisture requirements necessary for survival.

Non-native Invasive Species

Project Area A: Beaver Fire

There are two moderate priority NNIS, *Centaurea solstitialis* and *Isatis tinctoria*, located within or adjacent to activity units in the Beaver fire area. These species are common across the Forest, and because of their widespread distribution they are typically given a lower priority than less common weeds and thus there is a high likelihood that there are populations of both *C. solstitialis and I. tinctoria* within the Project area that have not been mapped. Because these species are both located in activity units and along haul routes there is potential for spread through the disturbance of existing populations, activation of seed banks, and transport on equipment and vehicles. There is a **high** risk of spread of these two species within this subpart.

Project Area B: Happy Camp Complex Fire

There are seven non-native invasive species known to be present in or adjacent to project activity units within the Happy Camp Complex fire area. Of these, five are considered high priority species on the Forest: *Centaurea maculosa, Centaurea squarrosa, Cytisus scoparius, Euphorbia esula,* and *Lepidium latifolium*. Two are considered moderate priority species: *Centaurea solstitialis* and *Isatis tinctoria*.

Centaurea pratensis, Euphorbia esula and *Lepidium latifolium* populations occur in riparian areas located along river and stream banks and thus have a **very low** likelihood of being disturbed by Project activities, unless water drafting sites are located within known populations.

Because *Centaurea maculosa, Centaurea squarrosa, Cytisus scoparius, Centaurea solstitialis* and *Isatis tinctoria* are located in activity units and along haul routes there is potential for spread through the disturbance of existing populations, activation of seed banks, and transport on equipment and vehicles. There is a **high** risk of introduction and spread of these non-native invasive species within this subpart.

Project Area C: Whites Fire

There are three non-native invasive species present in or adjacent to project activity units within the Whites fire area. Of these, two are high priority species, *Centaurea maculosa* and *Cytisus scoparius*, and1 is a moderate priority species, *Isatis tinctoria*.

Because these species are located in activity units and along haul routes there is potential for weed spread through the disturbance of existing populations, activation of seed banks, and transport on equipment and vehicles. There is a **high** risk of introduction and spread of NNIS within this subpart.

All Project Areas (Project Area A, B, and C)

Direct Effects and Indirect Effects

The three fire-related project areas are already highly susceptible to NNIS infestation regardless of project activities due to the numerous NNIS infestations already present, the

vulnerability of the project area from the 2014 fires, and the high recreational use of the area. Project activities are not expected to increase invasion potential through the removal of canopy cover or duff layers because these elements were already lost during the 2014 fires.

In this alternative, the five risk factors combined have a **higher** potential for NNIS introduction and spread within the project area when compared to Alternative 1, due to the higher level of ground disturbing activities and increased vectors. Ground disturbance that includes the movement of soils contaminated with NNIS propagules, such as road and landing construction, grading, and treatment of watershed legacy sites (Happy Camp Complex fire area), would directly contribute to the spread of these infestations. With extensive infestations occurring along roadways, dispersal distance may be increased through transport on recreational or project related vehicles and equipment. Helicopter logging in areas infested with NNIS would increase the rate of spread because down drafts from rotor blades could displace weed seeds and disperse them over large distances. Water-tenders could also spread NNIS propagules through waterways when filling their tanks, allowing new infestations to establish downstream.

Project design features and mitigation measures would minimize these effects; however the risk would remain high due to the pre-existing condition. Continuation of the existing Forest weed monitoring and treatment would detect any new high-priority weed sites that may become established within the project area. Quickly treating these sites will limit new NNIS establishment.

Cumulative Effects

There are no cumulative effects for Threatened, Endangered, Proposed, or Candidate species, because there will be no direct or indirect effects.

All activities and factors listed in Appendix C of this EIS could have additional effects to Sensitive, Survey and Manage, and Non-native invasive species populations in the project area when added to Alternative 2. On-going and future foreseeable Forest projects have been and will be evaluated for effects to Sensitive, Survey and Manage and Non-native Invasive species. Project design features have been or will be incorporated into ongoing and future foreseeable Forest projects to limit their effects on Sensitive, Survey and Manage and Non-native Invasive species populations.

Sensitive species viability and persistence may be both beneficially and negatively affected by cumulative Forest projects. Project design features have been or will be incorporated into all on-going and future foreseeable Forest projects to limit negative effects on population viability trends. Consequently, the cumulative effect of Forest projects on Sensitive species would be expected to cause a short-term declining trend in population viability as individuals are lost, but would create a long-term increasing trend in population viability from the beneficial impacts of management activities on suitable habitat (i.e. fuel treatments, conifer planting, habitat creation, etc.).

Projects on private lands are not required to protect Sensitive botanical species, and subsequently actions on private lands may lead to a localized downward trend in population viability for these species. If that is the case, on-going and future foreseeable projects on private lands would have a declining cumulative effect on population viability trends for Sensitive species. However, without knowing how many species and/or populations are present, how many may be effected, and how project activities will affect

habitat conditions it is difficult to determine how potential effects from private actions would cumulatively influence population viability trends for Sensitive botanical species.

Forest compliance with Survey and Manage regulations requires pre-disturbance surveys for habitat-disturbing projects (Category A and C species only), and the management of known and high-priority sites for continued persistence. On-going and future foreseeable Forest projects would not cumulatively affect Survey and Manage botanical species and would comply with regulations if project design features structured to protect Survey and Manage populations and associated habitats are implemented. Additionally, on-going and future foreseeable projects on private land that affect Survey and Manage botanical species would have no effect on whether the Project is in compliance with these regulations since they pertain only to Forest occurrences and lands. Therefore, the Project would continue to comply with Survey and Manage regulations regardless of cumulative actions on Forest or private lands.

The five risk factors combined have a high potential for NNIS introduction and spread within the project area for Alternative 2, due to the high level of ground disturbing activities and increased vectors. Project design features and mitigation measures would minimize these effects; however the risk would remain high due to the pre-existing condition. On-going and future foreseeable projects would also implement mitigation measures aimed at reducing NNIS introduction and spread. Unfortunately, project design features cannot eliminate risk and it is expected that new NNIS infestations may still become established despite these mitigation measures. Consequently, on-going and future foreseeable Forest projects have the potential to elevate the cumulative risk of NNIS introduction and spread, resulting in a continued risk rating of high.

There are eight grazing allotments that overlap treatment units and may contribute to the long-distance dispersal of NNIS infestations in the project area. Livestock mainly transport NNIS propagules on their fur or through ingestion. Many NNIS have barbed or prickly seeds that readily adhere to animal fur and may potentially be transported long-distance and/or fall off in areas that are currently weed-free. Since many NNIS seeds can pass through the stomach unaffected, ingested seeds may also introduce NNIS to new areas once they are expelled. The added cumulative effects of grazing to Alternative 2 would likely increase the risk of NNIS introduction and spread. Projects on private lands are not required to mitigate for the spread and/or introduction of NNIS species which could also increase negative cumulative effects to NNIS populations and subsequently raise the risk rating.

The BAER team analyzed the project area and prescribed emergency treatments to help limit the introduction and spread of NNIS from the 2014 fires and suppression activities. Emergency treatments will take place in the first year following the fires (2015) and will include additional surveys for NNIS within the fire footprints and contingency areas as well subsequent hand removal of newly located infestations. These treatments will help control the introduction and spread of annual NNIS species, such as *Centaurea solstitialis.* Unfortunately, biennial and perennial species that have a rosette life stage are difficult to locate in the first year because of their short stature, and may not be found during these surveys. The Forest Noxious Weed Detection and Treatment program would also continue to survey for and treat new populations that may be introduced or spread onto Forest lands through on-going and future foreseeable Forest and Private land

projects; however, the cumulative risk for the introduction and spread of NNIS would remain high due to the particularly vulnerable condition of the habitat.

Alternative 3

Threatened, Endangered, Proposed and Candidate Plant Species

All Project Areas (Project Area A, B, and C)

Direct, Indirect, and Cumulative Effects

Alternative 3 will have the same direct, indirect, and cumulative effects to Threatened, Endangered, Proposed, and Candidate botanical species as Alternative 2 and the same project Design Features would be incorporated to mitigate those effects.

Sensitive Vascular Plants, Bryophytes, Lichens, and Fungi

All Project Areas (Project Area A, B, and C)

Direct, Indirect, and Cumulative Effects

Alternative 3 will have the same direct, indirect, and cumulative effects to Sensitive botanical species as Alternative 2 and the same project Design Features would be incorporated to mitigate those effects. Additionally, the added retention of snag clumps and coarse woody debris under this Alternative would indirectly benefit habitat for Sensitive bryophytes and fungi by mitigating effects to microclimate and providing substrate.

Survey and Manage Vascular Plants, Bryophytes, and Fungi

All Project Areas (Project Area A, B, and C)

Direct, Indirect, and Cumulative Effects

Alternative 3 will have the same direct, indirect, and cumulative effects to Survey and Manage species as Alternative 2 and will incorporate the same project Design Features to mitigate those effects. Additionally, the added retention of snag clumps and coarse woody debris under this Alternative would indirectly benefit habitat for Survey and Manage bryophytes and fungi by mitigating effects to microclimate and providing substrate.

Non-native Invasive Species

All Project Areas (Project Area A, B, and C)

Direct, Indirect, and Cumulative Effects

Direct, indirect, and cumulative effects from these alternatives to the spread and introduction of NNIS infestations would be the same as for Alternative 2 and the same Project Design Features would be incorporated to mitigate those effects.

Alternative 4

Threatened, Endangered, Proposed and Candidate Plant Species

All Project Areas (Project Area A, B, and C)

Direct, Indirect, and Cumulative Effects

Alternative 4 will have the same direct, indirect, and cumulative effects to Threatened, Endangered, Proposed, and Candidate botanical species as Alternative 2 and the same project Design Features would be incorporated to mitigate those effects.

Sensitive Vascular Plants, Bryophytes, Lichens, and Fungi

All Project Areas (Project Area A, B, and C)

Direct, Indirect, and Cumulative Effects

Fewer populations of *E. hirtellum* would be located within project activity units under this Alternative. Remaining populations will have the same direct, indirect, and cumulative effects as Alternative 2 and the same project Design Features would be incorporated to mitigate those effects.

Alternative 4 will have the same direct, indirect, and cumulative effects to Sensitive bryophytes, lichens, and fungi as Alternative 2 and the same project Design Features would be incorporated to mitigate those effects. Additionally, the added retention of snag clumps and coarse woody debris under Alternative 4 would indirectly benefit habitat for Sensitive bryophytes and fungi by mitigating effects to microclimate and providing substrate.

Survey and Manage Vascular Plants, Bryophytes, and Fungi

All Project Areas (Project Area A, B, and C)

Direct, Indirect, and Cumulative Effects

Alternative 4 will have the same direct, indirect, and cumulative effects to Survey and Manage species as Alternative 2 and will incorporate the same project Design Features to mitigate those effects. Additionally, the added retention of snag clumps and coarse woody debris under Alternative 4 would indirectly benefit habitat for Survey and Manage bryophytes and fungi by mitigating effects to microclimate and providing substrate.

Non-native Invasive Species

All Project Areas (Project Area A, B, and C)

Direct, Indirect, and Cumulative Effects

Direct, indirect, and cumulative effects from these alternatives to the spread and introduction of NNIS infestations would be the same as for Alternative 2 and the same Project Design Features would be incorporated to mitigate those effects.

Alternative 5

Threatened, Endangered, Proposed and Candidate Plant Species

All Project Areas (Project Area A, B, and C)

Direct, Indirect, and Cumulative Effects

Alternative 5 will have the same direct, indirect, and cumulative effects to Threatened, Endangered, Proposed, and Candidate botanical species as Alternative 2 and the same project Design Features would be incorporated to mitigate those effects.

Sensitive Vascular Plants, Bryophytes, Lichens, and Fungi

All Project Areas (Project Area A, B, and C)

Direct, Indirect, and Cumulative Effects

Alternative 5 will have the same direct, indirect, and cumulative effects to Sensitive botanical species as Alternative 2 and will incorporate the same Project Design Features to mitigate those effects.

Survey and Manage Vascular Plants, Bryophytes, and Fungi

All Project Areas (Project Area A, B, and C)

Direct, Indirect, and Cumulative Effects

Alternative 5 will have the same direct, indirect, and cumulative effects to Survey and Manage botanical species as Alternative 2 and will incorporate the same Project Design Features to mitigate those effects.

Non-native Invasive Species

All Project Areas (Project Area A, B, and C)

Direct, Indirect, and Cumulative Effects

Direct, indirect, and cumulative effects from this alternative to the spread and introduction of NNIS infestations would be slightly less than for Alternative 2, because of the reduction in acres treated, resulting in less disturbed ground and chance of introduction of new species. The decrease in risk is very minimal and not enough to lower the risk rating from high. The same Project Design Features would be incorporated to mitigate effects.

Alternative 2 Modified

Threatened, Endangered, Proposed and Candidate Plant Species

All Project Areas (Project Area A, B, and C)

Direct, Indirect, and Cumulative Effects

Alternative 2 Modified will have the same direct, indirect, and cumulative effects to Threatened, Endangered, Proposed, and Candidate botanical species as Alternative 2 and the same project Design Features would be incorporated to mitigate those effects.

Sensitive Vascular Plants, Bryophytes, Lichens, and Fungi

All Project Areas (Project Area A, B, and C)

Direct, Indirect, and Cumulative Effects

Alternative 2 Modified will have the same direct, indirect, and cumulative effects to Sensitive botanical species as Alternative 2 and will incorporate the same Project Design Features to mitigate those effects.

Survey and Manage Vascular Plants, Bryophytes, and Fungi

All Project Areas (Project Area A, B, and C)

Direct, Indirect, and Cumulative Effects

Alternative 2 Modified will have the same direct, indirect, and cumulative effects to Survey and Manage botanical species as Alternative 2 and will incorporate the same Project Design Features to mitigate those effects.

Non-native Invasive Species

All Project Areas (Project Area A, B, and C)

Direct, Indirect, and Cumulative Effects

Alternative 2 Modified will have the same direct, indirect, and cumulative effects on the risk of spread and introduction of non-native invasive species (NNIS) as Alternative 2 and the same Project Design Features will be incorporated to mitigate effects.

Alternative 3 Modified

Threatened, Endangered, Proposed and Candidate Plant Species

All Project Areas (Project Area A, B, and C)

Direct, Indirect, and Cumulative Effects

Alternative 3 Modified will have the same direct, indirect, and cumulative effects to Threatened, Endangered, Proposed, and Candidate botanical species as Alternative 2 and the same project Design Features would be incorporated to mitigate those effects.

Sensitive Vascular Plants, Bryophytes, Lichens, and Fungi

Project Area A: Beaver Fire

Direct, Indirect, and Cumulative Effects

Alternative 3 Modified will have the same direct, indirect, and cumulative effects to Sensitive botanical species as Alternative 2 and will incorporate the same Project Design Features to mitigate those effects.

Project Area B: Happy Camp Complex Fire

Direct, Indirect, and Cumulative Effects

Alternative 3 Modified will have the same direct, indirect, and cumulative effects to *Erythronium hendersonii* and *Thermopsis robusta* populations as Alternative 2 and will incorporate the same Project Design Features to mitigate those effects. The likelihood of effects from Alternative 3 Modified to *Eriogonum hirtellum* populations will be reduced because fewer populations are located within activity units (

Table 3-22). The direct, indirect, and cumulative effects to populations still located within activity units will be the same as for Alternative 2 and the same Project Design Features will be incorporated to protect species viability.

Project Area C: Whites Fire

Direct, Indirect, and Cumulative Effects

Alternative 3 Modified will have the same direct, indirect, and cumulative effects to Sensitive botanical species as Alternative 2 and will incorporate the same Project Design Features to mitigate those effects.

Survey and Manage Vascular Plants, Bryophytes, and Fungi

Project Area A: Beaver Fire

Direct, Indirect, and Cumulative Effects

There would no longer be any effects to *Ptilidium californicum* populations in the Beaver Fire area under Alternative 3 Modified (Table 3-23). The direct, indirect, and cumulative effects to Survey and Manage botanical populations still located within activity units will be the same as for Alternative 2 and the same Project Design Features will be incorporated to protect species viability.

Project Area B: Happy Camp Complex Fire

Direct, Indirect, and Cumulative Effects

The likelihood of effects from Alternative 3 Modified to *Cypripedium fasciculatum* populations would be reduced in the Happy Camp Complex fire area because fewer populations are located within activity units (Table 3-23). The direct, indirect, and cumulative effects to Survey and Manage botanical populations still located within activity units will be the same as for Alternative 2 and the same Project Design Features will be incorporated to protect species viability.

Project Area C: Whites Fire

Direct, Indirect, and Cumulative Effects

The likelihood of effects from Alternative 3 Modified to *Cypripedium montanum* populations would be reduced in the Whites fire area because fewer populations are located within activity units (Table 3.13). The direct, indirect, and cumulative effects to Survey and Manage botanical populations still located within activity units will be the same as for Alternative 2 and the same Project Design Features will be incorporated to protect species viability.

Non-native Invasive Species

Project Area B: Beaver Fire

Direct, Indirect, and Cumulative Effects

Direct, indirect, and cumulative effects from Alternative 3 Modified on the risk of spread and introduction of NNIS infestations within the Beaver fire area would be the same as for Alternative 2, except fewer populations of *Centaurea solstitialis* and *Isatis tinctoria* would be located within project activity units (Table 3-24). The decrease in risk will be very minimal and not enough to lower the risk rating from **high** due to the highly vulnerable condition of the habitat**.** The same Project Design Features will be incorporated to mitigate effects.

Project Area B: Happy Camp Complex Fire

Direct, Indirect, and Cumulative Effects

Direct, indirect, and cumulative effects from Alternative 3 Modified on the risk of spread and introduction of NNIS infestations within the Happy Camp Complex fire area would be the same as for Alternative 2, except fewer populations of *Euphorbia esula* (leafy spurge) would be located within project activity units (Table 3-24). The decrease in risk will be very minimal and not enough to lower the risk rating from **high** due to the highly vulnerable condition of the habitat. The same Project Design Features will be incorporated to mitigate effects.

Project Area C: Whites Fire

Direct, Indirect, and Cumulative Effects

Direct, indirect, and cumulative effects from Alternative 3 Modified on the risk of spread and introduction of NNIS infestations within the Whites fire area would be the same as for Alternative 2, except fewer populations of *Centaurea maculosa* and *Isatis tinctoria* would be located within project activity units (Table 3-24). The decrease in risk will be very minimal and not enough to lower the risk rating from **high** due to the highly vulnerable condition of the habitat. The same Project Design Features will be incorporated to mitigate effects.

Comparison of Effects

Table 3-25: Summary of Effects by analysis indicator for the Beaver Fire Area

Indicator	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Mod Alt. 2	Mod Alt. 3
Likelihood of jeopardizing the continued existence of Threatened, Endangered, Proposed, or Candidate species populations	No likelihood of jeopardizing continued existence	No likelihood of jeopardizing continued existence	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2
Trend of Sensitive species population viability	Static trend, no known populations present	Static trend, no known populations present	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2
Compliance with Survey & Manage guidelines as defined by the 2001 ROD	Compliant	Compliant following implementation of project design feature's	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2
Risk of introducing and/or spreading non-native invasive species	High	High	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2

Table 3-26: Summary of Effects by analysis indicator for the Happy Camp Fire Area

Indicator	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Mod Alt. 2	Mod Alt. 3
Likelihood of jeopardizing the continued existence of Threatened, Endangered, Proposed, or Candidate species populations	No likelihood of jeopardizing continued existence	No likelihood of jeopardizing continued existence	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2
Sensitive species viability: *Eriogonum hirtellum*	Static trend in population viability	Static trend in population viability	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2
Sensitive species viability: *Erythronium hendersonii*	Declining trend in population viability	Increasing trend in population viability	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2
Sensitive species viability: *Thermopsis robusta*	Declining trend in population viability	Short term increasing trend in population viability	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2
Compliance with Survey & Manage guidelines as defined by the 2001 ROD	Compliant	Compliant following implementation of project design feature's	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2
Risk of introducing and/or spreading non-native invasive species	High	High	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2

Table 3-27: Summary of Effects by analysis indicator for the Whites Fire Area

Indicator	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Mod Alt. 2	Mod Alt. 3
Likelihood of jeopardizing the continued existence of Threatened, Endangered, Proposed, or Candidate species populations	No likelihood of jeopardizing continued existence	No likelihood of jeopardizing continued existence	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2
Trend of Sensitive species population viability	Static trend, no known populations present	Static trend, no known populations present	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2
Compliance with Survey & Manage guidelines as defined by the 2001 ROD	Compliant	Compliant following implementation of project design feature's	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2
Risk of introducing and/or spreading non-native invasive species	High	High	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2	Same as Alt 2

Determination of Effects

Alternative 1

Under Alternative 1, it is my determination that the Project **will not affect** the Sensitive plant species: *Eriogonum hirtellum, Erythronium hendersonii, and Thermopsis robusta.*

Alternative 2

Under Alternative 2, it is my determination that the Project **may affect individuals, but is not likely to result in a trend toward federal listing or a loss of viability** *for* the Sensitive plant species: *Eriogonum hirtellum, Erythronium hendersonii, and Thermopsis robusta.*

Alternative 3

Under Alternative 3, it is my determination that the Project **may affect individuals, but is not likely to result in a trend toward federal listing or a loss of viability** *for* the Sensitive plant species: *Eriogonum hirtellum, Erythronium hendersonii, and Thermopsis robusta.*

Alternative 4

Under Alternative 4, it is my determination that the Project **may affect individuals, but is not likely to result in a trend toward federal listing or a loss of viability** *for* the Sensitive plant species: *Eriogonum hirtellum, Erythronium hendersonii, and Thermopsis robusta.*

Alternative 5

Under Alternative 5, it is my determination that the Project **may affect individuals, but is not likely to result in a trend toward federal listing or a loss of viability** *for* the Sensitive plant species: *Eriogonum hirtellum, Erythronium hendersonii, and Thermopsis robusta.*

Alternative 2 Modified

Under Modified Alternative 2, it is my determination that the Project **may affect individuals, but is not likely to result in a trend toward federal listing or a loss of viability** *for* the Sensitive plant species: *Eriogonum hirtellum, Erythronium hendersonii, and Thermopsis robusta.*

Alternative 3 Modified

Under Modified Alternative 3, it is my determination that the Project **may affect individuals, but is not likely to result in a trend toward federal listing or a loss of viability** *for* the Sensitive plant species: *Eriogonum hirtellum, Erythronium hendersonii, and Thermopsis robusta.*

Compliance with Law, Regulation, Policy, and the Forest Plan

Threatened, Endangered, and Sensitive Botanical Species:

The Project complies with the Endangered Species Act of 1973, as amended, in the preparation of a Biological Assessment; Forest Service Policy (FSM 2670), and Forest Plan Standards and Guidelines for Sensitive plant species have been met by managing populations for continued viability (see the Forest Plan consistency checklist in the project record for compliance with the Forest Plan).

Survey and Manage Plants:

The Project complies with the 2001 Record of Decision and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines by preparing an assessment and documenting effects (USDA 2014a).

Non-native Invasive Species:

The Project complies with Forest Service Manual 2900 and Forest Plan Standards and Guidelines for Non-native invasive species by preparing the Noxious Weed Risk Assessment, and providing Project Design Features to minimize effects.

Range

The purpose of this section is to describe the condition of range resources in the Project area and how rangeland resources may be affected by the proposed action and alternatives for this project.

Methodology

The method used to determine effects on rangeland resources included a qualitative comparison of each alternative's likelihood of affecting the amount of forage available for livestock use and rangeland condition. Existing rangeland conditions were determined through field visits, monitoring data, and historical records for each allotment.

To describe the rangeland resources in the project area and analyze alternatives, the following Klamath National Forest Geographic Information System data files were used:

- Allotment and unit/pasture boundaries;
- Fire intensity; and
- Project alternative maps.

Condition and trend of rangelands is determined by monitoring "key areas" on upland, meadow, and riparian rangeland areas. Key areas are a small ecological site or plant community that is responsive to management actions and indicative of the larger ecological site or plant community they are intended to represent (USDI 1999b). Condition and trend monitoring protocols employed include Best Management Practices Effectiveness Program (BMPEP), Photo Point Monitoring, and Rooted Frequency.

Following the 2014 fires, ocular observations were made to ground truth the fire intensity maps, assess condition of key areas, and estimate vegetation regrowth potential for forage.

Analysis Indicators

The effects of the project on rangeland resources are evaluated using two analysis indicators:

- Amount of Available Forage
- Rangeland Condition

Amount of forage and rangeland condition are the biggest impact to allotment viability. Adequate forage is needed to sustain cattle grazing without exceeding rangeland

standards and guidelines and rangeland condition can indicate if grazing is a proper use of the land.

Spatial and Temporal Context

The spatial limits of this analysis are limited to the grazing allotments which fall within the project area. This allows for analysis of the total effect to all rangeland resources associated with the project. Due to the nature of grazing permits, effects are measured in the short term of 10 years or less and long term of 20 years to consider trend of the rangeland resource.

Affected Environment

The project encompasses portions of the East Beaver, Dry Lake, Horse Creek, Johnny/Seiad, South Klamath, Big Ridge, Scott Bar Mountain, Marble Valley, Etna Creek, and South Russian allotments and includes all areas on the Lake Mountain and Middle Tompkins allotments. Allotment names, status, use period, and permitted cow/calf pair numbers are provided in Table 3-28.

Table 3-28: Allotments within the project boundary

Area	Allotment Name	Status	Use Period and Permitted Number
Beaver Fire	East Beaver	Active	4/1-6/15, 44 pairs 6/16-10/30, 250 pairs
Beaver Fire	Dry Lake	Active	4/15-5/09, 116 pairs 5/10-10/15, 170 pairs
Beaver Fire	Horse Creek	Active	4/15-10/15, 101 pairs
Beaver Fire	Johnny/Seiad	Vacant	N/A
Beaver Fire	South Klamath	Vacant	N/A
Happy Camp Complex	Scott Bar Mountain	Vacant	N/A
Happy Camp Complex	Lake Mountain	Active	7/15-10/15, 25 pairs
Happy Camp Complex	Middle Tompkins	Vacant	Currently being analyzed
Happy Camp Complex	Big Ridge	Active	7/15-10/15, 120 pairs
Happy Camp Complex	Marble Valley	Active	7/15-10/15, 35 pairs
Whites Fire	Etna Creek	Active	7/15-10/15, 54 pairs
Whites Fire	South Russian	Active	7/15-10/15, 40 pairs

Seiad/Johnny, South Klamath, and Scott Bar Mountain will not be discussed further as they are vacant and are not expected to be restocked within the next 10 years. Middle Tompkins is also vacant; however, it is included because it is currently undergoing analysis to update the allotment management plan. Although Big Ridge is within the project boundary, it will not be discussed further as all grazing activities are in wilderness and therefore treatments will not overlap with rangeland resources.

Allotment Monitoring

Rangeland condition assessment methods most commonly used on the Forest are Rooted Frequency Plots (USDI, 1999a) in key areas. Table 3-29 shows the most current reading of rooted frequency plots within the affected allotments.

Table 3-29: Condition based on Rooted Frequency Plots

Allotment	Plot Name	Year of Last Reading	Vegetation Type	Vegetation Condition[1]	Overall Condition[2]	Ecological Condition[3]
Dry Lake	KLA1402-Dead Cow*	2014	Moist Meadow	Fair	Good	Satisfactory
East Beaver	KLA9904-Trapper Creek*	2009	Wet Meadow	Moderate	Moderate	Satisfactory
East Beaver	KLA0202-Trapper Creek*	2007	Dry Meadow	Moderate	Moderate	Satisfactory
Horse Creek	No Frequency Plots Established					
Lake Mountain	KLA1301-Kuntz Creek	2013	Dry Meadow	Moderate	Moderate	Satisfactory
Middle Tompkins	KLA1302-Tyler Meadows	2013	Moist Meadow	Moderate	High	Satisfactory
Middle Tompkins	KLA1201-Middle Creek Meadows	2012	Moist Meadow	Moderate	Moderate	Satisfactory
Marble Valley	KLA0103-Big Rock*	2006	Moist Meadow	Moderate	Low	Unsatisfactory
Etna Creek	KLA1401-Meeks Meadow*	2014	Moist Meadow	Good	Good	Satisfactory
South Russian	No Frequency Plots Established					

*Plot is not within the Westside Project boundary but is the nearest key area within the allotment that is representative of rangeland conditions.

[1]Vegetation condition: There are two ranking scales displayed in the Table because region 5 recently changed their scoring system for rangeland plots. High, Moderate, and Low refer to high seral, mid seral, and early seral respectively. The terms poor, fair, and excellent are the current classifications for rangeland condition.

[2]Overall condition is based upon hydrologic, vegetative, and soil conditions

[3]Ecological condition simply summarizes overall condition as either satisfactory or non-satisfactory

As outlined in Table 3-29, most rangeland key areas are in satisfactory condition. Marble Valley is in unsatisfactory condition due to shallow rooting depth and bare soil, which can put rangeland at risk of undesirable plant invasion. However, the vegetation in the Marble Valley area had been maintaining mid-seral species since 2001 and reevaluation of this site is expected to occur in 2015. Conditions within the South Russian and Horse Creek areas have been measured by other methods, thus no frequency plots have been established to date.

Riparian conditions on the Forest allotments are assessed through the BMPEP (Table 3-30). The grazing protocol for the Pacific Southwest Region (Region 5) of the Forest Service records herbaceous and woody utilization levels, stream-bank disturbance, ground cover, bank angle, riparian and upslope erosion, and riparian vegetation condition.

Table 3-30: Most current BMPEP rating for each allotment within the project area

Allotment Name	Key Area	Year Evaluated	Met Implementation Standards?	Met Effectiveness Criteria?
Dry Lake	Dead Cow*	2009	Yes	Partial
East Beaver	West Long John*	2008	Yes	Yes
Horse Creek	Salt Creek*	2012	Yes	Yes
Lake Mountain	Lookout Spring	2013	Partial	Partial
Middle Tompkins	Tyler Meadows	2008	Yes	Yes
Marble Valley	South Fork Kelsey	2009	Yes	Yes
Etna Creek	Meeks Meadow	2010	Partial	Partial
South Russian	Lees Meadow	2013	Yes	Yes

Allotments that met both implementation and effectiveness BMPEP criteria demonstrate that grazing is not degrading water resources in the allotment. Changes in grazing management are recommended and implemented for sites that partially meet the criteria. In the three allotments that partially met effectiveness criteria, trampling had caused stream-bank vulnerabilities or exposed soil at the edges of ponds. These disturbances were localized and did not cause impacts to beneficial uses such as fisheries and wildlife use.

2014 Wildfire

During the summer of 2014, the Beaver, Happy Camp Complex, and Whites fires burned about 200,000 acres of land. As a result, the project was developed in response to landscape-level changes to forested habitat resulting from the 2014 wildfires on the Forest. Table 3-18 outlines the levels of burn mortality by acre for each allotment as a result of these fires.

Table 3-31: Fire intensity in Allotments

Allotment Name	Total Allotment Acres	1-10 %	10-25 %	25-50 %	50-75 %	75-90 %	>90 %	Total Burned Acres	Percentage of allotment acres burned
Dry Lake	41,501	2962	1704	2031	1633	1046	7890	17,266	42 %
East Beaver	67,042	1941	982	920	685	399	2567	7,494	11 %
Horse Creek	37,055	401	191	188	147	94	1017	2,038	6 %
Lake Mountain	9,655	1334	724	838	686	455	2735	6,772	70 %
Middle Tompkins	14,736	3204	1471	1344	795	420	1759	8993	61 %
Marble Valley	8,136	7	2	2	0	0	0	11	<1 %
Etna Creek	18,903	351	112	94	63	48	253	921	5 %
South Russian	13,200	647	275	269	215	149	796	2351	18 %
Total	210,228	10,847	5,461	5,686	4,224	2,611	17,017	45,846	21 %

Field visits performed after the fire revealed that burning was patchy and irregular throughout the allotments. The fire severity drifted toward the extreme with most acres either being in the 1-10 percent mortality category or over 90 percent mortality category. The most intense burning occurred where dense closed canopy forest dominated the landscape. Herbaceous forest understory and shrublands were burned in a patchy manner, but because this forage component is widely scattered and separated, effects could not be comprehensively assessed at time of inspection. Direct effects of the burn on meadows were minimal. Most meadows were either unburned or lightly burned in some areas. In general, the fire did not produce serious mortality on primary rangeland to the point of altering existing conditions.

To allow for post-fire recovery of vegetation, livestock grazing areas will be modified within the project area where necessary. For the Middle Tompkins allotment, livestock grazing permits will not be authorized until 2016 or later. Lake Mountain and Dry Lake allotments will be monitored prior to the 2015 grazing season to determine if vegetation has recovered enough to support grazing and grazing won't hinder tree establishment. If grazing is allowed, animals may be turned out at a later date and/or the season may be shortened in the fall to allow for optimal vegetation recovery and the most beneficial use of livestock grazing. These modifications for post-fire livestock use of rangelands will be variable based to rangeland conditions and climate as observed by rangeland managers.

Environmental Consequences

Many of the proposed activities overlap spatially so the footprint on the landscape will be less than the acres proposed under each individual treatment: this is displayed as the number of "dissolved" acres. (For the individual acres proposed for each allotment, please see the Rangeland Resource Report.) Table 3-32 displays an updated Table for the percentage of allotment acres being treated under Alternative 2, as this alterative proposes the greatest number of acres under treatment. Percentage of allotment acres for the Alternative 2 Modified and Alternative 3 Modified has also been included as a comparison.

Table 3-32: Approximate acres of proposed activity with allotment boundaries for Alternative 2

Allotment Name (Fire area)	Forest Service Acres within allotment	Total dissolved acres	Percentage of allotment acres being treated
Dry Lake (Beaver Fire)	37,457	4,285	11%
East Beaver (Beaver Fire)	41,607	1,157	3%
Horse Creek (Beaver Fire)	23,224	504	2%
Total for Beaver Fire Allotments	102,288	5,946	6%
Lake Mountain (Happy Camp Complex)	9,655	3,150	33%
Marble Valley (Happy Camp Complex)	8,136	103	1%
Middle Tompkins (Happy Camp Complex)	14,736	4,528	31%
Total For Happy Camp Complex Allotments	32,527	7,781	24%
Etna Creek (Whites Fire)	17,254	188	1%

Allotment Name (Fire area)	Forest Service Acres within allotment	Total dissolved acres	Percentage of allotment acres being treated
South Russian (Whites Fire)	12,277	34	0.3%
Total for Whites Fire Allotments	29,531	222	0.8%

Table 3-33: Approximate acres of proposed activity with allotment boundaries for Alternative 2 Modified

Allotment Name (Fire area)	Forest Service Acres within allotment	Total dissolved acres	Percentage of allotment acres being treated
Dry Lake (Beaver Fire)	37,457	3,993	11%
East Beaver (Beaver Fire)	41,607	1,157	3%
Horse Creek (Beaver Fire)	23,224	504	2%
Total for Beaver Fire Allotments	102,288	5,654	6%
Lake Mountain (Happy Camp Complex)	9,655	2,939	30%
Marble Valley (Happy Camp Complex)	8,136	103	1%
Middle Tompkins (Happy Camp Complex)	14,736	4,487	30%
Total For Happy Camp Complex Allotments	32,527	7,529	23%
Etna Creek (Whites Fire)	17,254	188	1%
South Russian (Whites Fire)	12,277	34	0.3%
Total for Whites Fire Allotments	29,531	222	0.8%

Table 3-34: Approximate acres of proposed activity with allotment boundaries for Alternative 3 Modified

Allotment Name (Fire area)	Forest Service Acres within allotment	Total dissolved acres	Percentage of allotment acres being treated
Dry Lake (Beaver Fire)	37,457	4091	11%
East Beaver (Beaver Fire)	41,607	1198	3%
Horse Creek (Beaver Fire)	23,224	478	2%
Total for Beaver Fire Allotments	102,288	5767	6%
Lake Mountain (Happy Camp Complex)	9,655	2562	27%
Marble Valley (Happy Camp Complex)	8,136	0	0%
Middle Tompkins (Happy Camp Complex)	14,736	3366	23%
Total For Happy Camp Complex Allotments	32,527	5928	18%
Etna Creek (Whites Fire)	17,254	168	1%
South Russian (Whites Fire)	12,277	34	0.3%
Total for Whites Fire Allotments	29,531	202	.07%

Alternative 1

Direct Effects and Indirect Effects

Under Alternative 1, no treatments are proposed within the Project area. As a result, there will be no direct effects to rangeland resources, and rangelands will slowly heal from wildfire effects. New areas of transitory rangeland will likely be available for livestock and wildlife where moderate or low severity burns occurred. Not implementing project activities such as salvage harvest, hazardous fuels treatments, roadside hazard treatments,

and site preparation, planting and release may have the indirect effects of limiting livestock access to forage in the short term and could make livestock management (turnout, moving, and gathering cattle) dangerous for permittees. Areas that were severely burned will be susceptible to weed invasion which may have the indirect effect of lower productive rangeland conditions in the long term. However, the burn may also allow rangelands to flourish and expand with more water and sunlight available to vegetation.

Project Area A: Beaver Fire

The effects of Alternative 1 for the Beaver Fire area are the same as for the other fire areas as described in the environmental consequences section of the Rangeland Resource report.

Project Area B: Happy Camp Complex

The effects of Alternative 1 for the Happy Camp Fire area are the same as for the other fire areas as described in the Rangeland Resource report.

Project Area C: Whites Fire

The effects of Alternative 1 for the Whites Fire area are the same as for the other fire areas as described in the Rangeland Resource report.

Cumulative Effects

This alternative will not add project-related incremental effects to the effects of current or future grazing projects, because no management activities are proposed. Grazing, projects on private lands and recreational activities will not adversely affect the availability of rangeland forage, and rangeland conditions will continue to fluctuate in response to climatic conditions, wildfire, and grazing management. The stated effects apply to each of the fire areas: Beaver Fire, Happy Camp Complex, and Whites Fire

Alternative 2

The description of treatments for all alternatives is provided in Chapter 2.

Salvage harvest, hazardous fuels treatment, roadside hazard treatments, and site preparation, planting, and release activities are planned as proposed treatments within the allotment boundaries. The proposed activities have been reviewed and the will have minimal effects on rangeland resources because the proposed activities do not often overlap the same areas where cattle graze. Most salvage harvest and planting activities take place on steeper slopes which cattle rarely, if ever, use. Capable rangeland, or areas that are accessible to cattle and produce forage, are generally limited to a 40 percent or less slope during rangeland capability analysis on the Forest (Holechek 1989; USDA Forest Service 2001). Project activities are also planned in timbered vegetative communities that are not likely to be able to produce substantial forage because of heavy canopy cover and lack of a seedbank.

Efforts will be taken to schedule grazing in areas that are not actively being treated so as to minimize stress to livestock and protect young seedlings. Permittees will be notified through Annual Operating Instructions of areas where harvesting, burning activity, and/or grazing restrictions will occur that could affect their permit. Additionally, Range project

design features have been created to protect rangeland improvements such as cattle guards and corrals.

For a description of alternatives and a list of project design features, see Table 2-42 of Chapter 2.

Direct Effects and Indirect Effects

Where capable rangeland overlaps with salvage logging or fuels treatments, the Project will likely provide new areas of transitory range. This will temporarily (5-10 years) increase the amount of forage available for livestock and wildlife; encourage animals to disperse on the landscape, and decrease grazing pressure on primary rangelands. Heavy equipment operations during treatment will likely increase the chance of weed dispersal; however; noxious weed project design features (NNIS-1 through NNIS-5) will be in place and provide for proper mitigation. Livestock management will also be safer for permittees after hazardous trees have been removed. Rangeland conditions in the Beaver Fire Area should not be negatively affected as a result of Alternatives 2, 3, and 4, as a Range project design feature (Range-3) protects allotment meadows.

Project Area A: Beaver Fire

Between the draft and final EIS there were dropped units and modifications to fuels and harvest units which slightly reduces the potential new transitory forage available for permitted cattle. Much of the treated area will be replanted so that reduces the available forage even more. Since treatments are limited to six percent or less of the allotment acres, only a small portion of the allotments will produce additional forage. All other effects are similar to those stated above.

Project Area B: Happy Camp Complex

Very little has changed in the unit boundaries for the Happy Camp Complex allotments. Harvest and fuels treatments will open up forest areas and potentially increase forage within 24 percent or less of the allotment acres. All other effects will be similar to those stated above.

Project Area C: Whites Fire

About 30 acres of fuels treatments have been removed but the number of acres being treated in the allotment areas as a whole are negligible at less than one percent. In addition, most work will be done around pre-existing roads, where there are few rangeland resources. Treatments will only produce a minimal amount of open areas which may produce additional forage. Rangeland condition will be largely unaffected as there is little overlap between rangelands and units that will require heavy equipment. Mitigation measures for weeds and rangelands will continue to pertain to this alternative to further ensure rangeland condition is protected.

Cumulative Effects

Adding the effects of this alternative to the ongoing and reasonably foreseeable future actions identified in Alternative 1 will not have substantial cumulative effects to range. There will be a slight increase of transitory range available for livestock and wildlife foraging and rangeland conditions will continue to fluctuate in response to climatic conditions, wildfire, and grazing management. The stated effects apply to each of the fire areas: Beaver Fire, Happy Camp Complex, and Whites Fire.

Alternative 3

Direct Effects and Indirect Effects

Project Area A: Beaver Fire

Alternative 3 does not propose any salvage units which would slightly decrease the amount of available forage within the allotment areas. Other effects would be similar to those in Alternative 2.

Project Area B: Happy Camp Complex

Effects are similar to that of Alternative 2.

Project Area C: Whites Fire

Effects are similar to those identified for Alterative 2.

Cumulative Effects

The cumulative effects are similar to those stated for Alternative 2

Alternative 4

Direct Effects and Indirect Effects

Project Area A: Beaver Fire

Effects are similar to that of Alternative 2.

Project Area B: Happy Camp Complex

Effects are similar to that of Alternative 2.

Project Area C: Whites Fire

Effects are similar to those identified for alterative 2.

Cumulative Effects

The cumulative effects are similar to those stated for Alternative 2

Alternative 5

Direct Effects and Indirect Effects

Project Area A: Beaver Fire

Alternative 5 proposes approximately 1,000 more acres of fuels treatments in the Beaver Fire area than the other alternatives. This would open up forest understory and renew herbaceous and shrubby growth which would provide more forage for cattle and wildlife. Other effects would be similar to those described for Alternative 2.

Project Area B: Happy Camp Complex

As compared to Alternative 2, there are more than 1,000 acres less proposed for both salvage logging and site preparation and planting. These effects seem to have a cancellation effect on each other as the logging would leave standing timber in an area that would otherwise be a potential forage source; however, the decrease in planting units would leave openings in the forest that may be available as forage in the future. There would be fewer disturbances from heavy equipment which may reduce the potential spread of weeds into rangeland areas.

Project Area C: Whites Fire

Effects of Alternative 5 are identical to that described for Alternative 2.

Cumulative Effects

Cumulative effects will be identical to those of Alternative 2.

Alternative 2 Modified

Direct Effects and Indirect Effects

Project Area A: Beaver Fire

Alternative 2 Modified will reduce proposed harvesting treatments to 333 acres, less than half of what Alternative 2 proposes. Acres of fuels treatments, site preparation and planting acres, and roadside hazard treatment areas will remain at similar levels which will slightly increase the amount of available forage, but not as much as Alternatives 2, 4, and 5. Less salvage units may mean some rangelands are harder to access as they will not be easily traversed by cattle when trees have fallen and will be a hazard for permittees. Rangeland Condition will not be affected as mitigation measures are in place that will protect meadows and reduce the risk of week spread.

Project Area B: Happy Camp Complex

Effects are similar to that of Alternative 2.

Project Area C: Whites Fire

Effects are identical to that of Alternative 2.

Cumulative Effects

Cumulative effects will be similar to those of Alternative 2.

Alternative 3 Modified

Direct Effects and Indirect Effects

Project Area A: Beaver Fire

Alternative 3 Modified will reduce proposed harvesting treatments to zero acres within allotment boundaries, and reduce the amount of open canopy that could potentially offer transitory range. Fuels treatments would be increased by over 1,000 acres as compared to Alternative 2. Rangeland will respond favorably to fuels treatments by allowing sparse herbaceous vegetation to grow within the understory but will produce fewer pounds per acre than opening the canopy through salvage harvesting. Site preparation and planting acres and roadside hazard treatment areas will remain at similar levels. No salvage units may mean some rangelands are harder to access as they will not be easily traversed by cattle when trees have fallen and will be a hazard for permittees. Rangeland condition will not be affected as mitigation measures are in place that will protect meadows and reduce the risk of week spread.

Project Area B: Happy Camp Complex

Both roadside hazard treatments and salvage harvest are proposed to be reduced by 1,000 acres, when compared to Alternative 2. Fuels treatments site preparation and planting units are similar to what was proposed for Alternative 2. The reduction in salvage harvest

and roadside hazard treatments means this alternative will not have the potential for transitory range that Alternative 2 does. Additionally, reduction in salvage harvest will make permittee travel and cattle management more difficult and dangerous within the allotments. Rangeland condition will not be affected as mitigation measures are in place that will protect meadows and reduce the risk of week spread.

Project Area C: Whites Fire

Effects will be similar to those of Alternative 2, with the exception that a 20-acre unit of salvage harvesting would not occur. This will be only a negligible change to the amount of forage available.

Cumulative Effects

Effects are similar to those identified under Alternative 2

Comparison of Effects

Fire Area A: Beaver Fire

Alternative 1 will add no additional forage to rangeland resources within the Beaver Fire Area and will be more dangerous for permittees managing cattle in allotments as a result of no treatment activities. Alternative 3, Modified Alternative 2, and Modified Alternative 3 will slightly increase forage availability and reduce hazards to permittees, as compared to Alternative 1. Alternatives 2, 4, and 5 will benefit rangeland resources the most as the treatments proposed will increase the amount of forage available, decrease grazing pressure on primary rangelands, and reduce hazards for permittees who maintain rangeland conditions.

Table 3-35: Summary of Effects by analysis indicator for the Beaver Fire Area

Indicator	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Mod Alt. 2	Mod Alt 3
Availability of Forage	No additional increase of forage	Increase	Small increase	Increase	Increase	Small increase	Small increase
Rangeland Condition	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral

Fire Area B: Happy Camp Fire

Alternative 1 will add no additional forage to rangeland resources within the Happy Camp Fire Area and will be more dangerous for permittees managing cattle in allotments as a result of no treatment activities. Alternatives 2, 3, 4, 5, and Modified Alternative 2 will benefit rangeland resources the most as the treatments proposed will increase the amount of forage available, decrease grazing pressure on primary rangelands, and reduce hazards for permittees who maintain rangeland conditions. Modified Alternative 3 will slightly increase forage availability and reduce hazards to permittees, as compared to Alternative 1.

Table 3-36: Summary of Effects by analysis indicator for the Happy Camp Fire Area

Indicator	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Mod Alt. 2	Mod Alt 3
Availability of Forage	No additional increase of forage	Increase	Increase	Increase	Increase	Increase	Small increase

Indicator	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Mod Alt. 2	Mod Alt 3
Rangeland Condition	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral

Project Area C: Whites Fire

Alternative 1 will add no additional forage to rangeland resources within the Whites Fire Area Alternatives 2,3,4,5, Modified Alternative 2, and Modified Alternative 3 will provide a negligible benefit to rangeland resources as the treatments proposed will slightly increase the amount of forage available, and slightly reduce hazards for permittees who maintain rangeland conditions.

Table 3-37: Summary of Effects by analysis indicator for the Whites Fire Area

Indicator	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Mod Alt. 2	Mod Alt 3
Availability of Forage	No additional increase of forage	Negligible increase	Negligible increase	Negligible increase	Negligible increase	Negligible increase	Negligible increase
Rangeland Condition	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral	Neutral

Compliance with law, regulation, policy, and the Forest Plan

All Project alternatives are in compliance with law, policy, and regulation related to rangeland resources, and is in compliance with the standards of the Forest Plan as displayed in the Forest Plan consistency checklist, available on the project website.

Hydrology

This section compares potential impacts and benefits to hydrologic function and water quality of project alternatives. Results of the analysis are used to verify that project alternatives adhere to existing law, regulation, and policy such as the Clean Water Act (specified by Total Maximum Daily Load requirements for the Klamath, Salmon, and Scott Rivers) and Forest Plan requirements including those related to the Aquatic Conservation Strategy. See Aquatic Conservation Strategy Report in project record.

Methodology

The effects of project alternatives on hydrologic function and water quality are analyzed based on existing Forest ecosystem analysis documents, recent watershed field surveys, and Geographic Information System (GIS) reports and modeling. Ongoing stream channel monitoring to meet North Coast Region Water Quality Control Board (Water Board) waiver requirements, and field surveys during and after the 2014 fires provided current data. Data were synthesized to define existing watershed conditions for comparison with Total Maximum Daily Load requirements for the Klamath, Salmon, and Scott Rivers, Aquatic Conservation Strategy objectives and desired watershed conditions from the Forest Plan. See Aquatic Conservation Report in project record.

The Forest uses standardized Cumulative Watershed Effects (CWE) models (Equivalent Roaded Area, Universal Soil Loss Equation, and mass-wasting) to assess effects of past, present, and reasonably foreseeable activities as described further in the body of the Hydrology resource report and relevant supporting references. Cumulative watershed effects models were used to index watershed disturbance (Equivalent Roaded Acres –

ERA), evaluate the effects of soil erosion (Universal Soil Loss Equation – USLE) and evaluate the potential for mass-wasting (landsliding).

Models were updated to incorporate effects of the 2014 fires and road improvements identified in BAER assessments. The updates provide a picture of post-fire watershed conditions. The potentially ground-disturbing activities and events that are included in the CWE modeling for both US Forest Service lands and private lands in the project area are:

- Vegetation removal (timber harvest, thinning, fuels reduction);
- Roads used for temporary access;
- Log landing construction and enlargement;
- Effects of wildfires and suppression efforts (including fire lines);
- Prescribed burning;
- Road improvements (outsloping, rocking and crossing upgrades) (results shown as negative numbers); and
- Road decommissioning (results shown as negative numbers).

Ground-disturbing activities are assigned coefficients of disturbance in the Equivalent Roaded Area (ERA) model to represent the disturbance created by a road segment of equal size in area (Haskins 1986). Effects from vegetation management, wildfire, and prescribed fire show naturally reduced disturbance over time for all three models (ERA, universal soil loss equation (USLE) and mass-wasting (GEO)). Recovery curves are displayed in figures 1, 2 and 3 for the three models. Sediment yield (cubic yards/acre/year) estimated by the USLE occurs in the first winter season, requires a 2-year, 6-hour storm, and recovers to background rates within seven years (USDA Forest Service 2004). Sediment yield (cubic yards/acre/decade) estimated by the mass-wasting model depends on a ten-year storm event, and yield recovers to background rates in 50 years (USDA Forest Service 2004). The models make assumptions regarding the rates of recovery for the processes represented by the models. As site re-vegetation provides increased interception, evapotranspiration, ground cover, and mechanical strength, the effects of ground disturbing activities lessen (see Figures 3-1, 3-2 and 3-3). Road and landing areas do not recover naturally over time; however, their coefficients of disturbance can be reduced if the areas are improved by decommissioning, outsloping, rocking, or crossing upgrades.

Model results fall on a continuum. The models are indexed using a “risk ratio.” The threshold of concern for the risk ratio for both models is 1.0. The threshold of concern does not represent the exact point at which adverse cumulative effects will occur. Rather it serves as a “yellow flag” indicating increasing susceptibility for adverse effects to beneficial uses in a watershed (Bell 2012).

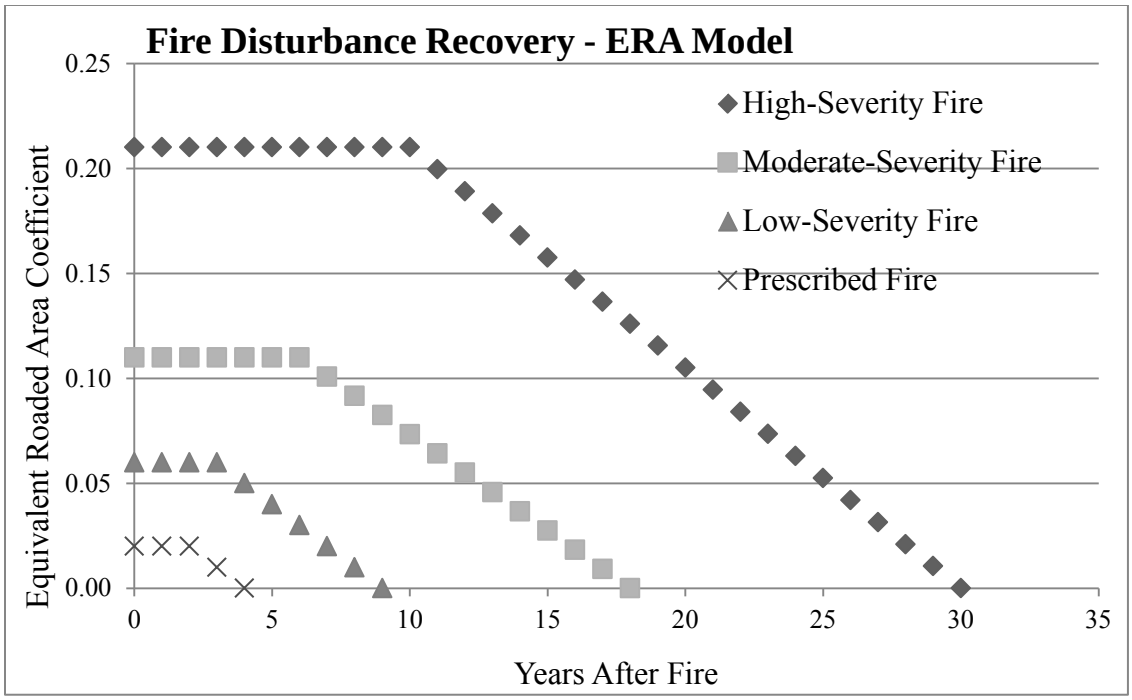

Figure 3-14: Fire disturbance recovery curves for the Forest cumulative watershed effects ERA model

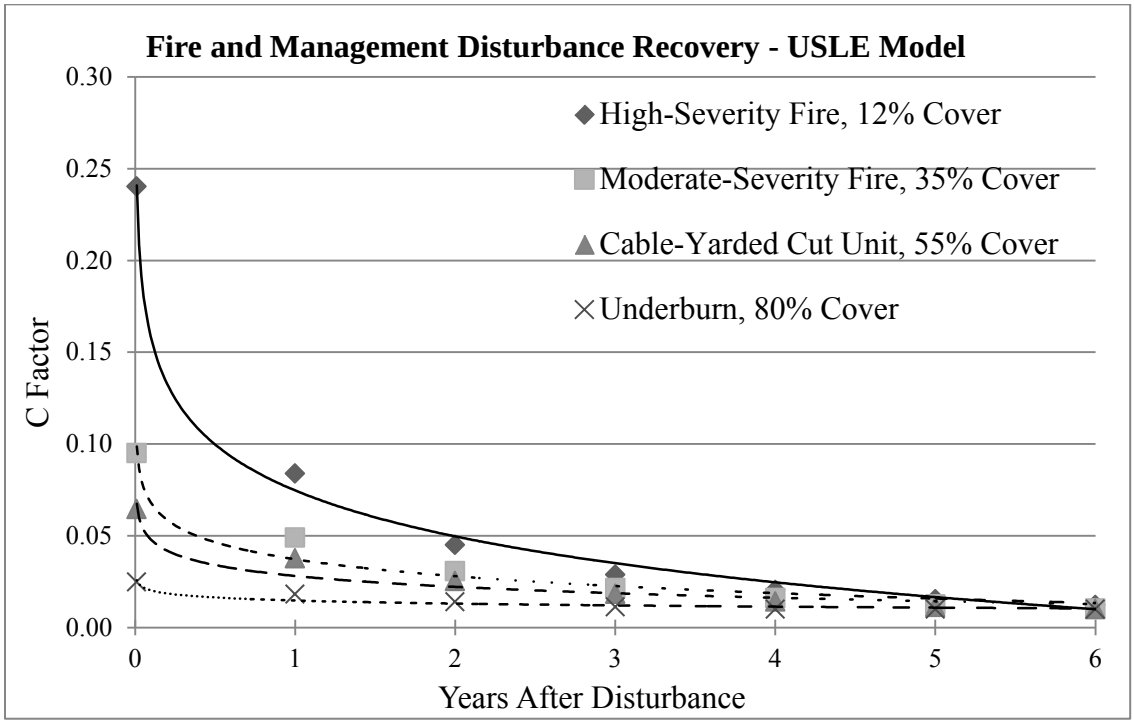

Figure 3-15: Fire and vegetation management recovery curves for the Forest cumulative watershed effects USLE model

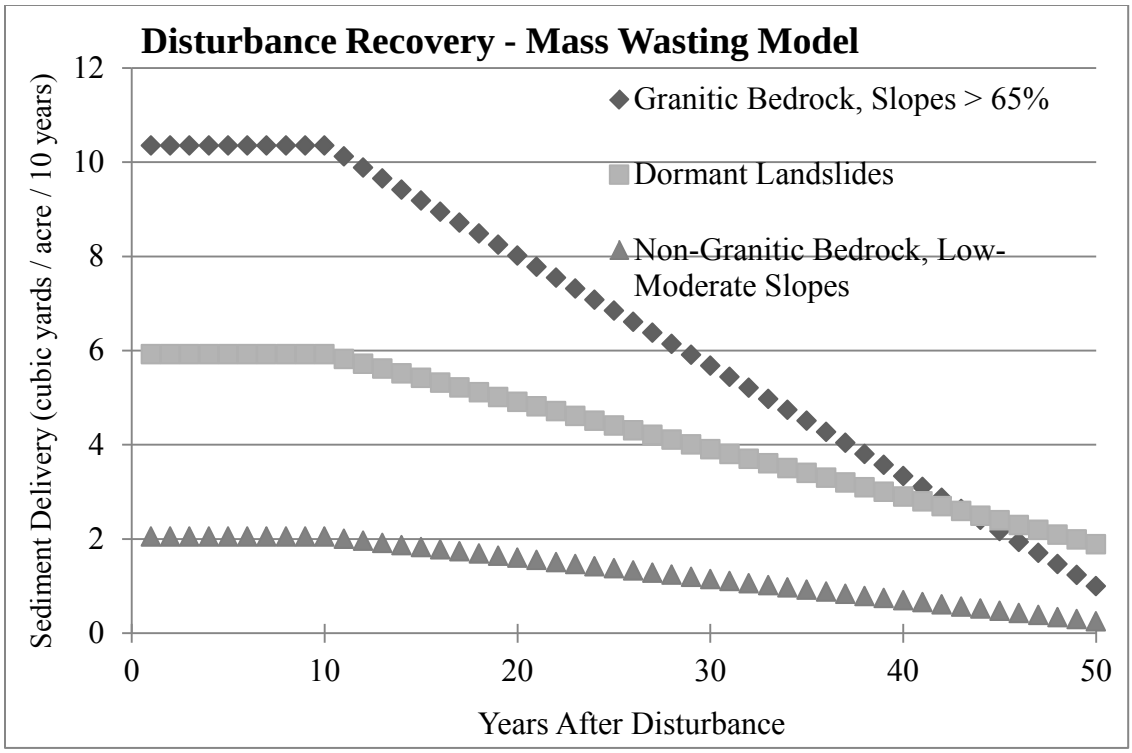

Figure 3-16: Recovery curves for the Forest cumulative watershed effects mass-wasting model

Analysis Indicators

Analysis indicators are chosen to be responsive to Total Maximum Daily Load (Clean Water Act) requirements and the Forest Plan (including Aquatic Conservation Strategy objectives), and to demonstrate potential differences between project alternatives with respect to hydrologic function and water quality.

Risk to Channel Morphology

There are two processes that the project might affect that could influence the risk to channel morphology. The first is an increase in peak flow which can lead to modifications of channel bed, banks and floodplain (where it exists). Loss of ground vegetation, ground cover and canopy from high severity fires may cause increases in the magnitude of peak flow (flood) events. In other words, the loss of vegetation allows more precipitation to reach the ground, increasing the amount of water transported in stream channels. Peak flows following large fires are often increased from pre-fire flows that would result from a storm of the same magnitude. Based on results from the 2014 BAER analysis, post-fire unit peak stream flows (cubic feet per second/square mile) are not expected to increase sufficiently to increase risk to existing channel morphology. This is because project area streams are predominantly steep with channel beds and banks armored by coarse substrate (cobble, boulder, bedrock). Based on ERA model (which can be used as a proxy for peak flow changes) results potential effects of Alternative 2 are indiscernible from fire effects (Alternative 1) at both the 5th and 7th field watershed scale. In other words, the conditions created by the Westside Fires are driving watershed conditions with respect to peak flow, and project impacts are not likely to be discernible. This does not mean that peak flows will not increase; it means the Proposed Action would not be the cause of that increase. The evidence suggests that there is no change to

peak flow as a result of the wildfire or in the ERA model due to the proposed activities so peak flow will not be used in this analysis.

The second process that can affect channel morphology is debris flow events. Landslide likelihood is analyzed in the Geology report and the Geology section of Chapter 3 of this Environmental Impact Statement. The landslide likelihood encompasses all landsliding processes not just debris flow events. The cross walk below (Table 3-38) was developed to provide a more accurate depiction of the debris flow likelihood associated with a given landslide likelihood description.

Table 3-38: Crosswalk of depiction of debris flow likelihood associated with landslide likelihood description

Landslide Descriptor	Debris Flow Descriptor
Almost Certain	Highly Likely
Highly Likely	Likely
Likely	Unlikely

Risk of Sediment Regime Alteration

The sediment regime analysis uses all three cumulative watershed effects models because they all represent some process that can introduce sediment into a stream channel from the hillslope. Watersheds with one model risk ratio over the threshold of concern (1.0) have an elevated risk of adverse effects to beneficial uses. Watersheds with risk ratios of less than 1.0 have a low risk of adverse effects to beneficial uses.

The duration of elevated risk is estimated based on CWE model recovery curves presented in the draft EIS. Elevated risk of surface erosion as assessed by the Universal Soil Loss Equation (USLE) model is expected to reduce quickly, approaching the pre-fire levels after 2 years. Elevated risk as assessed by the ERA model is expected to remain constant for up to 10 years post-fire and then recover quickly over the next approximately 10 years. Elevated risk of mass wasting is expected to remain constant for 10 years post-fire and then recover gradually over the subsequent approximately 80 years. The geology report assesses all types of landsliding in the landslide risk assessment and the duration of elevated risk. In that analysis the Forest Geologist determined that the landslide risk will be elevated for more than 80 years in watersheds with more than 10 percent high and moderate vegetation severity. This can be mitigated by artificial regeneration. If 25 percent or more of the moderate and high severity areas are planted in a watershed the duration of elevated risk is expected to be about 30 years. Watersheds at elevated risk that are subject to project activities that increase risk ratios are interpreted as having negative cumulative effects.

Trend of Riparian Function

The trend of Riparian Function is analyzed at the project scale. It is intended to give an overall look at how the Riparian Reserves are functioning and whether the function is improving (positive trend), declining (negative trend) or staying the same (neutral trend). The information from the indicators above is used to determine the magnitude and direction of the trend. The analysis includes effect to temperature regime via debris flow events and shade reduction not related to debris flows along stream channels. The trend will also consider effects to large wood recruitment in the short and long term.

Spatial and Temporal Context

The spatial context for the hydrologic analysis is the project area that includes portions of the following eight 5th field watersheds: Beaver Creek; Humbug Creek-Klamath River; Horse Creek-Klamath River; Seiad Creek-Klamath River; Lower Scott River; Thompson Creek-Klamath River; Elk Creek; and North Fork Salmon River. The 5th field watersheds are the analysis area for broad scale effects analysis. The 7th field watersheds are considered small scale for a project area of this size. There are seventy-five 7th field watersheds that intersect portions of the three fire-related areas (Happy Camp Complex, Beaver, and Whites fires). In addition to the analysis of broad- and small-scale watersheds, the effects of proposed new infrastructure are analyzed. Effects to water quality of proposed temporary roads, stream crossings, and landings are assessed. The long-term temporal bounding for this analysis is up to 10 years because recovery of the fire-disturbed hydrologic function (from ERA modeling) and surface erosion (from USLE modeling) is appreciable in the first decade. The short-term is between 2 and 4 years after implementation.

Affected Environment

Desired Conditions

Desired conditions for water and Riparian Reserves are provided in the Forest Plan and summarized in this section. For Riparian Reserves, desired vegetation is an overstory of coniferous vegetation providing shade and thermal cover and understory vegetation providing further thermal regulation, nutrient regulation, and bank stability (Forest Plan pg. 4-106). Riparian vegetation is diverse and dense enough such that it stabilizes stream banks and hillslopes, promotes sediment trapping, and contributes downed large wood (Forest Plan pg. 4-107). These riparian conditions maintain and promote water quality and reduce potential stress from sediment and temperature loading. Desired conditions for stream flows (including peak flow) are such that they provide adequate protection to semi-aquatic and aquatic habitat and maintain natural hydrologic processes (Forest Plan pg. 4-107). Desired flow conditions promote and maintain channel function and resulting morphology. These flow conditions support beneficial uses such as cold freshwater habitat and associated fish migration, fish spawning, and preservation of rare and endangered species.

Existing Condition

Post Fire Debris Flows: Over 50,000 acres of the Westside Fires burned with moderate to high severity, killing most of the trees. Because of the extreme fire conditions, ground vegetation, down woody debris and tree crowns were completely consumed in large areas of the fire. Lack of ground cover and crown interception exposes soils to raindrop impacts, and increases the amount of precipitation that reaches the ground. Moderate to high severity fires can also cause a loss of soil hydrologic function by sealing pores and degrading soil structure. Under high severity fire conditions, soils become resistant to water infiltration because burned organic material soaks into empty pore spaces in the soils, making the soil surface impervious to water, or “hydrophobic”. Also, silica in the soil can fuse at high temperatures contributing to hydrophobicity. Once soils become hydrophobic, surface runoff and erosion can increase dramatically because rainfall cannot infiltrate the soil. Hydrophobicity rarely persists beyond the first season following a fire.

During mid-July, 2015 high intensity rainfall events over severely burned portions of the West Side Fire area caused surface erosion that triggered a number of debris flows. As much as 1.5 inches of rain fell in less than an hour in many parts of the fire area during these storms causing localized flash flooding. The high-intensity rainfall event on hydrophobic soils that had been denuded of vegetation in the 2014 Westside Fires caused rapid delivery of water and sediment to stream channels by rills and small gullies. This slurry of water and debris is what formed the debris flows. Water, rocks, mud and trees were swept downslope in the Music Creek, Beaver Creek, Grider Creek, and Walker Creek drainages.

Debris flows in a post-fire environment are a natural phenomenon that is common especially where there are large areas of high severity burn such as the 2014 Westside Fires (Everest and Reeves, 2007). These debris flows were surface erosion events related primarily to loss of ground vegetation, loss of forest canopy and hydrophobic soil conditions rather than landslides caused by loss of root strength.

As noted elsewhere in this report, and in the Geology Report, events like this were predicted to occur in the Draft EIS as a result of the conditions created by the 2014 fires. The surface erosion event and associated debris flows do not alter the findings of this assessment. See tables 3-25, 3-26 and 3-27 for a display of landslide and debris flow risk by watershed.

CWE Analysis Area and Projects: The analysis of the Affected Environment for the CWE models includes the Eddy Late Successional Reserve, Elk Thin, Fish Meadows, Glassups Timber Sale, Happy Camp Fire Protection Phase 2, Johnny O'Neil Late Successional Reserve Habitat Restoration and Fuels Reduction, Lake Mountain Foxtail Pine, Lower Scott Roads, North Fork Roads Storm-proofing, Oak Flat Thin, Singleton, Thom Seider Vegetation Management and Fuels Reduction, and Two Bit Vegetation Management projects. Work done under the Burned Area Emergency Response (BAER), grazing allotments, Private Timber Harvest Plans since 2005, and Private Land Salvage (Emergency Timber Harvest Plans) are on-going activities and the CWE models include them in the "current" portion of the results.

Legacy Sites: One cause of impairment on National Forest System lands has been attributed to *legacy sediment sites* from past management including historic mining, road building, and silviculture (NCRWQCB 2010, NCRWQCB 2005). A majority of the legacy sediment sites are associated with the road system, most of which was constructed in the 1960s and 1970s prior to modern best management practices (best management practicess). Culverts were commonly designed to pass a 25-year flood rather than the 100-year flood required by current road standards. Road construction often did not avoid unstable slopes or riparian areas that are protected by today's best management practicess. As a result, some of the current road system is not resilient to natural disturbance by fire and floods. A flood in 1997 caused road failures which triggered debris torrents that traveled miles downstream. Some of the impact to water quality occurred when landslides and debris flows removed riparian vegetation, reduced stream shade, and increased water temperatures (De La Fuente and Elder 1998, NCRWQCB 2010). To minimize or eliminate water quality impacts by future floods the Total Maximum Daily Loads for the Klamath, Scott, and Salmon Rivers set load allocations that require road stream crossings to pass a 100-year flood without diverting or failing.

The Forest has completed legacy sediment site inventories for most roads on the Forest (USDA Forest Service 2012). A total of 953 legacy sediment sites were inventoried in the project boundary (Table 3). Most of the legacy sediment sites are associated with undersized culverts, stream diversion potential at road crossings, or roads located on unstable slopes. Legacy sediment site inventories have not yet been completed for non-road sediment sources such as abandoned mines, historic hydraulic mining, past harvest units, or dredge tailings. In some watersheds these non-road legacy sediment sites could be a substantial source of additional stream sediment and reduced stream shade.

Table 3-39: Summary of legacy sediment site inventory data on roads in the project area by 5th field watershed

Watersheds	Number of Legacy Sediment Sites
Beaver Creek	557
Elk Creek	203
Horse Creek – Klamath River	417
Humbug Creek – Klamath River	153
Lower Scott River	155
North Fork Salmon River	323
Seiad Creek – Klamath River	188
Thompson Creek – Klamath River	125
Project Area	953

Project Area A: Beaver Fire

Risk to Channel Morphology

The debris flow likelihood is elevated due to the 2014 fire effects. There is a likelihood of highly likely for Lumgrey Creek, Soda Creek, Lower West Fork Beaver Creek, Dutch Creek, Buckhorn Gulch, Doggett Creek, Dona Creek and Kohl Creek. This means that a debris flow will probably occur during an average storm event.

Table 3-40: Beaver Fire 7th field watersheds with the greatest likelihood of experiencing debris flows as inferred from landslide likelihood.

		Alt 2	
7th-Field Watershed Name	2014 Fire	Landslide Likelihood	Inferred Debris Flow Likelihood
Lumgrey Creek	Beaver	Highly Likely	Likely
Soda Creek-Beaver Creek	Beaver	Highly Likely	Likely
Lower West Fork Beaver Creek	Beaver	Highly Likely	Likely
Dutch Creek	Beaver	Highly Likely	Likely
Buckhorn Gulch-Beaver Creek	Beaver	Highly Likely	Likely
Doggett Creek	Beaver	Highly Likely	Likely
Dona Creek-Klamath River	Beaver	Highly Likely	Likely
Kohl Creek	Beaver	Highly Likely	Likely

Risk to Sediment Regime

Lumgrey Creek, Soda Creek, Lower West Fork Beaver Creek, Buckhorn Gulch, Doggett Creek, Dona Creek and Kohl Creek are over the threshold of concern for the mass wasting model. These watersheds have an elevated risk to channel geomorphology for about 10 years and will be back to pre-fire risk in about 30 years. Jaynes Creek and Dutch

Creek have a risk ratio over the threshold of concern which means they will have an elevated risk for about 10 years before it recovers to pre-fire risk.

Trend of Riparian Reserve Condition

In Riparian Reserves that had high or moderate vegetation burn severity there is on average little to no shade from large over story conifers as is the desired condition described in the Forest Plan (4-106). The deciduous understory will likely re-sprout and provide some shade on stream channels over the next two to five years. The 2014 wildfire have increased the risk to channel geomorphology or sediment regime alteration nine watersheds in the Beaver fire area. These watersheds will recover slowly over the next 10 to 30 years to pre-fire conditions.

Project Area B: Happy Camp Complex

Risk to Channel Morphology

The landslide likelihood is elevated due to the 2014 fire effects. There is a likelihood of almost certain in Lower Grider, O'Neil, Walker, Caroline, Granite and Middle Elk Creek. These watersheds have a probability of debris flow even in a below average storm event. Rancheria Creek, Tom Martin Creek, Schutts Gulch, Middle Creek, Deep Creek, Big Ferry Swanson, Bear Creek, Bishop Creek and Doolittle Creek have a likely probability of a debris flow event. This means that there is a probability of debris flow events in an average storm event.

Table 3-41: Happy Camp Complex Fire 7th field watersheds with the greatest likelihood of experiencing debris flows as inferred from landslide likelihood in Alternative 2.

7th-Field Watershed Name	2014 Fire	Landslide Likelihood	Inferred Debris Flow Likelihood
Lower Grider Creek	Happy Camp	Almost Certain	Highly Likely
O'Neil Creek	Happy Camp	Almost Certain	Highly Likely
Walker Creek	Happy Camp	Almost Certain	Highly Likely
Caroline Creek-Klamath River	Happy Camp	Almost Certain	Highly Likely
Granite Creek	Happy Camp	Almost Certain	Highly Likely
Middle Elk Creek	Happy Camp	Almost Certain	Highly Likely
Rancheria Creek	Happy Camp	Highly Likely	Likely
Tom Martin Creek-Klamath River	Happy Camp	Highly Likely	Likely
Schutts Gulch-Klamath River	Happy Camp	Highly Likely	Likely
Middle Creek	Happy Camp	Highly Likely	Likely
Deep Creek-Scott River	Happy Camp	Highly Likely	Likely
Big Ferry-Swanson	Happy Camp	Highly Likely	Likely
Bear Creek	Happy Camp	Highly Likely	Likely
Bishop Creek-Elk Creek	Happy Camp	Highly Likely	Likely
Doolittle Creek	Happy Camp	Highly Likely	Likely

Risk to Sediment Regime

Lower Grider Creek, O'Neil Creek, Schutts Creek, Walker Creek, Caroline Creek, Middle Creek, Deep Creek, Granite Creek, Middle Creek, Bear Creek, and Bishop Creek all have risk ratios over the threshold of concern for mass wasting model. These watersheds will have an elevated risk to sediment regime alteration for 10 years and slowly recovery to pre-fire conditions in aobut 30 years. Big Ferry-Swanson Creek has a risk ratio over the threshold of concern for the ERA model and will recovery to pre-fire

conditions in about 10 years. Horse Creek, Fryingpan creek, and Upper Elk Creek are over the threshold of concern for the USLE model and will have an elevated risk to sediment regime alteration for about 2 years and will quickly recover to per-fire conditions.

Trend of Riparian Reserve Condition

In Riparian Reserves that had high or moderate vegetation burn severity there is on average little to no shade from large over story conifers as is the desired condition described in the Forest Plan (4-106). The deciduous understory will likely resprout and provide some shade on stream channels over the next two to five years. The 2014 wildfire has increased the risk to channel geomorphology or sediment regime alteration 15 watersheds in the Happy Camp Complex area. These watersheds will recover slowly over the next 10 to 30 years to pre-fire conditions.

Project Area C: Whites Fire

Risk to Channel Morphology

The landslide likelihood is elevated due to the 2014 fire effects. Music Creek, Upper North Russian Creek, Lower North Russian Creek, Whites Gulch, and Robinson Gulch have a likely probability of a debris flow event. This means that there is a probability of debris flow events in an average storm event.

Table 3-42 Whites Fire 7th field watersheds with the greatest likelihood of experiencing debris flows as inferred from landslide likelihood in Alternative 2.

7th-Field Watershed Name	2014 Fire	Landslide Likelihood	Inferred Debris Flow Likelihood
Music Creek	Whites	Highly Likely	Likely
Upper North Russian Creek	Whites	Highly Likely	Likely
Lower North Russian Creek	Whites	Highly Likely	Likely
Whites Gulch	Whites	Highly Likely	Likely
Robinson Gulch-North Fork Salmon River	Whites	Highly Likely	Likely

Risk to Sediment Regime

Music Creek has risk ratios over the threshold of concern for mass wasting model. These watersheds will have an elevated risk to sediment regime alteration for 10 years and slowly recovery to pre-fire conditions in about 30 years. Lower North Russian Creek and Whites Gulch are over the threshold of concern for the USLE model and will have an elevated risk to sediment regime alteration for about 2 years and will quickly recover to per-fire conditions.

Trend of Riparian Reserve Condition

In Riparian Reserves that had high or moderate vegetation burn severity there is on average little to no shade from large over story conifers as is the desired condition described in the Forest Plan (4-106). The deciduous understory will likely resprout and provide some shade on stream channels over the next two to five years. The 2014 wildfire has increased the risk to channel geomorphology or sediment regime alteration five watersheds in the Happy Camp Complex area. These watersheds will recover slowly over the next 10 to 30 years to pre-fire conditions.

Environmental Consequences

Alternative 1

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

There are no direct effects to channel morphology, water quality (sediment and temperature regimes), or channel function resulting from Alternative 1. Recovery curves can be viewed as a timeline of the magnitude and duration of indirect effects on hydrologic function and hillslope sediment production of the 2014 wildfires and Alternative 1.

Over the long-term, the fuel load conditions created by fire-killed trees that break or fall and become surface fuels will lead to fire intensity and flame lengths that are conducive to major fire runs, crown fires, and spotting. The large fuels component (greater than 3 inches) will lead to an elevated fire intensity and duration of fire on the landscape if it should re-burn. In 10 years, the conditions under Alternative 1 will lead to nine percent of the area having flame lengths greater than 11 feet. Sixty percent of the treatment area is likely to experience flame lengths between 4 and 11 feet and thirty-one percent is likely to have flame lengths of less than 4 feet. (See fire and fuels report). High flame lengths are associate with high severity fire and will contribute to accelerated sediment delivery(DeBano et al. 2005), increased stream temperatures (Pabst and Spies 2001)and stream flows (Neary, et al. 2005a)and increased potential for the introduction of toxic chemicals from fire retardant application during future fire suppression efforts (Neary, et al. 2005b).

Risk to Channel Morphology

Alternative 1 will allow for passive recovery of vegetation in the watersheds which will be slower than if treatment, including planting, would occur. The extended duration of decreased interception, use of water by plants, and ground cover will extend the risk to channel morphology over the long-term.

Risk of Sediment Regime Alteration

The risk to sediment regime alteration will passively recover from current condition toward pre-fire conditions over the next four to five years for surface erosion. The recovery for landslide-related sediment will start in about 10 years and could take up to 80 years to be reduced to pre-fire levels because of the length of time required to re-establish forest vegetation without artificial regeneration (see Geology report).

Trend of Riparian Function

The watersheds with a high risk of temperature regime alterations, without artificial regeneration, will have an extended duration of elevated risk. Natural regeneration will occur, but in general it will more than 80 years to get trees with 10 inch diameters at breast height in areas burned with high and moderate severity (personal communication, Project Silviculturist).Large-wood loading to riparian zones and stream channels that is expected to occur under this alternative is widely regarded as beneficial for sediment retention, channel function, habitat complexity, cover, and nutrient cycling (Keller and Swanson 1979; Nakamura and Swanson 1994; Grant and Swanson 1995). Given the relatively small acreage of Riparian Reserve that burned at moderate- and high-severity

in 2014, and the small length of stream channels affected, negative fire effects are not expected to channel function resulting from burned Riparian Reserve areas. Where fire impacts increase large wood loading to stream channels, effects will be positive for channel sediment metering and other functions. However, the elevated likelihood of landsliding (see geology report) will take more than 80 years to recover under Alternative 1. Debris flows can have substantial effects on channel function. The overall trend of riparian function is positive but has a gentle slope (long-term recovery).

Cumulative Effects

McCollins Late Successional Reserve Enhancement project is the only action considered for cumulative effects that is not included in the affected environment. This project does not increase the risk ratio for any model above 1.0 or increase the landslide likelihood in the fire area.

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

Effects of Alternative 1 in the Happy Camp Complex Fire area are the same as those described in the Hydrology report for all indicators.

In the longer-term, legacy sediment sites will continue to have a high risk of failing in future floods and impacts will be similar to the channel scour, loss of stream shade, increased stream temperatures, and sedimentation that occurred in the 1997 flood as described by De La Fuente and Elder (1998). These impacts will adversely affect beneficial uses and violate the Waiver and water quality standards in the Basin Plan (State of California Water Board 2011). The risk of road failures is greater at sites located below high-severity burns due to increased runoff and peak flows.

Cumulative Effects

Lovers Canyon and Scott Mountain Fuels Reduction projects are the only actions considered for cumulative effects that are not already included in the affected environment. These projects do not increase the risk ratio for any of the models over 1.0 or increase the landslide likelihood in the fire area.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

Effects of Alternative 1 in the Whites fire area are the same as described for the Beaver fire area.

Cumulative Effects

The Jess project is the only project considered for cumulative effects that is not already incorporated into the affected environment. This project does increase the risk ratio in the Jessups Gulch watershed over 1.0 leading to an elevated risk of adverse effects for sediment regime alteration. The landslide risk is not increased so the risk to channel morphology remains the same as in the affected environment for Jessups Gulch. The Jess project is expected to improve Riparian Reserve conditions through treatments intended to increase the number of large trees in the Riparian Reserves and the fuels loading in Riparian Reserves. The trend in Riparian Reserve condition in this watershed will be a slow upward trend as a result of the Jess project.

Alternative 2

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

Risk to Channel Morphology

Based on results from the 2014 BAER analysis, post-fire unit peak stream flows (cubic feet per second/square mile) are not expected to increase sufficiently to increase risk to existing channel morphology via non-bulked flows. This is because project area streams are predominantly steep with channel beds and banks armored by coarse substrate (cobble, boulder, bedrock). Based on ERA model results none of the 5th field watersheds are at elevated risk for adverse hydrologic effects as a result of implementation of Alternative 2 (Appendix A). For 7th field watersheds Alternative 2 increases the number of watersheds at elevated risk from eight to twelve out of seventy seven watersheds for all fires (Table 1). Only Buckhorn Gulch-Beaver Creek moves in to the elevated risk category (ERA model) in the Beaver Fire area as a result of Alternative 2.

Mass wasting and potential associated debris flows are and have been (pre-settlement) fundamental mechanisms of channel change in the Klamath Mountains. The landslide likelihood derived for the amendment to the project geology report is employed here to infer likelihood of debris flows and potential effects to the *risk to channel morphology* indicator. Analysis in the project geology report indicates that landslides are *likely* in five and *highly likely* in eight Beaver Fire area 7th field watersheds due to fire effects (Table 8). There are no 7th field watersheds in the Beaver Fire area with almost certain likelihood of landslides. Neither Alternative 2 nor any other action alternative increases the landslide likelihood in the fire area (see geology report for details), and thus there is no effect on the likelihood of debris flows or risk to channel morphology. These results are interpreted to indicate that debris flow alteration of channel morphology and effects to hydrologic function and water quality is likely as a result of conditions created by the 2014 fire along at least some reaches of the channel network in the Lumgrey, Soda, Lower West Fork Beaver, Dutch, Buckhorn Gulch, Doggett, Dona, and Kohl Creek 7th field watersheds. This likelihood is not increased by implementation of Alternative 2. Effects on channel morphology from debris flow alteration, should a debris flow occur in a channel, are expected to persist for at least a decade as riparian vegetation recovers along debris flow tracks.

Risk of Sediment Regime Alteration

Risk of sediment regime alteration is assessed with all three CWE models. Nearly all 5th field watershed risk ratios are unchanged under Alternative 2 for each model (Appendix A). The exception is that Humbug Creek-Klamath River, Seiad Creek-Klamath River, and North Fork Salmon ERA risk ratios increase nominally with the largest increase (0.06 or 6%) still considered to be essentially within the model margin of error.

For 7th field watersheds Alternative 2 increases the number of watersheds at elevated risk from eight to twelve for the ERA model. For three of the four watersheds the largest risk elevation is 0.09 (9%) which falls near the margin of error. In other words, the change in risk is small ranging from no change to a slight change up to 9% (see Appendix B - CWE Model Results). The ERA serves as a proxy for peak flow and by deduction the small change will result in small to no changes in peak flow conditions. There is less than or

equal to a 9% change in the ERA model (see description above) for all watersheds in the Beaver fire area.

The four watersheds moved in to elevated risk as determined by the ERA model are Buckhorn Gulch-Beaver Creek (5% elevated risk), Walker Creek (9%), Music Creek (4%), and Jessups Gulch-North Fork Salmon River (32%). Jessups Gulch-North Fork Salmon River is the highest change in risk. Jessups Gulch overlaps the project area, but there are no parts of the Proposed Action occur in that watershed. (See cumulative effects discussion.) However, it is important to note that this elevated risk may remain unrealized without a triggering event. Additionally, watershed project design features such as watershed-4, which precludes mechanical equipment in hydrologic Riparian Reserves will reduce the risk of sediment regime alteration and sediment production to water bodies.

While risk of sediment regime alteration is undetectable to minor at 5th and 7th field watershed scales, some project activities are expected to produce site scale effects. Appendix C displays ground disturbing activities in hydrologic and geologic Riparian Reserves under Alternatives 2 and 3 Modified. The use of reopened decommissioned roads and temporary roads (these segments sum to 2.6 miles under Alternative 2) has potential to alter site-scale sediment regimes over the short-term, particularly where stream crossings and new landings would be constructed. Alternative 2 proposes eleven stream crossings along reopened decommissioned roads or temporary roads in Riparian Reserves and 22 new landings. However project design feature watershed-5 and watershed-23 will reduce risk of sediment production to water courses from these activities.

The treatment of legacy sediment sites under Alternative 2 (and any action alternative) will reduce the risk of sediment regime alteration resulting from road-related erosion and sedimentation. Table 11 displays legacy sediment site repairs proposed within hydrologic and geologic Riparian Reserves as part of the application to the North Coast Regional Water Quality Control Board for enrollment of the WFR project in the waiver program. Please note that some of these sites have already been analyzed under previous National Environmental Policy Act (NEPA) projects. Approximately seventy road-related legacy sediment sites are identified for treatment in the Beaver Fire area for the waiver application.

Table 3-43: Alternative 2 road-related legacy sediment site repairs proposed for hydrologic and geologic Riparian Reserves as part of the application to the North Coast Regional Water Quality Control Board for waiver coverage. Tallied sites do not include work done under 2014 BAER assessments.

Road Legacy Sediment Sites	Beaver Fire	Happy Camp Complex	Whites Fire	Total
Highly Risk Stream Crossings	4	85	13	102
Stream Diversion Potential	37	160	63	260
Diversion Potential, Undersized Culvert	21	80	21	122
Undersized Culvert	12	90	44	146
Total	74	415	141	630

Trend of Riparian Condition

For Beaver Fire 5th field watersheds post-fire increased peak flow is not expected to negatively affect channel morphology. Alternative 2 has no effect on the debris flow likelihood (see geology report for details) at the 7th field scale and there is no change from the existing condition for risk to channel morphology in this alternative. The indirect effects to shade not related to debris flow events as a result of Alternative 2 will be small in the Beaver Fire area because no planting will occur in the Riparian Reserves. However, recruitment of large wood to stream channels in the first decade post-fire may produce increases in stream shading where mature Riparian Reserve conifers were fire killed and fall across channels. Reforestation outside of the Riparian Reserves will have a small indirect effect on stream shading, but not enough to improve the trend of riparian conditions in any watershed overall.

Cumulative Effects

In the Beaver Fire area the only project analyzed as future or on-going is McCollins. Watershed risk ratios displayed in Appendices B and C account for these projects. Livestock grazing is not included in the CWE model assessments but grazing effects are assumed to be minor in the context of the 2014 wildfires.

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

Risk to Channel Morphology

There is a high probability of debris flows and landslides in watersheds affected by the 2014 Happy Camp fires because the fires killed trees and consumed nearly all of the ground vegeation and cover over large areas. Alternative 2 however does not increase the landslide or debris flow likelihood in the fire area because removal of dead trees does not affect landslide processes (see Geology report for details). The risk of debris flow alteration of channel morphology as a result of the fire is highly likely along at least some reaches of the Lower Grider, O'Neil, Walker, Caroline, Granite, Middle Elk Creek 7th field watersheds (Table 9). Proposed reforestation reduces the duration of elevated landslide risk to approximately 30 years for Upper Grider, Cliff Valley, Lower Grider, O'Neil, Walker, Caroline, Middle, Tompkins, Horse, Upper East Fork Elk, Upper Elk and Lower East Fork Elk Creeks (see Table 1 in the Amendment to the Geology report for details).

Peak flow alteration was estimated in the ERA model for the affected watersheds. As a result of a slight increase in potential peak flow events as estimated by the ERA model, in Alternative 2, the Walker Creek 7th field watershed is moved from low to moderate risk

with an elevation of 9% for Alternative 2 (ERA model) in the Happy Camp Complex Fire area. This moderate risk will persist for approximately a decade before declining.

Risk of Sediment Regime Alteration

CWE model outputs show that none of the 5th field watersheds in the Happy Camp Complex Fire area are at elevated risk for adverse effects to hydrologic function and water quality from implmentation of Alternative 2.

Surface erosion (USLE) and mass wasting risk categories are not changed by the alternative for any of the 7th field watersheds in the fire area with the exception of Lower East Fork Elk Creek which is reduced from elevated to low risk (USLE model) as a result of proposed road-related legacy sediment site treatments. Legacy site treatments in the Elk Creek watershed will reduce road-related erosion and sedimentation potential long term. Proposed legacy site repairs in Elk Creek will remove an estimated approximately 140,000 yards^3 of sediment from risk of impacting water quality in the Elk Creek watershed (G. Bousefield, personal communication).

The hand treatments and planting in the Riparian Reserves will increase their ability to buffer sediment delivery to the stream channel by increasing ground cover and encouraging vegetation in the short term.

Trend of Riparian Condition

Alternative 2 does not increase the debris flow likelihood (see geology report for details) at the 7th field scale and there is a reduction in the duration of elevated landslide likelihood in 12 watersheds as a result of reforestation from planting. Reforestation from planting in Riparian Reserves will decrease the time needed to regain effective shade on intermittent and perennial channels. Areas where the decrease in duration of landslide risk is juxtaposed with Riparian Reserve treatments will have a steeper positive trend when compared with areas where just one or the other will occur.

Cumulative Effects

Lovers Canyon and Scott Bar Fuels Reduction are the only projects considered as present or future activities in the Happy Camp Complex Fire area for this analysis. Watershed risk ratios displayed in Appendices B and C account for these projects. Livestock grazing is not included in the CWE model assessments but grazing effects are assumed to be minor in the context of the 2014 wildfires.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

Risk to Channel Morphology

Alternative 2 has no effect on landslide likelihood in the fire area (see geology report for details). The risk to channel morphology is similar in magnitude and scale as that described for the Beaver Fire area. Music Creek, Upper North Russian Creek, Lower North Russian Creek, Whites Gulch, and Robinson Gulch 7th field watersheds are likely to experience debris flows along at least some reaches of their channel networks.

Risk of Sediment Regime Alteration

Four 7th field watersheds in the Whites Fire area are over the TOC (risk ratio $\geq$ 1.0) for at least one of the three CWE models under Alternative 2: Music Creek (ERA and mass wasting), Jessups Gulch (ERA), Lower North Russian Creek (USLE), and Whites Gulch

(USLE). This evelvated risk will persists from about 2 years for surface erosion (USLE) rate recovery to at least three decades for recovery of mass wasting erosion rates. Music Creek and Whites Gulch were pushed in to the elevated risk category by Alternative 2 because a slight increase in peak flows will result in raising the risk level. This means that under Alternative 2 and Modified Alternative 2 the risk ratio for Music Creek is increased by 4% (Alternative 2) and 2% (Modified Alternative 2).

The treatment of legacy sediment sites under Alternative 2 will reduce the risk of sediment regime alteration resulting from road-related erosion and sedimentation. Approximately one hundred and forty road-related legacy sediment sites are identified for treatment in the Whites Fire area as part of the waiver application (Table 11) required for any action alternative. Please note that these sites have already been analyzed under previous NEPA projects.

The hand treatments and planting in the Riparian Reserves will increase the Riparian Reserves ability to buffer sediment delivery to the stream channel by increasing ground cover and encouraging vegetation on the short term.

Trend of Riparian Condition

Debris flows are considered likely in the Music, Upper North Russian, Lower North Russian, Whites Gulch, and Robinson Gulch 7th field watersheds in the Whites Fire Area. Alternative 2 does not increase the debris flow likelihood (see geology report for details) at the 7th field scale and there is no change from the existing condition for risk to channel morphology in this alternative. The reforestation in Riparian Reserves will increase the time needed to regain effective shade on intermittent and perennial channels. The trend in Riparian Reserves receiving treatment will be steeper compared to the areas where no treatment will occur.

Cumulative Effects

The only project modeled for cumulative effects in the Whites Fire area was the Jess project. Watershed risk ratios displayed in Appendices B and C account for these projects. Livestock grazing is not included in the CWE model assessments but grazing effects are assumed to be minor in the context of the 2014 wildfires.

Alternative 3

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

Potential effects to hydrologic function and water quality at the watershed scale (5th and 7th fields) are the same as Alternative 2. Only the Buckhorn Gulch-Beaver Creek 7th field watershed is pushed in to the elevated risk category (ERA) under Alternative 3. There is no effect to the debris flow likelihood for the Beaver Fire area from Alternative 3, and no fire salvage in the Beaver Fire area in this alternative.

Cumulative Effects

In the Beaver Fire area the only project analyzed as future or on-going is McCollins. Watershed risk ratios displayed in Appendices B and C account for these projects. Livestock grazing is not included in the CWE model assessments but grazing effects are assumed to be minor in the context of the 2014 wildfires.

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

Potential effects to hydrologic function and water quality at the watershed scale (5th and 7th fields) are the same as Alternative 2. Only the Walker Creek (ERA) is pushed in to the elevated risk category while Lower East Fork Elk Creek moves to the low risk category (USLE model) due to legacy sediment site treatments. There is no effect to the debris flow likelihood and the duration of elevated risk will not be reduced for Lower Grider Creek in this alternative. There is less salvage in the Happy Camp Complex Fire area under Alternative 3 than Alternative 2, so there may be a decreased risk of sediment regime alteration. However, CWE models were not sensitive to these fewer salvage acres at 5th and 7th field watershed scales. There is no hand treatment in Riparian Reserves so the benefit of increased shade and sediment buffering due to production of ground cover will not occur.

Cumulative Effects

Lovers Canyon and Scott Bar Fuels Reduction are the only projects considered as present or future activities in the Happy Camp Complex Fire area for this analysis. Watershed risk ratios displayed in Appendices B and C account for these projects. Livestock grazing is not included in the CWE model assessments but grazing effects are assumed to be minor in the context of the 2014 wildfires.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

Potential effects to hydrologic function and water quality at the watershed scale (5th and 7th fields) are the same as Alternative 2. Music Creek and Jessups Gulch-North Fork Salmon River 7th field watersheds are pushed in to the elevated risk category (ERA) under Alternative 3 There is no effect to debris flow likelihood or duration of elevated landslide risk in this alternative. There is less salvage in the Whites Fire area under Alternative 3 than Alternative 2, so there may be a decreased risk of sediment regime alteration. However, CWE models were not sensitive to these fewer salvage acres at 5th and 7th field watershed scales. There is no hand treatment in Riparian Reserves proposed so the benefit of increased shade and sediment buffering due to increase ground cover will not occur.

Cumulative Effects

The only project modeled for cumulative effects in the Whites Fire area was the Jess project. Watershed risk ratios displayed in Appendices B and C account for these projects. Livestock grazing is not included in the CWE model assessments but grazing effects are assumed to be minor in the context of the 2014 wildfires.

Alternative 4

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

Potential effects to hydrologic function and water quality at the watershed scale (5th and 7th fields) are the same as Alternative 2. Only the Buckhorn Gulch-Beaver Creek 7th field

watershed is pushed in to the elevated risk category (ERA) under Alternative 4. There is no effect to the debris flow likelihood for the Beaver Fire area from Alternative 4.

Cumulative Effects

In the Beaver Fire area the only project analyzed as future or on-going is McCollins. Watershed risk ratios displayed in Appendices B and C account for these projects. Livestock grazing is not included in the CWE model assessments but grazing effects are assumed to be minor in the context of the 2014 wildfires.

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

Potential effects to hydrologic function and water quality at the watershed scale (5th and 7th fields) are the same as Alternative 2. Only the Walker Creek (ERA) is pushed in to the elevated risk category while Lower East Fork Elk Creek moves to the low risk category (USLE model) due to legacy sediment site treatments. There is no effect to the debris flow likelihood and the duration of elevated risk will not be reduced for Lower Grider Creek in this alternative. There is less salvage in the Happy Camp Complex Fire area under Alternative 4 than Alternative 2, so there may be a decreased risk of sediment regime alteration. However, CWE models were not sensitive to these fewer salvage acres at 5th and 7th field watershed scales.

Cumulative Effects

Lovers Canyon and Scott Bar Fuels Reduction are the only projects considered as present or future activities in the Happy Camp Complex Fire area for this analysis. Watershed risk ratios displayed in Appendices B and C account for these projects. Livestock grazing is not included in the CWE model assessments but grazing effects are assumed to be minor in the context of the 2014 wildfires.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

Potential effects to hydrologic function and water quality at the watershed scale (5th and 7th fields) are similar to Alternative 2 with the exception being that the Music Creek 7th field watershed is not pushed in to the elevated risk category (ERA) under Alternative 4. There is no effect to debris flow likelihood or duration of elevated landslide risk in this alternative.

Cumulative Effects

The only project modeled for cumulative effects in the Whites Fire area was the Jess project. Watershed risk ratios displayed in Appendices B and C account for these projects. Livestock grazing is not included in the CWE model assessments but grazing effects are assumed to be minor in the context of the 2014 wildfires.

Alternative 5

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

Potential effects to hydrologic function and water quality at the watershed scale (5th and 7th fields) are the same as Alternative 2. Only the Buckhorn Gulch-Beaver Creek 7th field watershed is pushed in to the elevated risk category (ERA) under Alternative 5.

Cumulative Effects

In the Beaver Fire area the only project analyzed as future or on-going is McCollins. Watershed risk ratios displayed in Appendices B and C account for these projects. Livestock grazing is not included in the CWE model assessments but grazing effects are assumed to be minor in the context of the 2014 wildfires.

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

Potential effects to hydrologic function and water quality at the watershed scale (5th and 7th fields) are the same as Alternative 2. Only the Walker Creek (ERA) is pushed in to the elevated risk category while Lower East Fork Elk Creek moves to the low risk category (USLE model) due to legacy sediment site treatments.

Cumulative Effects

Lovers Canyon and Scott Bar Fuels Reduction are the only projects considered as present or future activities in the Happy Camp Complex Fire area for this analysis. Watershed risk ratios displayed in Appendices B and C account for these projects. Livestock grazing is not included in the CWE model assessments but grazing effects are assumed to be minor in the context of the 2014 wildfires.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

Potential effects to hydrologic function and water quality at the watershed scale (5th and 7th fields) are the same as Alternative 2. Music Creek and Jessups Gulch-North Fork Salmon River 7th field watersheds are pushed in to the elevated risk category (ERA) under Alternative 5.

Cumulative Effects

The only project modeled for cumulative effects in the Whites Fire area was the Jess project. Watershed risk ratios displayed in Appendices B and C account for these projects. Livestock grazing is not included in the CWE model assessments but grazing effects are assumed to be minor in the context of the 2014 wildfires.

Alternative 2 Modified

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

Potential effects to hydrologic function and water quality at the watershed scale (5th and 7th fields) as determined by the three CWE models are the same as Alternative 2 (see Tables 1-3 this report). Only the Buckhorn Gulch-Beaver Creek 7th field watershed is pushed in to the elevated risk category (ERA) under modified Alternative 2.

Cumulative Effects

In the Beaver Fire area the only project analyzed as future or on-going is McCollins. Watershed risk ratios displayed in Appendices B and C account for these projects. Livestock grazing is not included in the CWE model assessments but grazing effects are assumed to be minor in the context of the 2014 wildfires.

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

Potential effects to hydrologic function and water quality at the watershed scale (5th and 7th fields) as determined by CWE models are the same as Alternative 2 (Tables 1-3). Only the Walker Creek (ERA) is pushed in to the elevated risk category while Lower East Fork Elk Creek moves to the low risk category (USLE model) due to legacy sediment site treatments.

Cumulative Effects

Lovers Canyon and Scott Bar Fuels Reduction are the only projects considered as present or future activities in the Happy Camp Complex Fire area for this analysis. Watershed risk ratios displayed in Appendices B and C account for these projects. Livestock grazing is not included in the CWE model assessments but grazing effects are assumed to be minor in the context of the 2014 wildfires.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

Potential effects to hydrologic function and water quality at the watershed scale (5th and 7th fields) as determined by the CWE models are the same as Alternative 2. Music Creek and Jessups Gulch-North Fork Salmon River 7th field watersheds are pushed in to the elevated risk category (ERA) under modified Alternative 2.

Cumulative Effects

The only project modeled for cumulative effects in the Whites Fire area was the Jess project. Watershed risk ratios displayed in Appendices B and C account for these projects. Livestock grazing is not included in the CWE model assessments but grazing effects are assumed to be minor in the context of the 2014 wildfires.

Alternative 3 Modified

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

Potential effects to hydrologic function and water quality at the watershed scale (5th and 7th fields) are the same as Alternative 2 (Tables 1-3). Only the Buckhorn Gulch-Beaver Creek 7th field watershed is pushed in to the elevated risk category (ERA) under modified Alternative 3. Under modified Alternative 3 twenty eight 7th field watersheds exceed the model threshold of concern and of those thirteen have risk ratios that are increased by this alternative's activities.

Site-scale effects are anticipated to be different than Alternative 2. Appendix C demonstrates that fewer miles of temporary roads and associated stream crossings and landings (none in the Beaver Fire area) in Riparian Reserves are proposed anticipated under modified Alternative 3. This reduced ground disturbance will result in reduced risk

of sediment regime alteration, and thus reduced the risk to water quality. In addition, reduced disturbance may be expected to have less effect on the trend of post-fire riparian conditions.

Cumulative Effects

In the Beaver Fire area the only project analyzed as future or on-going is McCollins. Watershed risk ratios displayed in Appendices B and C account for these projects. Livestock grazing is not included in the CWE model assessments but grazing effects are assumed to be minor in the context of the 2014 wildfires.

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

Potential effects to hydrologic function and water quality at the watershed scale (5th and 7th fields) are the same as Alternative 2 (Tables 1-3). Only the Walker Creek (ERA) is pushed in to the elevated risk category while Lower East Fork Elk Creek moves to the low risk category (USLE model) due to legacy sediment site treatments.

Site-scale effects are anticipated to be different than Alternative 2. Appendix C demonstrates that fewer miles of temporary roads and associated stream crossings and landings in Riparian Reserves are proposed anticipated under modified Alternative 3. This reduced ground disturbance will result in reduced risk of sediment regime alteration, and thus reduced the risk to water quality. In addition, reduced disturbance may be expected to have less effect on the trend of post-fire riparian conditions.

Cumulative Effects

Lovers Canyon and Scott Bar Fuels Reduction are the only projects considered as present or future activities in the Happy Camp Complex Fire area for this analysis. Watershed risk ratios displayed in Appendices B and C account for these projects. Livestock grazing is not included in the CWE model assessments but grazing effects are assumed to be minor in the context of the 2014 wildfires.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

Potential effects to hydrologic function and water quality at the watershed scale (5th and 7th fields) are the same as Alternative 2 (Tables 1-3). Music Creek and Jessups Gulch-North Fork Salmon River 7th field watersheds are pushed in to the elevated risk category (ERA) in modified Alternative 3.

Site-scale effects are anticipated to be different than Alternative 2. Appendix C demonstrates that fewer miles of temporary roads and associated stream crossings and landings (none in the Whites Fire area) in Riparian Reserves are proposed anticipated under modified Alternative 3. This reduced ground disturbance will result in reduced risk of sediment regime alteration, and thus reduced the risk to water quality. In addition, reduced disturbance may be expected to have less effect on the trend of post-fire riparian conditions.

Cumulative Effects

The only project modeled for cumulative effects in the Whites Fire area was the Jess project. Watershed risk ratios displayed in Appendices B and C account for these projects. Livestock grazing is not included in the CWE model assessments but grazing effects are assumed to be minor in the context of the 2014 wildfires.

Compliant with Law, Policy and the Forest Plan

All alternatives are complaint with applicable law, regulation, and policy. The project will be enrolled in the North Coast Regional Water Quality Control Board waiver program prior to implementation of the selected alternative.

Aquatic Resources (includes fisheries)

This section describes the environment for aquatic resources in the analysis area and discloses the effects to these resources. For a full description of the analysis of effects to these resources refer to the Aquatic Resources Report and Amendment; Fisheries Biological Assessment; and aquatic section of the Project Management Indicator Report.

Methodology

Analysis is based on three components: (1) a review of existing information for streams in the analysis area; (2) post-fire field review of proposed treatment units, Riparian Reserves and stream channels; and (3) a review of best available information related to aquatic resources present and potential impacts of the various actions proposed. Existing information came from the Forest Plan, watershed analysis conducted by the Forest, existing stream survey data and reports, and other environmental analyses completed for projects within the analysis area. These sources provide information on watershed histories and land uses, aquatic species distribution and habitat use within the analysis area, and aquatic habitat conditions.

The analysis area 5th field and 7th field watersheds provide habitat for the special status aquatic species listed under analysis indicators.

Analysis Indicators

Threatened and Endangered Species/Forest Service Sensitive Species

There are no endangered species in the analysis area and the Southern Oregon/Northern California Coast (SONCC) Coho Salmon is the only threatened species; critical habitat has been identified for SONCC Coho Salmon. Three key habitat indicators form the *Analytical Process for Developing Biological Assessments for Federal Actions Affecting Fish within the Northwest Forest Plan Area* (USDA-USDOC-USDI 2004) are used for the analysis of effects to Coho Salmon. This allows standardization of evaluations of actions and effects for conferencing/consultations under Section (§) 7(a)(2) of the Endangered Species Act (ESA). The same analysis indicators are used to evaluate effects on Forest Service sensitive species: Upper Klamath-Trinity River (UKT) Chinook Salmon; Klamath Mountains Province (KMP) steelhead; Pacific lamprey; Klamath River lamprey; southern torrent salamander; foothill yellow-legged frog; cascade frog; and western pond turtle. These indicators are: water temperature; sediment (fine sediment in substrates and substrate embeddedness); and large wood. Essential fish habitat (EFH) has been determined for the SONCC Coho Salmon and the UKT Chinook Salmon as required

by the Magnuson-Stevens Fishery Conservation and Management Act; effects on EFH are also measured by effects on these indicators.

Management Indicator Species

Management indicator species associations are identified in the Forest Plan as associations that may be affected by management activities. Analysis of effects of actions on these associations involves examining the impacts of the project on habitat associations for management indicator species. Species associations related to aquatic species are the river/stream association and the marsh/lake/pond association. For this analysis, the following analysis indicators will be used to determine the level of effects for each habitat association.

River/Stream Associated Species (steelhead, resident rainbow trout, tailed frog, and cascades frog):

Change in Water Quality (WQ), physical barriers, substrate, refugia, stream-bank condition, disturbance history/regime, flows, drainage network, and Riparian Reserves.

Aquatic species included in this association are steelhead and resident trout, tailed frog, and Cascades frog. For purposes of the management indicator species association analysis, river/stream habitat is degraded where the project may result in impacts to the near stream environment, water quality, and/or aquatic habitat to the point that the quality of the habitat is lessened. River/stream habitat is removed if the habitat is affected by the project such that it is no longer suitable habitat for the indicator species.

Marsh/Lake/Pond Associated Species (western pond turtle):

Change in low gradient, open water habitat quality, including streamside vegetation and large wood.

Western pond turtle is the only species for this association. The analysis of this habitat association is the same as for river/stream associated species except with an emphasis on perennial low gradient streams, ponds and other lentic waterbodies.

Spatial and Temporal Context

The aquatic resources analysis area is comprised of the 5th field watersheds and their 7th field drainages that were affected by the 2014 fires and in which activities are proposed for this project (see list of these watersheds in Chapter 1).

The temporal bounding of the analysis includes effects during implementation, short-term effects expected to occur within the first year following implementation, and long-term effects (greater than one year).

Affected Environment

The affected environment describes the 5th field watersheds in the 2014 burned area, the special status aquatic resources that are likely to be present, and the pre-project condition of the key indicators of habitat quality for aquatic species (temperature, sediment, and large wood).

Overall, the water quality in the project area is impaired and is on the 303(d) Clean Water Act list due to temperature and other constituents (Table 3-44).

Table 3-44:Clean Water Act 303(d) listed reaches of the Middle Klamath River (NCRWQCB 2008).

Waterbody	Pollutant
Middle Klamath River HA, Iron Gate Dam to Scott River Reach	Nutrients, Organic Enrichment/Low Dissolved Oxygen, Temperature
Middle Klamath River HA, Iron Gate Dam to Scott River Reach, mainstem Klamath	Microcystin
Middle Klamath River HA, Beaver Creek, Cow Creek, Deer Creek, Humgry Creek, West Fork Beaver Creek	Sediment
Middle & Lower Klamath River HAs, Scott River to Trinity River Reach	Nutrients, Organic Enrichment/Low Dissolved Oxygen, Temperature
Middle & Lower Klamath River HAs, Scott River to Trinity River Reach, mainstem Klamath River	Microcystin
Middle & Lower Klamath River HAs, China Creek, Fort Goff Creek, Grider Creek, Portuguese Creek, Thompson Creek, Walker Creek	Sediment
Salmon River HA	Temperature
Scott River HA	Sedimentation/Siltation, Temperature

Table 3-28 displays the miles of stream that were affected by moderate or high severity fire in 2014. Wildfires result in increased runoff and sediment yield commensurate with burn severity. Due to the nature of fire salvage, project actions and effects are likely within or near streams that were affected by the fires. Within the riparian areas that were heavily affected by moderate and high severity effects from the fires, riparian and aquatic habitat are currently degraded in terms of loss of shade/canopy cover and soil cover, as well as potential for hydrophobic soils in areas that burned hot (see the Soil section of this chapter and the Soil Resources Report). These changes led to a reduced capacity of some riparian areas to provide shade and cover for aquatic organisms and to reduced capacity to slow overland flow and filter out sediment before it reaches stream channels

Table 3-45: Summary of stream channel burn severity data from BAER Reports (USFS 2014a-2014f) for the 2014 fires.

Fire Area	Stream Type	Moderate miles (%)	High miles (%)	Total (miles)
Beaver Fire	Intermittent	37 (28%)	10 (8%)	47
	Perennial	5 (14%)	<1 (0%)	5
Happy Camp Complex	Intermittent	50 (18%)	2 (1%)	52
	Perennial	27 (11%)	<1 (0%)	27
Whites Complex	Intermittent	21 (24%)	4 (5%)	25
	Perennial	9 (14%)	2 (3%)	11
Total (miles)	Intermittent	108	16	124
	Perennial	41	2	43

Project Area A: Beaver Fire

The Beaver Fire burned approximately 43,327 acres in the following 5th field watersheds (and their 7th field subwatersheds which are discussed in detail in the Aquatic Resources Report):

- Beaver Creek (16,303 acres burned)
- Horse Creek-Klamath River (21,244 acres burned)
- Humbug Creek-Klamath River (5,780 acres burned)

Aquatic Resources

Beaver Creek is a tributary to the Klamath River and the watershed provides approximately 31 miles of designated critical habitat for SONCC Coho salmon, as well as for Klamath Mountains Province steelhead and Upper Klamath-Trinity Rivers Chinook salmon. Resident trout occur in Beaver Creek, as well as within most tributary streams higher up in the drainages than salmon occur. Beaver Creek also provides habitat for Pacific and Klamath River lamprey and other special status aquatic species including foothill yellow legged frog, and western pond turtle. The Beaver Fire area does not provide suitable habitat for Cascade frogs and this species is not likely to occur in aquatic habitat potentially affected by actions in this area. The Beaver Creek Ecosystem Analysis (USFS 1996) contains more detailed watershed information.

Sediment

The Beaver Creek watershed is on the 303(d) Clean Water Act list as impaired for sediment. Approximately 36% of the watershed is privately owned and managed for timber production. Intensive management on private lands and high road density contributes to the high pre-project risk ratios in the Beaver Creek 5th field watershed. Additionally, Long John, Grouse Creek, and Hungry Creek subwatersheds all have large proportions of granitic soils and are recognized as heavy sediment contributors to Beaver Creek. Dutch Creek was the most severely affected tributary of the Beaver Fire in 2014; approximately 93% of this subwatershed burned and had a large area of moderate to high soil burn intensity. Burned Area Emergency Response (BAER) teams reported that the highest changes in peak runoff potential are in the Dutch Creek and Kohl Creek. Decreased interception of rainfall as a result of wildfire as well as increased sediment and runoff delivered to streams can lead to increased debris flow probability in the affected watersheds compared to pre-fire conditions. The duration of impacts is likely to be intermediate between short- and long-duration depending on the location until regrowth of vegetation reduces sediment source areas and high gradient channels flush stored sediments. Post-fire, the sediment habitat indicator in the Beaver Creek watershed is considered as “at risk” or “not properly functioning” based on modeled high risk ratios and impacts on sediment observed or documented in KNF BAER reports. As a result of storms during the winter and summer following the 2014 wildfires, elevated sediment conditions were observed in Doggett, Kohl, Dutch, and Beaver Creeks.

Water Temperatures

Tributaries and upper reaches of Beaver Creek have low summer water temperatures and are considered “Properly Functioning”. Thus, the Beaver Creek provides thermal refugia for salmonids and other aquatic species. Relative to stream shade, the percent of perennial streamside areas that were burned is the primary indicator of the potential effects to shade and water temperatures post-fire. Approximately 3% of perennial streamside areas were burned at high severity and 14% of perennial streamside areas were burned at moderate severity. This represents an impact to riparian function in burned area, at the site-scale, but is not expected to affect water temperatures in Beaver Creek to a measurable extent. However, these fire related impacts to stream shade and water temperature are additive to those of ongoing timber harvest activities on private land in this watershed which have affected shade over streams.

Large Wood

In general, streams within the Beaver Fire area are considered deficit in desired large wood loading. This is mostly due to the legacy of past management actions which included large tree removal from riparian areas as well as 'stream cleaning' operations in the 1980's that removed wood from streams with the intention of protecting infrastructure such as roads. These actions that resulted in large wood removal from near stream areas on Forest lands ended when the current Forest Plan and its Aquatic Conservation Strategy was put in place in 1994. Timber harvest on private lands most likely continues to have some negative effect on large wood in near stream areas.

Pre-fire wood loading in Beaver Creek was determined to be "Properly Functioning". The Beaver Fire had no effect on instream wood levels in mainstem Beaver Creek, but it did increase short-term wood loading in streams. Long-term large wood recruitment from areas burned at moderate and high severity in 2014 will remain high on Forest lands, and low on private lands because most of these have or will be salvage harvested. Relative to perennial streams, the percent of streamside areas that burned at high severity in this watershed is limited (less than 3 percent) indicating that overall effects to large wood loading and recruitment in fish-bearing streams will be minor. Approximately 14% of perennial streamside areas were burned at moderate severity which means that an estimated 50% of the vegetation was burned. Thus, in high and moderate severity areas, an increase in large wood loading is expected in the short-term, and a reduction in large wood recruitment is expected over the long-term until mature forests are reestablished. Currently for the Beaver Creek watershed, large wood recruitment is considered to be "properly functioning".

Project Area B: Happy Camp Fire

The Happy Camp Complex Fire burned approximately 131,313 acres within the following 5th field watersheds (and their 7th field watersheds described in detail in the Aquatic Resources Report):

- Lower Scott River (43,108 acres)
- Elk Creek (34,633 acres)
- Seiad Creek-Klamath River (50,897 acres)
- Thompson Creek-Klamath River (11,243 acres)

Approximately 1% of the area burned at high severity in the Happy Camp Complex and approximately 22% at moderate severity.

Aquatic Resources

Grider and Elk creek watersheds are identified as Key Watersheds in the Forest Plan. The Scott and Klamath Rivers in the project area provide habitat for known populations of SONCC Coho salmon, Chinook salmon, steelhead and resident trout, Pacific and Klamath River lamprey, and other native and non-native fish species. Other special status aquatic species present in these mainstem rivers include foothill yellow legged frog and western pond turtle. Resident rainbow trout occur upstream of the distribution of salmon in most fish-bearing tributaries of the project area. Cascade frogs are known to occur in upper watershed areas in Wilderness lakes; this species is assumed to occur in lakes and stream habitat above 2500 feet in elevation. Southern torrent salamanders are typically

found nearer to the coast than the project area, however this species may occur in the western-most parts of the project area in Elk Creek watershed.

Main tributaries of the Middle Klamath River occurring in the project area include Elk, Grider, and Walker Creeks as well as the Scott River. These streams provide critical thermal refugia to salmonids in the Klamath River and contain spawning, rearing, and holding habitat for salmon and trout and other special status aquatic species. Tompkins Creek, tributary to the Scott River, also provides valuable habitat for salmonids and other special status aquatic species. Much of the Walker and Grider Creek watersheds were heavily affected by 2014 wildfires; post fire impacts to fish habitat during winter and summer storms in 2015 likely affected fish distribution in these drainages at least in the short term. In the project area, other smaller tributary streams that provide critical salmonid habitat include Kelsey, O'Neil, China, (Little) Horse, Cougar, and East Fork Elk Creeks. Most of these streams also provide habitat for Pacific and Klamath River lamprey and other native fish species.

Sediment

Soils in the Happy Camp Fire area are in general highly erodible, and in combination with the steep terrain, recent large wildfires, and a legacy of past timber harvest and road building activities, fine sediment loading contributes to impaired aquatic habitat conditions. The Scott River and Middle/Lower Klamath River including Walker, Grider, and China Creeks are 303(d) Clean Water Act-listed for sediment; excessive sediment loads and associated elevated water temperatures in these streams have resulted in degraded water quality conditions that impair salmon production.

Relatively low amounts of intermittent and perennial Riparian Reserves burned at high severity during 2014 fires, however post fire sediment related impacts to fish habitat depend heavily upon weather and timing and location of other stochastic events such as localized intense precipitation and rain on snow events. KNF BAER teams documented conditions in these watersheds after the 2014 fires, it was noted that many of the intermittent and ephemeral channels in the affected watersheds were full of sediment. A significant storm event was expected to mobilize this sediment and send it downstream including to Tompkins, Walker, Grider, and East Fork Elk Creek. As a result of storms during the winter and summer following the 2014 wildfires, elevated sediment conditions were observed in Walker, Grider, and Elk Creeks; as well as smaller fish bearing and non-fish bearing streams.

Water Temperatures

Overall, the water quality in the Klamath River is impaired and is on the 303(d) Clean Water Act list due to temperature and other constituents. Use of mainstem river habitat by salmonids is most limited by water quality during the summer months (June through September) when water temperatures are high throughout the day. Salmonids seek, and are dependent upon, thermal refugia habitat in tributaries and other off-channel areas where cooler water can be found.

Water temperatures in the Scott River are also limiting for salmonids, particularly in dry years. While the mainstem Scott River stream temperatures are "not properly functioning", many tributaries including French, Tompkins, and Canyon Creeks are considered "properly functioning" relative to stream temperatures and provide important

thermal refugia to aquatic species in this watershed. The percent of streamside areas that burned in 2014 is an indication of impacts to riparian function including stream shade along perennial streams. The percent impact to streamside areas is relatively low, and is not expected to measurably change stream temperatures. However, stream temperatures would be affected where/if channel-altering debris flow events occur that remove streamside vegetation.

Peak summer temperatures have been higher than optimal for salmonids in the lower mainstem reaches of Elk Creek. However, habitat in Elk creek provides some of the highest quality spawning and rearing habitat for Coho salmon in the Middle Klamath River. Recent temperature monitoring data indicates that Walker, Grider and Elk creeks stream temperatures are "at risk". These creeks provide important high quality habitat that serves as important thermal refugia for salmonids in the Middle Klamath River during warm periods; smaller project area tributaries such as Tom Martin, O'Neil, (Little) Horse, China, Cougar, and East Fork Elk creeks also provide important thermal refugia with capacity to support less fish.

Large Wood

In general, streams within the Happy Camp Fire area are considered deficit in desired large wood loading. This is mostly due to the legacy of past management actions which included large tree removal from riparian areas as well as 'stream cleaning' operations in the 1980's that removed wood from streams with the intention of protecting infrastructure such as roads. Actions that remove large wood from near stream areas on Forest lands, for the most part, ended when the current Forest Plan and its Aquatic Conservation Strategy was put in place in 1994; currently only the removal of hazard trees in administrative and recreation sites, in limited circumstances, results in the loss of any large wood from near stream areas.

The 2014 fires affected large wood near streams only where high burn severity occurred along perennial streams. Approximately 11% of perennial stream Riparian Reserves were burned at moderate severity, and less than 1% at high severity, in the Happy Camp Complex. In localized near stream high burn severity areas, large wood was actually consumed and therefore the fire caused negative short and long term effects to large wood recruitment. In other moderate or mixed severity burns, near stream areas will experience an increase wood loading in the short-term, and potentially a reduction (or little change, depending on the burn) in large wood available for recruitment in the long-term. Overall, the main tributaries of the Happy Camp Fire area are considered either "at risk" in the case of Elk and Grider Creeks, or "not properly functioning" in Walker and Tompkins Creeks.

Project Area C: Whites Fire

The Whites Fire area burned a total of 38,916 acres in the North Fork Salmon River and its 7th field drainages, as described in detail in the Aquatic Resources Report and Amendment.

Aquatic Resources

The Salmon River is a Key Watershed. The basin provides approximately 175 miles of salmon and trout habitat distributed within the main stem, Wooley Creek, and North Fork

and South Fork Salmon River. This habitat supports populations of SONCC Coho salmon, Upper Klamath-Trinity River Chinook salmon, and Klamath Mountains Province steelhead; as well as Pacific and Klamath River lamprey, and western pond turtle. Cascade frogs are known to occur in upper watershed areas in Wilderness lakes, and are assumed to occur in stream habitat of the Whites Fire area as well.

The Salmon River spring-run Chinook salmon are the last and largest wild population of this run in the Klamath Basin, and one of the last remaining the State. Steelhead trout are the most widely-distributed of salmonids in the Salmon River watershed.

Sediment

The 2014 wildfires affected tributaries to the North Fork Salmon River that provide habitat for anadromous salmonids (Cow Creek, North Russian and Whites Gulch) as well as tributaries that provide habitat for resident and steelhead trout, and the other special status aquatic species.

Post-fire mapping indicated that burn intensity along fish-bearing streams was predominantly low, or unburned. The primary exception was East Fork Whites Gulch, as well as a small segment of the North Fork Salmon River. The North Fork Salmon River post-fire 5th field watershed risk ratio for both ERA and USLE is at 0.3, well below 1.0 indicating that disturbance resulting from roads, vegetation management, and wildfire is sufficiently below the threshold of concern; these results are interpreted to mean that effects related to sedimentation and increased peak flow will not be significant at this scale. However, given the post-fire condition, sediment delivery to streams as a result of near term storms and other stochastic events is likely.

Water Temperatures

The Salmon River is impaired and is listed under the 303(d) Clean Water Act for temperature (Table X). Due primarily to past intense mining practices, shade is lacking along the entire North Fork of the Salmon with the exception of the upper-most reaches. Tributary temperatures are typically below lethal levels for salmonids and therefore provide thermal refugia. The North Fork Salmon River stream temperatures ranged from “Properly Functioning” to “Not Functioning” in 2014 relative to salmonid criteria.

The percent of stream channel burned in 2014 is an indication of the fire-related impacts to riparian function, including stream shade along perennial streams. Approximately 3% of perennial streamside areas were burned at high severity, these areas will provide little to no shade to stream channels post-fire until trees re-establish. Approximately 14% of perennial streamside areas burned at moderate severity, which means these areas experienced an estimated 50% reduction in streamside vegetation. The relative percentage of reduction in vegetation along streams due to the fire is low and not expected to measurably increase stream temperatures. However, stream temperature would be affected where/if channel-altering debris flow events occur and temporarily remove streamside vegetation.

Large Wood

In general, streams within the Whites Fire area are considered deficit in desired large wood loading. This is mostly due to the legacy of past management actions which included in channel mining and large tree removal from riparian areas as well as ‘stream

cleaning' operations in the 1980's that removed wood from streams with the intention of protecting infrastructure such as roads. Actions that remove large wood from near stream areas on Forest lands, for the most part, ended when the current Forest Plan and its Aquatic Conservation Strategy was put in place in 1994; currently only the removal of hazard trees in administrative and recreation sites, in limited circumstances, results in the loss of any large wood from near stream areas.

Indirect effects from the 2014 fires include increases in short-term wood loading and reductions in large wood available for recruitment in the long-term for areas that burned at high severity. Particularly high burn severity areas along perennial streams will experience an increase in wood loading in the short-term and a reduction in large wood available to streams in the long-term. The percentage of perennial stream channels that burned in the Whites Fire at high severity is limited (3%) indicating that effects to large wood loading and recruitment at the watershed scale will be minor. Approximately 14% of perennial streamside areas were burned at moderate severity in the Whites Fire, which means an estimated 50% percent of the vegetation was burned in these areas. Collectively, these high and moderate burn severity areas will increase large wood loading in the short-term and in some areas there may be a reduction in the available sources of large wood for recruitment in the long-term.

Environmental Consequences

All alternatives include Project Design Features (project design features) that were developed for this project by watershed specialists to minimize impacts to soils and riparian/aquatic resources (see Table 2-42 in Chapter 2 for project design features). Particularly for in stream actions such as stream crossing work, project BMPs and project design features include those methods agreed upon during interagency ESA consultation to sufficiently minimize negative effects to salmonids (Facilities Maintenance and Watershed Restoration programmatic Biological Assessment 2004).

Implementation of these project design features as part of the project is critical to ensure that actions meet Forest Plan direction and compliance with all other applicable law, regulation, and policy.

Potential direct effects to each special status aquatic species are disclosed below. Because these species have some overlapping habitat requirements, potential impacts to their habitat (indirect effects) are discussed together using key habitat indicators that reflect the quantity and quality of suitable habitat for these species pre- and post-project, as well as the trend of aquatic/riparian condition in the area potentially affected by this project.

Alternative 1

Threatened/Endangered and Forest Service Sensitive Species

Direct Effects

Under Alternative 1, there would be no action taken to meet the purpose and need for the project and desired future conditions within the project area (see Chapter 1).

This alternative is not a baseline condition, but rather a description of future circumstances without implementation of the project. This alternative is a continuation of the current level of management including road maintenance, hazard tree removal, dispersed recreation, mining, watershed restoration, appropriate management and fire

suppression against the back-drop of about 160,000 acres of Forest lands in the project area that burned in 2014. No direct effects will occur under this alternative since no activities will be implemented as a result of the project.

Indirect Effects

For the sediment and temperature indicators, watershed conditions will recover over time from the impacts of the 2014 fires. In the moderate and high burn severity areas surrounding stream channels, an increase in large wood loading is expected in the short-term from falling snags, and a reduction in large available for recruitment is expected over the long-term unless and until these areas naturally recover with large conifers.

Salvage Harvest and Reforestation

Alternative 1 will not remove burned trees or help to restore forests including in moderate and high fire intensity areas. Without salvage, site preparation, and replanting severely burned stands (such as Walker Creek) will likely be replaced by shrublands (Skinner et al. 2006, page 174) and restoration to conifer stands may take decades or even longer. Planting without site preparation would likely result in the loss in conifer plantations before they mature given the median five to 25-year fire return interval predicted within the analysis area. Failing to salvage and reforest moderate to high severity stands in subsequent years increases the potential for a future wildfire to spread and cause adverse impacts to Riparian Reserves (including sediment, stream temperature, and large wood) because it will be unsafe to fight the fire directly. This alternative can indirectly affect sediment regimes in the analysis area when a future wildfire occurs because there will be an increased potential for severe fire effects if fuels are not reduced and because the abundance of burned trees within the fire areas will make fire suppression difficult if not impossible. With this alternative, short-term negative impacts of post-fire salvage logging on aquatic resources will be eliminated.

Fuels Reduction

Immediate post-fire conditions in the analysis include reduced surface fuel loading across the landscape. Thus, over the next one to five years, if a fire occurs there is a low potential for fire spread and fire intensity that would add to the ongoing watershed impacts to aquatic species and their habitat. Fire suppression would be effective in containing new fire ignitions. Within five to ten years, the potential for future wildfire to spread and cause adverse impacts to watershed processes and fish bearing habitat increases. Within moderate to high severity burn areas, enormous amounts of dead trees will remain standing and some will fall, creating high fuel loads across the burned landscape. If a fire does not occur within this time, these areas will likely be covered with shrubs and dead and down snags, making the area susceptible to high severity fire. Where stand-replacing fire intensity occurs on hillslopes and in streamside zones, adverse impacts to habitat indicators and aquatic species are expected to be negligible in the short-term (due to current low surface fuel loading) and moderate or more sizeable when/if the next wildfire occurs in the long-term.

Hazard Tree Abatement

Hazard tree reduction as described for this project will not occur under this alternative. Hazard tree removal will continue where it is part of ongoing actions, or where proposed in future project.

Temporary Roads, Landings, and Water Drafting

Since no project activities, including construction of temporary roads and landings or water drafting will occur under this alternative, there will be no effects on habitat indicators or aquatic species associated with these activities. With Alternatives 2,3, and 5 there are several sites (along tributaries of Doggett and Grider) where project temporary road actions involve using roads that currently have legacy sediment sites, or areas that are at risk of erosion (and therefore a threat to water quality) due to past land use. When/if the project uses these roads they will be hydrologically stabilized and any active erosion, or risk of erosion will be addressed. For the drainages where this would occur with the action alternatives, the opportunity to improve/protect water quality would be foregone with Alternative 1.

Legacy Sites

None of the treatments to address roughly 150 legacy sediment sites in the Elk Creek watershed will occur in this alternative; there will be no treatment to address undersized culverts, diversion potential, fill removal on abandoned roads, or aquatic organism passage. Also, road storm-proofing treatments on about 33 miles of system road in the Elk Creek watershed will not be covered by this alternative.

Cumulative Effects

Alternative 1 will not add project-related direct effects to the effects of past, present/ongoing or future projects because no management activities are proposed.

There will be minimal impacts on aquatic species from reasonable future action in other projects. Where there is spatial or temporal overlap of projects currently undergoing implementation, they have already been accounted for in the existing environment. Where future actions do overlap with the project, cumulative effects will be minor because adding the indirect effects of Alternative 1 to the effects of other projects is not expected to cumulatively produce measurable effects to aquatic species.

Management Indicator Species

Direct Effects

Because there would be no action taken, there would be no direct effects.

Indirect Effects

An important indirect effect of the Alternative 1, relative to riparian and aquatic resources, is the missed opportunity for the legacy site treatments included in all of the action alternatives.

Failing to salvage and reforest moderate to high severity burned stands would have no effect on stream temperature, sediment, or large wood over the next one to five years as post-fire conditions include reduced surface fuel loading across the landscape. From five to 10 years out, failing to salvage and reforest moderate to high severity burned stands, and conduct fuels treatments, increases the potential for a wildfire that spreads and is likely to cause adverse impacts to Riparian Reserves and aquatic habitat. As large trees fall and brush accumulates, it becomes more unsafe to fight fires directly and, therefore, fires are likely to burn across more drainages, causing more negative effects to aquatic habitat.

Cumulative Effects

Cumulative effects to management indicator species associations are similar to the cumulative effects to threatened and Forest Service sensitive species.

Alternative 2

Project Area A: Beaver Fire

Threatened/Endangered and Forest Service Sensitive Species

Direct Effects

Water drafting and stream crossing work associated with near stream temporary road actions are the only actions proposed within streams of the Beaver Fire area, and therefore the actions that with potential for directly affecting aquatic resources. Special status aquatic species that may be directly affected in the Beaver Fire area include: SONCC Coho salmon, Chinook salmon, steelhead and resident rainbow trout, Pacific lamprey, Klamath River lamprey, Foothill yellow legged frog, and western pond turtle.

Water Drafting

During water drafting, aquatic species present could experience direct effects associated with rapid changes or sustained reductions in flow, reduced dissolved oxygen, and/or increased water temperature. In order to reduce or eliminate these potential effects, the Forest Service follows Best Management Practice guidance described in Region 5 Forest Service Handbook 2509.22, Chapter 10-Water Quality Management Handbook (2011). Specifically Best Management Practice (best management practices) 2.5 Water Source Development and Utilization provides direction specific to water drafting.

These best management practices protection measures ensure that water drafting may only occur when bypass stream flows can be sustained of 1.5 cubic feet per second for fish bearing streams, or 10 gallons per minute for non-fish bearing streams; drafting rate is not to exceed 20% of surface flows in fish bearing streams and 50% of surface flows in non-fish bearing streams. When in Coho salmon Critical Habitat (CH), in addition Project water drafting will be implemented according to NOAA water drafting specifications (2001). These NOAA water drafting specifications require that pumping rates during drafting do not exceed 10% of the stream flow, and that drafting does not result in obvious draw-down of either upstream or downstream pools. Both best management practices and NOAA specifications require that water drafting operations use a fish screen appropriate to protect aquatic species present at the site; NOAA specifications require specific size of screen mesh (maximum 3/32 inch diameter for round or square openings).

Water drafting typically overlaps the Coho salmon lifecycle when young fish (0+ and 1+ years old) are utilizing summer rearing habitat, which is limiting in general in the mid Klamath River. Protection of cold water habitat is critical to promote the survival of juvenile Coho salmon in this area. The potential effects of water drafting were further minimized between draft EIS and final EIS by updating project design feature Watershed-34 with National Marine Fisheries Service and Karuk Tribe specifically to avoid potential impacts drafting could have on salmonids that are dependent upon thermal refugia areas in summer and early fall. This project design feature specifies that certain areas (lower reaches of cold tributaries) across the project area and several specific creeks are to be avoided during summer and fall water drafting (generally June

through September). None of the specific creeks identified in the project design feature occur in the Beaver Fire area; however, the increased protection of flows in lower reaches of all cold tributaries reduces the chance that water drafting would have measurable negative impacts to fish that are relying upon thermal refugia. Implementation of this project design feature requires that lower reaches of cold water tributaries to, and including, Beaver Creek would be avoided during water drafting; water needed for dust abatement in this area will primarily come from the Klamath River at drafting site(s) outside of any cold-water tributary inputs. Protection of cold aquatic habitat is incredibly important to aquatic species in this area including SONCC Coho salmon, especially as extended drought conditions persist.

Relative to Pacific and Klamath River lamprey, Chinook salmon, and steelhead trout; because these species occur primarily within Coho salmon CH they will be protected from impacts of water drafting as described for Coho salmon. Especially for steelhead trout, the overlap in typical timing of water drafting operations and fish life cycle results in more potential exposure of vulnerable life history forms (eggs and alevins which are still dependent upon gravel nests/redds) to water drafting impacts, especially when dust abatement is needed early during dry spring and early summer months. As described in project design feature Watershed-35, minor instream modifications are only allowed outside of CH which is mostly equivalent to steelhead trout spawning distribution. This reduces the chance that water drafting operations would directly affect steelhead redds or young fish. Required screening in all fish bearing streams eliminates the chance of direct impacts to all fish species.

In many drainages, the distribution of resident rainbow trout and other aquatic species extend beyond/above Coho salmon CH. According to current water drafting site information, there are not water drafting sites in resident trout only fish-bearing creeks in Beaver Fire area. However, if one was to be identified and designated for use by the Forest Service, best management practices described above would protect flows in these creeks by allowing drafting only up to 20% of surface flows and providing for at least 1.5 cubic feet per second bypass flows in the creek. Required screening in all fish bearing streams eliminates the chance of direct impacts to all fish species.

Foothill yellow legged frog and Western pond turtle, in the Beaver Fire area, are likely to occur along Beaver Creek and the Klamath River. Because these areas are also Coho salmon CH, there will be no modification of drafting sites that could impact these species. Screening requirements, and maintenance of surface flows as described above for fish species, will also protect foothill yellow legged frogs and Western pond turtles. It is possible that these species also occur in upper watershed areas in small spring ponds or wetlands. These water sources are subject to the same best management practices that protect flows and require screening (and require coordination with fish biologists on drafting locations); these areas often do not provide the conditions suitable to non-emergency water drafting per best management practices. Also, the timing of typical water drafting operations is when frogs and turtles are mobile and able to avoid areas of disturbance. If water drafting per best management practices occurs in upper watershed ponds or springs, there would be some impact to these species if they occur there. The impact would be a result of losing up to 50% of surface flow, or reducing flowing water to 10 gallons per minute. In this case, individuals may be temporarily harassed or

displaced, however essential functions such as breeding, feeding, and sheltering would not be meaningfully affected.

Stream crossing work

Several temporary stream crossings will be required as part of temporary road actions; these crossings are outside/above the range of fish, therefore potential effects to fish associated with temporary stream channel crossings are disclosed below under indirect effects. Special status aquatic species that may be present and therefore directly affected by stream crossing work associated with these temporary road actions are foothill yellow legged frog and western pond turtle. There are two locations where crossing work may involve work in an active stream channel, reopening/use/hydrologic stabilization on existing road beds:

- Existing temp 8 – This old road bed has several legacy sediment sources along it related to drainage problems and one perennial stream crossing on non-fish-bearing tributary to Doggett Creek.
- Existing temp 39 and 40 – This old road bed has several legacy sediment sources related to drainage problems and two intermittent stream crossings on non-fish-bearing tributary to Beaver Creek.

Potential effects would be minimized by implementation of project design features and best management practices; only temporary disturbance/displacement of individual frogs or turtles would occur and these effects are not likely to reduce population levels or reduce distribution of these species.

Indirect Effects

Potential indirect effects were evaluated based on three main indicators of aquatic habitat: sediment, stream temperature, and large wood/riparian function.

Salvage Harvest and Reforestation

In large part because salvage harvest is proposed only outside of stream course Riparian Reserves including inner gorges, this analysis concludes that proposed salvage and reforestation actions are likely to result in neutral or discountable effects to aquatic species and their habitat. These conclusions are based on field reviews, CWE analysis and professional judgement. Given the substantial landscape-level effects of the 2014 Beaver Fire, and the slight incremental increase in disturbance that salvage harvest would cause, any negative effect of proposed salvage and reforestation to aquatic habitat would be minor and discountable. In addition, removing dead trees and brush (fuels for future fires) and planting conifers as described in this EIS is likely to allow for quicker development of large trees and sustainable forests in these areas.

Site preparation and planting activities are proposed within salvage units and separate site preparation and planting units. Site preparation and planting units are mostly relatively young plantations that burned at high or moderate severity. As with salvage harvest, stream course Riparian Reserves and inner gorges, are excluded from activities in site preparation and planting units with Alternative 2 therefore these actions are likely to have little to no effect on aquatic habitat. Alternative 2 does not include the Beaver Fire area for hand treatments within Riparian Reserves. The beneficial effects of this treatment, as described for Modified Alternative 3, would be foregone in the Beaver Fire area with Alternative 2.

Fuels Reduction

Although fuels reduction actions will occur within Riparian Reserves, project design features were developed to sufficiently protect riparian and aquatic system functions including sediment, stream temperature and large wood. Therefore, these actions are likely to have only discountable short term effects on habitat indicators and minor effects on aquatic species. Project fuels treatments are designed to reduce the adverse effects of future wildfires and, therefore, would provide some protection for future watershed condition and function especially if/when the future fire is greater than five years in the future.

Hazard Tree Abatement

In the Beaver Fire area, a total of 4 miles of perennial stream and 8 miles of intermittent stream may be exposed to the effects of roadside hazard tree removal with Alternative 2. Streams affected that contain habitat for SONCC Coho salmon and most other special status aquatic species include sections of the Klamath River and Beaver Creek, as well as Dutch Creek and several non-fish bearing reaches of Doggett and Kohl Creeks.

The potential effects of roadside hazard tree removal on aquatic resources includes ground disturbance associated with felling trees and yarding up to roads, and localized loss of woody debris and potentially shade. Equipment restrictions that prohibit ground based equipment from leaving roads when implementing roadside hazard tree removal within RR minimizes near stream ground disturbance (Watershed-4 which was updated between draft EIS and final EIS) so that these actions are not likely to cause stream sedimentation. Risk of impacts to other aquatic habitat indicators is associated mostly with removal of trees near stream channels, particularly live trees and groups of hazard trees along roads that parallel streams or have many road/stream crossings. Project design feature Watershed-12 specifies that hazard trees equal to or greater than 26 inches DBH that are within one site tree distance from all stream channels, including perennial non-fish bearing and intermittent stream channels will be retained even if they need to be felled for safety. Considering that the probability of wood entering an active stream channel from greater than one tree height is generally low (FEMAT 1993), this project design feature is likely to ensure that roadside hazard tree removal (the only action that would remove trees from Riparian Reserves) would have discountable effects to large wood recruitment. Another project design feature restricts hazard tree removal to only fire-injured or killed trees, which further decreases the likelihood that trees that currently provide shade to streams would be removed. Based on inclusion of watershed project design features, and project specific Best Management Practices (see Appendix D for details), field review of hazard tree removal areas, and consideration of the proportion of drainages that would be affected, this analysis concludes that hazard tree abatement along roadsides will have discountable effects to habitat indicators and minor effects to aquatic species and habitat.

Roads, Landings and Water Drafting

New temporary roads, particularly temporary road stream crossings, have a high risk for affecting aquatic habitat indicators at the site scale because of their impacts on sediment regimes and drainage networks. As describe above in Direct Effects, Alternative 2 includes temporary road actions that overlap non fish bearing reaches of Doggett and Beaver Creeks. Aquatic habitat in these drainages would experience temporary short-

term impacts related to sediment while existing roads are opened, used and hydrologically stabilized; also there would be long term benefits from fixing the current legacy sediment sources on these old road beds. Due to inclusion of project design features and best management practices the short term negative effects would be localized near crossing sites and limited to during actions and the first several storms after. See the Aquatic Resources Report and Amendment for detailed analysis.

Landings located within Riparian Reserves have a high risk of effects to habitat indicators and aquatic species because landings will disturb soils and vegetation in close proximity to stream channels. There are no new landings in Riparian Reserves proposed in the Beaver Fire area. Use of existing landings in Riparian Reserve may result in localized sediment related impacts, but these will be sufficiently reduced by implementation of project design features and best management practices.

All action alternatives will require water drafting at the same locations designated by the Forest Service. Water drafting temporarily disrupts aquatic habitat and can result in short term and localized increases in turbidity, particularly when the water hose is set into and pulled from the water. As described in project design features Watershed-34 and 35, vegetation providing stream shade will not be removed, and there will be no modification of drafting sites within Coho Salmon critical habitat. These protective measures will minimize effects of water drafting to aquatic habitat so that a measurable increase in turbidity is not expected beyond the immediate drafting area. Water drafting is likely to result in only discountable effects to sediment and minor effects to aquatic species.

Cumulative Effects

Current and future foreseeable actions considered for analysis within the twenty-nine 6th field watersheds (Table F-1) that intersect the WSFR Project boundary are provided in Appendix F. The activities listed in F-1 were accounted for in the project CWE analysis and interpretation. The Forest uses standardized Cumulative Watershed Effects (CWE) models (Equivalent Roaded Area, Universal Soil Loss Equation, Mass Wasting) to assess effects of past, present, and reasonably foreseeable future activities. In addition to other current actions, models were updated to incorporate effects of the 2014 fires and road assessment of post-fire existing conditions, as well as an initial assessment of the project *No Action* alternative. Subsequently, effects of project *action alternatives* were modeled based on proposed actions. These model results reflect that there will be minimal cumulative impact from adding the effects of Alternative 2 to the past, present, and reasonably foreseeable future actions.

The site level analysis found that short term negative effects to aquatic habitat may occur in several stream reaches due to the project. Ongoing and future actions in these drainages where site level effects are expected include grazing and private timber harvest (green and salvage timber harvest plans). Additive effects related to sediment delivery to streams are likely only as a result of effects of private timber harvest, particularly in Doggett Creek. These effects to habitat are likely restricted to within the first year post project and will contribute to elevated sediment inputs to Doggett Creek, Beaver Creek, and Klamath River.

Management Indicator Species (River/Stream Association)

Direct Effects

Project actions that occur in streams could directly impact aquatic habitat. Within the Beaver Fire Area for Alternative 2, these actions are water drafting and temporary road crossings.

As discussed above in effects to Threatened, Endangered, and Sensitive species, water drafting actions would have only temporary effects and due to implementation of National Marine Fisheries Service and FS best management practices, these actions are not likely to meaningfully reduce the quantity or quality of river/stream habitat.

Temporary roads used by the project include stream crossings. Direct effects to aquatic habitat would occur while crossings on temporary roads are being constructed, or reconstructed, used, and hydrologically restored after use. Due to these actions river/stream habitat for management indicator species may be affected at several discrete sites on non-fish-bearing tributaries of Doggett Creek and Beaver Creek within the Beaver Fire Area.

Indirect Effects

Vegetation treatments proposed for Beaver Fire area with Alternative 2 only include Riparian Reserve treatment within fuels treatment units. These treatments will reduce fuel accumulations, provide ground cover, and encourage natural regeneration in Riparian Reserves. Equipment and activities such as handline construction are restricted within Riparian Reserves so that additional ground disturbance from these activities is not likely to result in any effect to aquatic habitat. Temporary road actions may affect the quality of river/stream habitat over a total of about 2.6 miles of stream above fish-bearing habitat; Cascade and tailed frog are the only special status aquatic species that may occur in this habitat and thus be indirectly affected. Because the project would address existing legacy sediment sources on temporary road beds, long term benefits of reduced erosion and protection of water quality in Doggett and Beaver Creeks are expected.

Cumulative Effects

Project effects to river/stream management indicator species habitat will not reduce the quantity of habitat available. The quality of management indicator species habitat is expected to be temporarily reduced for several years along stream reaches associated with the temporary road crossings. Long term site level habitat improvement and protection of water quality is expected due to legacy sediment site fixes. While the project would allow for some long term improvement of river/stream habitat, these would be relatively minor in light of ongoing impacts on private land impacts.

Project Area B: Happy Camp Complex

Threatened/Endangered and Forest Service Sensitive Species

Direct Effects

Water drafting and stream crossing work associated with temporary road actions and legacy site treatments are the only actions proposed within streams, and therefore the actions with the potential for directly affecting aquatic resources. Special status aquatic species that may affected by these actions in the Happy Camp Fire area include: SONCC Coho salmon, Chinook salmon, steelhead and resident rainbow trout, Pacific lamprey, Klamath River lamprey, Foothill yellow legged frog, western pond turtle, Cascade frog, and southern torrent salamander.

Water drafting

For effects of water drafting, much of the effects discussion above for the Beaver Fire area applies to effects of water drafting in the Happy Camp Fire area. Creeks that will be avoided during project water drafting include Tom Martin Cr, O'Neil Cr, (Little) Horse Cr, and China Cr; aquatic species and habitat in these creeks would not be affected by Project water drafting. The increased protection of salmonid rearing habitat in these creeks, as well as flows in lower reaches of all cold tributaries reduces the chance that water drafting would have measurable negative impacts to fish that are relying upon thermal refugia. Protection of cold aquatic habitat is incredibly important to aquatic species in this area including SONCC Coho salmon, especially as extended drought conditions persist.

In many drainages, the distribution of resident rainbow trout and other aquatic species extend beyond/above Coho salmon CH. Especially during the current extended drought, in late summer and fall, project area streams above mainstem rivers and several tributaries (Tompkins, Grider, and Elk Creeks), are likely to be dry or have flows too low to allow for drafting in accordance with best management practices described above. Project water drafting will most likely be occurring at mainstem rivers (Scott and Klamath River). However, if drafting sites above CH in the mainstem rivers and tributaries are identified and designated for use by the Forest Service, best management practices allow for drafting only up to 20% of surface flows and providing for at least 1.5 cubic feet per second bypass flows in fish bearing creeks. Required screening in all fish bearing streams eliminates the chance of direct impacts to all fish species. These protection measures are likely to ensure that Project water drafting will not negatively affect the distribution or viability of special status aquatic species populations in the project area.

Foothill yellow legged frog and Western pond turtle, in the Happy Camp Fire area, are likely to occur along Scott and Klamath Rivers and potentially Tompkins, Grider, Walker, and Elk Creeks. Because these areas are also Coho salmon CH, there will be no modification of drafting sites that could impact these species. Screening requirements, and maintenance of surface flows as described above for fish species, will also protect other aquatic species that may be present. It is possible that these species also occur in upper watershed areas in small spring ponds or wetlands. However, these areas often do not provide the conditions suitable to non-emergency water drafting per best management practices, and use of them are subject to the same best management practices that protect flows and require screening (and require coordination with fish biologists on drafting locations). Also, the timing of typical water drafting operations is when frogs and turtles are mobile and able to avoid areas of disturbance. If water drafting per best management practices occurs in upper watershed ponds or springs, there would be some impact to these species if they occur there. The impact would be a result of losing up to 50% of surface flow, or reducing flowing water to 10 gallons per minute. In this case, individuals may be temporarily harassed or displaced, however the ability to carry out essential functions such as breeding, feeding, and sheltering would not be meaningfully affected.

Special status aquatic species that are less likely to occur where water drafting occurs, and are therefore less likely to be affected include Cascade frog and southern torrent salamander.

Because upper watershed spring ponds or wetlands, where Cascade frogs may occur, do not often provide the flows necessary for non-emergency water drafting per best

management practices, it is not likely that this species would be exposed to the impacts of Project water drafting. If water drafting does occur in these upper watershed areas, it is subject to the same best management practices that protect flows and require screening (and require coordination with fish biologists on drafting locations). Southern torrent salamanders are typically found in relatively undisturbed stream environments nearer to the coast than the project area, however this species may occur only in the western-most parts of the project area in Elk Creek watershed. While it is possible that this species may occur where water drafting occurs in Elk Creek watershed, it is not likely because water drafting sites are typically along roads in stream reaches that are regularly disturbed by human activities and are not well-shaded. Therefore water drafting is not likely to occur within suitable habitat for southern torrent salamanders. Water drafting may affect Cascade frogs and southern torrent salamanders. The impact would be a result of disturbance and loss of up to 50% of surface flow, potentially reducing flowing water to 10 gallons per minute. In this case, individuals may be temporarily harassed or displaced, however the ability to carry out essential functions such as breeding, feeding, and sheltering would not be meaningfully affected.

Stream crossing work

Several temporary stream crossings will be required as part of temporary road actions; these crossings are outside/above the range of fish, therefore effects to fish habitat and species associated with temporary stream channel crossings are disclosed below under indirect effects. The only special status aquatic species that may be present and therefore directly affected by crossing work associated with these temporary road actions is Cascade frog. Potential effects would be minimized by implementation of project design features and best management practices; only temporary disturbance/displacement of individuals would occur and these effects are not likely to reduce population levels or reduce distribution of this species. There are two locations where crossing work may involve work in an active stream channel, reopening the following decommissioned roads:

- 46N62 – Caroline Creek road involves one perennial stream crossing and several intermittent and ephemeral channel crossings.
- 46N41YA – This road crosses a non-fish-bearing perennial stream twice, the first crossing is a legacy sediment site that would be addressed if the road is used by the project.

Legacy sediment site crossing work

In channel actions would be involved during culvert upgrades at 48 sites, including three culvert upgrades to open bottom arch structures (see project maps for locations). Most culvert upgrade locations are well above the distribution of Coho salmon CH and Chinook salmon, however six culvert upgrade sites are near CH (within 300 feet) on tributaries of Elk Creek and East Fork Creek. Special status aquatic species that may be present at these sites and therefore potentially directly affected include: rainbow trout, Pacific and Klamath River lamprey, foothill yellow legged frog, western pond turtle, Cascade frog, and southern torrent salamander.

Timing of the instream work will be targeted for late summer or fall when most of the sites will be dry; relevant project design features (Watershed-17 through 21) and best management practices will be integrated into design and erosion control plans to minimize effects to aquatic resources. Potential direct effects to aquatic species present

include temporary harassment and displacement during the in channel work period (late summer or fall). Due to the timing of activities and implementation of project design features, these temporary negative effects to individuals are not likely to have meaningful direct impacts on reproduction or distribution of aquatic species.

Indirect Effects

Indirect effects of Alternative 2 within the Happy Camp Fire area are much the same as described for the Beaver Fire Area with the addition of the exceptions described below.

Salvage Harvest and Reforestation

In large part because salvage harvest is proposed only outside of stream course Riparian Reserves including inner gorges, this analysis concludes that proposed salvage and reforestation actions are likely to result in neutral or discountable effects to aquatic species and their habitat. These conclusions are based on field reviews, CWE analysis and professional judgement. See Aquatics Resource Report and Amendment for more detailed analysis of the effects of these actions.

Site preparation and planting activities are proposed within salvage units and within separate site preparation and planting units which are mostly plantations that burned at high or moderate severity. Alternative 2 includes hand treatments within Riparian Reserves that are within site preparation and planting units in the Happy Camp Fire Area, unless safety of forest workers prohibits implementation. These treatments target plantations that were heavily burned during recent fires and are within units where actions are proposed. The hand treatment would cause a low level of disturbance (no ground based equipment off roads in Riparian Reserves) and is likely to provide for near-term soil cover and fuels reduction activities in these areas where the natural buffering capacity of the Riparian Reserves has been temporarily lost. With no action, as vegetation naturally regenerates in these areas fire-killed trees and brush are likely to lead to undesirable fuels accumulations. Riparian Reserve hand treatments are designed to address these fuels accumulations by providing for maintenance burning and fuels reduction while promoting conditions for natural regeneration and soil recovery as well as increased fire resiliency in Riparian Reserves.

Fuels Reduction

The effects of fuels reduction within the Happy Camp Fire area for Alternative 2 are the same as described for the Beaver Fire Area for Alternative 2. These actions are likely to result in neutral short term effects and long term beneficial effects to aquatic resources including overall watershed condition.

Hazard Tree Abatement

In the Happy Camp Fire area, a total of 24 miles of perennial stream and 22 miles of intermittent stream may be exposed to the effects of roadside hazard tree removal with Alternative 2. Streams affected that contain habitat for SONCC Coho salmon and most other special status aquatic species include sections of the Klamath River and Scott River, as well as Kelsey Creek, Tompkins Creek, O'Neil Creek, Walker Creek, Grider Creek, China Creek, (Little) Horse Creek, Cougar Creek, Elk Creek and East Fork Elk Creek. As described above for Beaver Fire area, fisheries biologists have been monitoring the hazard tree marking near fish-bearing habitat to ensure it is consistent with the description in this EIS. Because only a relatively small proportion of near stream areas

may be affected by roadside hazard tree removal and potential effects to soils and loss of large wood have been minimized by project design features and best management practices, these actions are likely to have only minor and discountable impacts to aquatic habitat.

Roads, Landings and Water Drafting

Temporary road actions in the Happy Camp Fire area for Alternative 2 include near stream actions along a face drainage to Grider Creek, Cliff Valley Creek, China Creek, O'Neil Creek, Kuntz Creek and Gard Creek (face drainage to Klamath River near Caroline Creek).

Alternative 2 would have short-term negative effects to habitat indicators (particularly sediment) and aquatic species within these drainages, due to construction/reconstruction of temporary roads, installation and removal of stream crossings, and new landings in Riparian Reserves. Scale and intensity of temporary road effects increase to moderate in the case of the long road segment traversing multiple mid- or upper-slope channel crossings in Caroline Creek-Klamath River drainage (46N62). This drainage experienced a debris flow in the 1997 flood event that affected road stream crossings, the largest of which is the Gard Creek crossing which involves a perennial and an intermittent channel. There is also an active landslide below the road, west of Gard Creek, which is narrowing the roadbed. Temporary re-opening of the road will require the reinstallation of stream crossings and widening the road on an active landslide. The effects of this work were incorporated into the geology risk analysis for Caroline Creek-Klamath River drainage. At the site scale the probability of re-activating the landslide by temporarily widening the road is moderate. Where the roadbed is narrowed due to road-fill related landslides, proposed re-construction of this segment could add weight to the head of the landslide which could cause it to re-activate if a landslide producing storm should occur before vegetation is re-established. Based on information presented in the geology assessment and field reviews, it was estimated that proposed reopening of 46N62 with Alternative 2 may adversely affect aquatic habitat.

All alternatives allow for six new landings in Riparian Reserves in the Happy Camp Fire area where they meet specific criteria such as not requiring the removal of any vegetation that provides stream shade, and not involving substantial ground disturbance in areas with direct hydrologic connection to a stream channel (Watershed-5). These effects could be of moderate duration (longer than temporary crossings which are pulled) and low to moderate intensity, depending on the volume of potentially unstable material as well as weather and other stochastic events. Construction and use of these landings in Riparian Reserves still has the potential to cause minor negative effects to habitat indicators and moderate effects to aquatic species at the site-scale, although with implementation of required project design features and best management practices the likelihood of sizeable effects to aquatic resources is relatively low.

Stream reaches that are likely to be negatively affected by temporary road actions and landings include portions of a perennial face drainage to Grider Creek, Cliff Valley Creek, O'Neil Creek, Kuntz Creek, China Creek, and Klamath River (due to actions in Gard Creek and Caroline Creek drainages). Long-term beneficial effects in terms of reduced erosion, and/or risk of erosion, are expected at several sites where legacy sediment sources will be addressed if the roads are used for the project: 46N41YA in

lower Grider Creek, and temporary roads on existing roadbed near the bottom of O'Neil and Kuntz Creek drainages; in addition to the legacy site treatment proposed for Elk Creek in the Happy Camp Fire area.

Legacy Sites

These activities involve upgrading culverts, including 3 sites that will be upgraded to open bottom arches, and addressing diversion potential and other road-related issues that are a potential threat to water quality (mostly sediment). Project specific design features and Best Management Practices are design to protect aquatic habitat from potential short term impacts associated with these activities. These protective measures are likely to be sufficient so that impacts to aquatic habitat and species will be minor and localized and not result in any significant effect to any special status aquatic species or habitat. These actions will also result in meaningful beneficial effects in terms of aquatic organism passage and habitat connectivity at crossings and significant reduction in potential future sediment-related impacts from roads in Doolittle, Cougar, East Fork Elk, and mainstem Elk creeks. Overall proposed legacy sediment site treatments in Elk Creek watershed would reduce risk of road-related erosion along 14 miles of stream; in addition, trout and other aquatic species would have unimpeded access to a total of about one mile of additional habitat in Malone, Twin, and Upper Elk creeks post-project.

Cumulative Effects

Cumulative Effects for the Happy Camp Fire Area are similar to those described in the Beaver Fire Area for Alternative 2. The site level analysis in the Happy Camp Fire area found that short term negative effects to aquatic habitat may occur in the following stream reaches due to the project: non fish bearing reaches of Grider, Cliff Valley, China, Gard, and Caroline Creeks. Ongoing and future actions in these drainages where site level effects are expected include grazing, private timber harvest (green and salvage timber harvest plans), and ongoing Forest Service fuels reduction actions, roadside hazard tree removal, and a vegetation projects (Thom Seider). These ongoing and future actions involve low risk of impacting aquatic habitat, therefore are not likely to have effects that are additive to those predicted to occur with this project. The potential negative effects of this project to aquatic resources would likely occur within those drainages identified in this analysis during storm events over the next several years. Some uncertainty exists related to when and where effects to aquatic habitat may occur; this is due to the inherent variability in recovery of post fire vegetation and soils conditions as well as uncertainty around predicting localized weather events that could trigger channel-altering events.

Management Indicator Species (River/Stream Association)

Direct Effects

Direct effects to Management Indicator Species habitat may occur due to water drafting, and stream crossing work associated with temporary road actions and legacy sediment site treatments. Direct effects would be minimized by implementation of project design features and best management practices, and would be much as those described for the Beaver Fire Area in Alternative 2.

Temporary road actions would affect river/stream association habitat in several discrete sites on non-fish bearing reaches of Grider Creek, Cliff Valley Creek, O'Neil Creek, Kuntz Creek, China Creek, Gard Creek, and Caroline Creek.

Indirect Effects

Indirect effects to management indicator species in the Happy Camp Fire Area are the same as described in the Beaver Fire Area for Alternative 2 with the following additions:

Temporary road actions may affect the quality of river/stream habitat over a total of about 6 miles of stream above fish-bearing habitat; Cascade and tailed frog are the only special status aquatic species that may occur in this habitat and thus be indirectly affected. Legacy sediment site treatments would result in short term site level negative effects to aquatic habitat and long term benefits by reducing road-related sediment inputs to streams. There will be beneficial effects to aquatic species, and to the connectivity of aquatic habitat, at the three sites that will have crossing upgraded to bottomless arches. Aquatic species are likely to have unimpeded access to a total of about one mile of additional habitat in Malone, Twin, and Upper Elk creeks post-project. The culvert upgrades, to occur on 45 sites, will also have beneficial effects to the passage of watershed products like coarse sediment and large wood down through the Elk Creek watershed. All action alternatives also include stormproofing 33 miles of road in the Elk Creek watershed. These actions will provide additional benefit to aquatic habitat in Doolittle, Cougar, East Fork Elk, and mainstem Elk creeks (on a total of 14 stream miles) by reducing diversion potential and chronic sediment inputs from roads.

Cumulative Effects

As described in effects to Threatened, Endangered, and Sensitive species, ongoing and future actions in the project area are not likely to negatively affect aquatic habitat. Project effects to river/stream management indicator species habitat may temporarily affect the quality of habitat over about 6 miles of stream total, but will not reduce the quantity of habitat available in the Happy Camp Fire area. The quality of management indicator species habitat is expected to be temporarily reduced along stream reaches associated with sites where temporary road crossings and landings are constructed. Due to the legacy site treatments included in the project, the quality of management indicator species habitat will be improved long-term in reaches of Elk Creek and Grider Creek because sites with active erosion, or at risk for erosion, will be hydrologically stabilized. Over the long term, the project would either have neutral effects to river/stream management indicator habitat, or beneficial effects – particularly in Elk Creek watershed.

Project Area C: Whites Fire

Threatened/Endangered and Forest Service Sensitive Species

Direct Effects

Direct effects to Threatened/Endangered and Forest Service Sensitive species are the same as described in the Beaver Fire Area for Alternative 2, with the following additions. Special status aquatic species that may be affected by project water drafting include: SONCC Coho salmon, Chinook salmon, steelhead and resident rainbow trout, Pacific lamprey, Klamath River lamprey, western pond turtle, and Cascade frog. Alternative 2 does not include any near stream temporary road actions or legacy sediment site treatments; there would be no potential effects of these actions in Whites Fire area.

Western pond turtle, in the Whites Fire area, are likely to occur only on the North Fork Salmon River. Because this river is also Coho salmon CH, there will be no modification of drafting sites that could impact this species. Screening requirements, and maintenance

of surface flows as described above for fish species, will also protect Western pond turtles. Cascade frogs are likely to occur in the project area within lakes and streams above 2500 feet in elevation (all of the Whites Fire area is above 2500 feet in elevation). Although they may occur within streams, much of the suitable habitat for Cascade frogs occurs in Wilderness lakes, where they are known to occur (i.e. Lower Russian Lake and Golden Russian Lake). As described above, Project water drafting will most likely be occurring in mainstem rivers such as the North Fork Salmon River where NOAA drafting specifications will be implemented and provide the highest level of protection for aquatic species. Because upper watershed spring ponds or wetlands, where Cascade frogs are most likely to occur, do not often provide the flows necessary for non-emergency water drafting per best management practices, it is less likely that individuals in these areas would be exposed to the impacts of Project water drafting. If water drafting does occur in these upper watershed areas, it is subject to the same best management practices that protect flows and require screening (and require coordination with fish biologists on drafting locations); potential impacts to Cascade frogs would be a result of disturbance and loss of up to 50% of surface flow, potentially reducing flowing water to 10 gallons per minute. In this case, individuals may be temporarily harassed or displaced, however the ability to carry out essential functions such as breeding, feeding, and sheltering would not be meaningfully affected.

Indirect Effects

Indirect effects within the Whites Fires Area are similar as described in the Happy Camp Fire Area for activities involving Salvage Harvest and Reforestation, Fuels Reduction, Hazard Tree Abatement, and Water Drafting for Alternative 2 with the following additions/exceptions:

In the Whites Fire area, a total of 13 miles of perennial stream and 6 miles of intermittent stream would be exposed to potential effects of adjacent roadside hazard tree removal. These actions are proposed in relatively close proximity to Coho salmon CH in mainstem reaches of North Fork Salmon River, North Russian and South Russian Creeks, and Whites Gulch. Fisheries biologists conducted field review of roadside hazard tree marking in these areas and confirmed that hazard trees along roads in close proximity to Coho salmon CH are marked according to the description in this EIS including project design features. Because potential effects to soils and loss of large wood from near stream areas have been minimized by project design features and best management practices, these actions are likely to have only minor and discountable impacts to aquatic habitat.

Cumulative Effects

Because there are no near stream temporary road actions or landings, potential effects to aquatic resources in the Whites Fires Area for Alternative 2 are expected to be neutral or minor and discountable. Ongoing actions in the project area include grazing, mining, fuels reduction and hazard tree removal. Also, the Eddy Late Successional Reserve Project is ongoing. Because the project is not likely to cause any negative effect to aquatic habitat in the Whites Fire area, no additive or cumulative effects with other actions are expected.

Management Indicator Species (River/Stream Association)

Direct Effects

The direct effects to management indicator species within the Whites Fire Area for Alternative 2 are similar to these described for the Beaver Fire Area for Alternative 2, except that water drafting is the only action that would occur in streams within Whites Fire. As described above, water drafting actions would have only temporary effects and due to implementation of National Marine Fisheries Service and FS best management practices, these actions are not likely to meaningfully reduce the quantity or quality of river/stream habitat.

Indirect Effects

The indirect effects within the Whites Fire Area to management indicator species in Alternative 2 are similar to those described in the Beaver Fire Area for Alternative 2. However, the Whites Fire area does not include any near stream temporary road actions and no negative effects to aquatic habitat are expected in Whites Fire area.

Cumulative Effects

Because there would be no negative effects to river/stream habitat in the Whites Fire area, there would be no cumulative effects.

Alternative 3

Project Area A: Beaver Fire

Threatened/Endangered/Forest Service Sensitive/Management Indicator Species

Direct Effects

The direct effects of Alternative 3 within the Beaver Fire Area are the same as described for Alternative 2 within the Beaver Fire Area, except as described below. Because all salvage harvest units in the Beaver Fire area are dropped with Alternative 3, stream crossing work associated with temporary road actions in Doggett Creek drainage are dropped with this alternative and potential effects of these actions would not occur. Direct effects to aquatic resources are limited to water drafting and stream crossing work in a non-fish bearing face drainage of Beaver Creek; these effects are described above for Alternative 2.

Indirect Effects

Salvage Harvest and Reforestation

Impacts to aquatic resources in the Beaver Fire Area associated with salvage harvest are eliminated under this alternative because Alternative 3 eliminates salvage harvest within the Beaver Fire Area. Effects of site preparation and planting are as described for Alternative 2.

Fuels Reduction

Fuels reduction actions, and potential effects, are the same as described in the Beaver Fire Area for Alternative 2.

Hazard Tree Abatement

Hazard tree actions, and potential effects, are the same as described in the Beaver Fire Area for Alternative 2.

Roads, Landings, and Water Drafting

Temporary road actions, landings, and water drafting actions, and potential effects, are mostly the same as described in the Beaver Fire Area for Alternative 2. The exception is

temporary road 8 has been dropped, therefore potential negative short term effects and long term beneficial effects associated with this road work in Doggett Creek drainage described for Alternative 2 would not occur with this alternative.

Cumulative Effects

Because all salvage and associated roads and landings have been dropped, effects of the project to aquatic resources would be neutral, or minor and discountable for site preparation and planting and fuels treatments within Riparian Reserve. Potential negative sediment related effects in Doggett Creek that would be additive to effects of ongoing timber harvest on private lands, as described for Alternative 2, are eliminated with Alternative 3. There is low risk that project effects would add to effects of ongoing and future actions in Beaver Fire area. The influence of actions on Federal lands in this area are minor compared to the effects of actions on private land.

Project Area B: Happy Camp Fire

Threatened/Endangered/Forest Service Sensitive/Management Indicator Species

Direct Effects

Potential direct effects to aquatic species would be the same as described for the Happy Camp Fire Area for Alternative 2. Several temporary road actions are dropped but these are just short ridge top segments that would have neutral effects to aquatic resources.

Indirect Effects

Potential indirect effects would be the same as described for the Happy Camp Fire Area for Alternative 2. Several temporary road actions are dropped but these are just short ridge top segments that would have neutral effects to aquatic resources.

Cumulative Effects

Potential cumulative effects to aquatic species remain as described for the Happy Camp Fire Area for Alternative 2.

Project Area C: Whites Fire

Threatened/Endangered/Forest Service Sensitive/Management Indicator Species

Direct Effects

Potential direct effects to aquatic species would be the same as described for the Whites Fire Area for Alternative 2.

Indirect Effects

There are no near stream temporary road actions in the Whites Fire Area. Because all salvage harvest has been dropped in the East Fork of Whites Gulch, and several units dropped in West Fork Whites, there will be slightly less of the discountable impacts described for Alternative 2. Otherwise, potential indirect effects to aquatic species remain as described for the Whites Fire Area for Alternative 2.

Cumulative Effects

Potential cumulative effects to aquatic species remain the same as described for the Whites Fire Area for Alternative 2.

Alternative 4

Alternative 4 includes a limitation on use and construction of near stream temporary roads (which reduces several harvest units and landings), and the six new landings in Riparian Reserve allowed for use with Alternative 2 are not included in Alternative 4. This alternative reduces the extent of proposed roadside hazard tree removal by dropping Maintenance Level 1 roads that would not be used for the project. This change results in 20 miles or 917 acres of reduced hazard tree removal in Alternative 4 relative to Alternative 2. Alternative 4 also includes hand treatment within Riparian Reserves within both site preparation and salvage units unless safety of forest workers prohibits it (dead trees less than 16 inches in diameter at breast height); Riparian Reserves in the Beaver Fire are also included for hand treatments with Alternative 4.

Project Area A: Beaver Fire

Threatened/Endangered/Forest Service Sensitive/Management Indicator Species

Direct Effects

Because all stream crossing work has been dropped, only water drafting may have direct effects to aquatic resources; potential water drafting related effects would be the same as described for the Beaver Fire Area for Alternative 2.

Indirect Effects

Salvage Harvest and Reforestation

Salvage harvest and reforestation actions, and potential effects, are mostly the same as described for the Beaver Fire Area for Alternative 2; approximately 100 acres of salvage harvest is dropped with Alternative 4 therefore there will be a slight reduction in the discountable effects described for Alternative 2.

Riparian Reserve hand treatments are included within site preparation and salvage units in the Beaver Fire area with Alternative 4. Watershed specialists worked with Project implementers to ensure that hand treatment actions in the Beaver Fire area were feasible, and likely to occur, even though ground-based equipment would not be allowed within the Riparian Reserve. Field review by watershed specialists in the Beaver Fire area confirmed that conditions in the Riparian Reserves would be improved by including hand treatments in heavily burned areas. As represented in Figure , these areas currently have very low soil cover and in many cases are far from seed-producing trees. Proposed hand treatments would involve low level of ground disturbance and would allow for actions that would increase near term soil cover and speed the development of mature forests in Riparian Reserves. Potential effects to aquatic resources would be neutral in the short term and beneficial in the long term. Proposed hand treatments with this alternative do not include planting but would still be beneficial to aquatic habitat and watershed condition including fire resiliency and the sustainability of forests overtime. However these beneficial effects would only occur over a small proportion of the watersheds that were affected by the 2014 Beaver Fire, and continue to be affected by ongoing private industrial timber production which has a larger influence on watershed condition and aquatic habitat than actions on Federal lands.

Figure 3-17. Heavily burned riparian area in Beaver Fire area (face drainage to Beaver Creek) that would receive hand treatment in Alternative 4 and Modified Alternative 3.

Fuels Reduction

Fuels reduction actions, and potential effects, are the same as described for the Beaver Fire Area for Alternative 2.

Hazard Tree Abatement

Alternative 4, in the Beaver Fire area, proposes 274 less acres of road side hazard tree removal relative to Alternative 2 as shown in Table 3-46 below shows the potential effects of roadside hazard tree removal on aquatic resources includes ground disturbance associated with felling trees and yarding up to roads, and localized loss of woody debris and potentially shade; the potential effects to aquatic resources are reduced to minor and discountable due to adherence to project design features and best management practices, and would occur over less area with Alternative 4.

Table 3-46: Reduced extent of proposed hazard tree removal in Alternative 4, relative to Alternative 2 in the Beaver Fire.

5th field watershed	Acres of reduced hazard tree removal proposed in Alternative 4 (relative to Alternative 2)
Beaver Creek	180
Horse Creek-Klamath River	94
Total	274

Roads, Landings and Water Drafting

Water drafting actions, and potential effects, are the same as described for the Beaver Fire Area for Alternative 2. No near stream temporary road actions are proposed with

Alternative 4, therefore potential negative short-term impacts (and long-term benefits from addressing existing legacy sediment sites) in non-fish-bearing tributaries of Doggett and Beaver creeks discussed for Alternative 2 would not occur under Alternative 4.

Cumulative Effects

Cumulative effects will be less with Alternative 4 because actions that are likely to result in negative short term effects at the site scale (near stream temporary road actions) are eliminated. With Alternative 4, the project is not likely to add to the elevated sediment conditions in Doggett and Beaver Creeks, which largely result from fire effects along with private timber harvest in much of the watershed.

Project Area B: Happy Camp Fire

Threatened/Endangered/Forest Service Sensitive/Management Indicator Species

Direct Effects

Potential direct effects to aquatic species from water drafting and stream crossings associated with legacy sediment site treatments would be the same as described for the Happy Camp Fire Area for Alternative 2. Potential direct effects from stream crossings associated with temporary road actions would be eliminated as these temporary road actions have been dropped with Alternative 4. The only near stream temporary road action included in this alternative is within Riparian Reserve associated with Kuntz Creek. There are no stream crossings associated with this road and use of it would not cause any direct effect to aquatic species.

Indirect Effects

Salvage Harvest and Reforestation

Alternative 4 reduces salvage harvest acreage by approximately 800 in the Happy Camp Fire area so there will be a slight reduction in the discountable effects described for Alternative 2. Potential sediment related effects of salvage harvest would be lessened in upper Grider Creek where much of the dropped acreage of salvage harvest occurs; to a lesser extent salvage related effects would also be reduced in lower Grider Creek and East Fork Elk Creek where units are dropped. These reductions in ground disturbance outside of Riparian Reserves are not likely to result in meaningful changes in effects to downstream fisheries habitat.

Potential effects of proposed hand treatments in Riparian Reserves are increased, as these treatments are proposed in both site preparation and salvage units with Alternative 4. Planting is not included in Riparian Reserves with this alternative. As described for Alternative 2, the short term effects of these actions relate to low levels of ground disturbance in Riparian Reserves caused by hand work and burning; these actions would cause only localized and temporary disturbance to vegetation and soils and are not likely to have negative effects to aquatic habitat. Long term benefits to watershed condition indicators are likely for drainages where these treatments occur. The long term benefits are more likely as the amount of this treatment across the post fire landscape increases, therefore Alternative 4 where most acreage of this treatment is proposed, would have the most potential beneficial effects to watershed condition including fire resiliency. However, the feasibility of implementing this treatment within Riparian Reserves of salvage units is questionable in most areas, particularly due to the presence of abundant large dead trees (overhead hazards).

Fuels Reduction

Fuels reduction actions, and potential effects, are the same as described for the Happy Camp Fire Area as for Alternative 2.

Hazard Tree Abatement

Alternative 4, in the Happy Camp Fire area, proposes 572 less acres of road side hazard tree removal relative to Alternative 2 as shown in Table 3-47 below. Potential effects of roadside hazard tree removal on aquatic resources includes ground disturbance associated with felling trees and yarding up to roads, and localized loss of woody debris and potentially shade; these effects would occur over less area with Alternative 4, as displayed in Figure 4 below.

Table 3-47: Reduced extent of proposed hazard tree removal in Alternative 4, relative to Alternative 2 in the Happy Camp Fire.

5th field watershed	Acres of reduced hazard tree removal proposed in Alternative 4 (relative to Alternative 2)
Elk Creek	1
Lower Scott River	433
Seiad Creek-Klamath River	51
Thompson Creek-Klamath River	87
Total	572

Because project design features and best management practices reduce potential effects of near stream hazard tree removal to minor and discountable levels, and areas dropped with Alternative 4 are mostly not in close proximity to fish habitat, effects of Alternative 4 are the same as described in the Happy Camp Fire Area for Alternative 2.

Roads, Landings and Water Drafting

Water drafting actions, and potential effects, are the same as described for the Happy Camp Fire Area for Alternative 2. No stream crossings on temporary roads are proposed with Alternative 4, therefore all negative site-scale impacts to the sediment regime described for Alternative 2 are avoided. Although near stream temporary road actions are still included near the bottom of Kuntz Creek, these activities do not involve stream crossings. Use of this old road bed has low risk of affecting the nearby Kuntz Creek and proper hydrologic stabilization of this road will decrease erosion and further protect water quality in this drainage. With Alternatives 2, 3, and 5 there are several sites where project temporary road actions involve using roads that currently have legacy sediment sites, or areas that are at risk of erosion (and therefore a threat to water quality) due to past land use. For the drainages where this would occur with the other action alternatives, the opportunity to improve/protect water quality in these areas would be foregone with Alternative 4.

Because the six new landings in Riparian Reserve are not included in Alternative 4, there would be no site level effects at these locations in Riparian Reserve of Grider Creek, and the Klamath and Scott Rivers.

Legacy Sites

Legacy sediment site treatments in the Elk Creek watershed and potential effects are the same as described for the Happy Camp Fire Area for Alternative 2.

Cumulative Effects

As described for Alternative 2, ongoing and future actions in this area are not likely to result in negative effects to aquatic habitat. The potential cumulative effects will be less with Alternative 4 because actions that are likely to result in adverse effects to aquatic habitat (re-opening of Caroline Creek road), or in negative short-term effects at the site scale (temporary road crossings and new landings in Riparian Reserves) are eliminated. Proposed hand treatments in Riparian Reserve, if all were feasible to implement, would have the most beneficial cumulative effect on watershed condition of all alternatives.

Project Area C: Whites Fire

Threatened/Endangered/Forest Service Sensitive/Management Indicator Species

Direct Effects

Potential direct effects to aquatic species would be the same as described for the Whites Fire Area for Alternative 2.

Indirect Effects

Salvage Harvest and Reforestation

Reforestation actions and potential effects are the same as described for the Whites Fire Area for Alternative 2.

Fuels Reduction

Fuels reduction actions, and potential effects to aquatic species are the same as described for the Whites Fire Area for Alternative 2.

Hazard Tree Abatement

Alternative 4, in the Whites Fire area, proposes 71 less acres of road side hazard tree removal relative to Alternative 2. Potential effects of roadside hazard tree removal on aquatic resources includes ground disturbance associated with felling trees and yarding up to roads, and localized loss of woody debris and potentially shade; these effects would not occur in the non-fish-bearing China Gulch drainage which is dropped in this alternative. Otherwise effects of roadside hazard tree removal would be as described for Alternative 2.

Roads, Landings and Water Drafting

Water drafting actions and potential effects are the same as described for the Whites Fire Area for Alternative 2. There are no near stream temporary road actions in the Whites Fire Area and effects remain the same as described for the Whites Fire Area for Alternative 2.

Cumulative Effects

Cumulative effects will be the same as described for the Whites Fire Area for Alternative 4.

Alternative 5

Project Area A: Beaver Fire

Threatened/Endangered/Forest Service Sensitive/Management Indicator Species

Direct Effects

The direct effects of Alternative 5 are the same as described for the Beaver Fire Area for Alternative 2.

Indirect Effects

Salvage Harvest and Reforestation

The effects of salvage harvest and reforestation are the same as described for the Beaver Fire Area for Alternative 2.

Fuels Reduction

Alternative 5 includes about 1,000 more acres of fuels treatment in the Beaver Fire area than are in other action alternatives. As described for the Beaver Fire Area for Alternative 2, fuel reduction actions are likely to have only discountable negative short-term effects on habitat indicators and minor effects on aquatic species. Additionally, project fuels treatments are likely to reduce the adverse effects of future wildfires and, therefore, will provide some protection for future watershed condition and function; especially if/when the future fire is greater than five years in the future. This alternative would have increased long term benefits to aquatic resources, relative to Alternative 2.

Hazard Tree Abatement

Hazard tree actions and potential effects are the same as described for the Beaver Fire Area for Alternative 2.

Roads, Landings and Water Drafting

Near stream temporary road actions and effects would be the same as described for the Beaver Fire Area for Alternative 2.

Cumulative Effects

Cumulative effects for Alternative 5 would be the same as described for the Beaver Fire Area for Alternative 2.

Project Area B: Happy Camp Fire

Threatened/Endangered/Forest Service Sensitive/ Management Indicator Species

Direct Effects

The potential direct effects to aquatic species from water drafting and stream crossing work associated with legacy sediment site treatments would be the same as described for the Happy Camp Fire Area for Alternative 2. All temporary road actions that would involve stream crossing work are dropped with Alternative 5, therefore there would be no direct effects to aquatic resources with this alternative.

Indirect Effects

Salvage Harvest and Reforestation

Alternative 5 eliminates salvage harvest in areas designated as late successional reserve in the Forest Plan, and eliminates site preparation and planting in these areas plus in Riparian Reserves and Inventoried Roadless Areas. Compared to Alternative 2, many fewer acres in the Happy Camp Fire Area will have salvage and reforestation treatments. The potential discountable effects resulting from these treatments (described for Alternative 2) will be substantially reduced with this alternative. This alternative removes site preparation and planting on about 3,300 acres in the Happy Camp Fire Area compared to Alternative 2. The beneficial effect of site preparation and planting on

reforesting parts of the burned landscape will be foregone on these acres. This alternative does not include hand treatments in Riparian Reserves, the potential beneficial effects of these actions as described for Alternatives 2, 4, Modified 2, and Modified 3 would be foregone with this alternative.

Fuels Reduction

The potential effects of fuels reduction to aquatic species would be the same as described for the Happy Camp Fire Area for Alternative 2.

Hazard Tree Abatement

Hazard tree actions and potential effects are the same as described for the Happy Camp Fire Area for Alternative 2.

Roads, Landings and Water Drafting

Because this alternative involves substantially less salvage and site preparation and planting acreage, landings and road actions are also reduced. Most near stream temporary road actions are dropped in this alternative, only temporary roads on existing roadbed near the bottom of Kuntz and O'Neil Creeks remain in Alternative 5. The effects of these actions are as described for Alternative 2.

Of the six new landings in Riparian Reserve approved for use with the other alternatives, only two remain in Alternative 5: DZ03 near the Klamath River and DZ10 near the Scott River. Potential negative site-level effects of new landings described for Alternative 2 would be eliminated where new landings are dropped near Cliff Valley Creek (L090), and Grider Creek (DZ23, L043 and L044). The extent of water drafting needed to support implementation of this alternative will also be reduced.

Legacy Sites

Legacy site treatments and potential effects are the same as described for the Happy Camp Fire Area for Alternative 2.

Cumulative Effects

Because much of the proposed salvage harvest and associated roads and landings have been dropped in the Happy Camp Fire area for Alternative 5, effects of this alternative to aquatic resources would be substantially less than those described for Alternative 2. As described for Alternative 2, ongoing and future actions in this area are not likely to result in negative effects to aquatic resources that would be additive to the effects of this project.

Project Area C: Whites Fire

Threatened/Endangered/Forest Service Sensitive/ Management Indicator Species

Direct Effects

Potential direct effects to aquatic species would be similar as described for the Whites Fire Area for Alternative 2, however because only 30 acres would have salvage harvested the need for water drafting would be much reduced and therefore there would be very little potential for direct effects to aquatic resources.

Indirect Effects

Salvage Harvest and Reforestation

Alternative 5 eliminates salvage harvest in areas designated as Late Successional Reserve, Riparian Reserves and Inventoried Roadless Areas. In the Whites Fire area only 30 acres, contained in two units along the North Fork Salmon River near Robinson Gulch are included for salvage harvest and all site preparation units are dropped. The potential discountable effects resulting from these treatments (described in Alternative 2) will be much reduced with this alternative. This alternative does not include hand treatments in Riparian Reserves therefore the beneficial effect of these treatments, as described for Alternatives 2 and 4, would not be realized with Alternative 5.

Fuels Reduction

The potential effects of fuels reduction treatments to aquatic species would be the same as described for the Whites Fire Area for Alternative 2.

Hazard Tree Abatement

Hazard tree actions and potential effects are the same as described for the Whites Fire Area for Alternative 2.

Roads, Landings and Water Drafting

The effects of this alternative will be the same as described for the Whites Fire Area for Alternative 2. The extent of water drafting needed to support implementation of this alternative would be much reduced.

Cumulative Effects

There would be no negative site level effects to aquatic habitat with Alternative 5, with the exception of minor amounts of water drafting. Because this alternative involves only fuels treatment units, roadside hazard tree removal, and two salvage units; effects when considered along with effects of ongoing and future actions would be neutral or beneficial to aquatic resources including overall watershed condition.

Modified Alternative 2

Project Area A: Beaver Fire

Threatened/Endangered/Forest Service Sensitive/Management Indicator Species

Direct Effects

Because all stream crossing work has been dropped in the Beaver Fire area, only water drafting may have direct effects to aquatic resources; potential water drafting related effects would be the same as described for the Beaver Fire Area for Alternative 2.

Indirect Effects

Salvage Harvest and Reforestation

Modified Alternative 2 removes approximately 300 acres of salvage harvest from the Beaver Fire Area relative to Alternative 2. The effects of Modified Alternative 2 on habitat indicators and aquatic species would be reduced from those described for the Beaver Fire Area for Alternative 2 due to less acreage proposed for treatment: effects on habitat indicators would be discountable and effects on aquatic species would be minor. Reforestation actions remain as in Alternative 2, and are likely to increase the likelihood and speed by which burned areas are develop mature forests which is considered a long-term positive effect to aquatic resources. Hand treatments in Riparian Reserve are not

included for the Beaver Fire area in this alternative, the potential beneficial effects of this treatment would be foregone with Modified Alternative 2.

Fuels Reduction

Modified Alternative 2 adds approximately 80 acres of fuels treatments within the Beaver Fire Area relative to Alternative 2. The potential effects of Modified Alternative 2 on aquatic resources are very similar to effects described for the Beaver Fire Area for Alternative 2. The discountable impacts of fuels reduction on sediment, water quality, and riparian function would be slightly increased due to the addition of 80 acres of treatment, some of which overlaps with Riparian Reserves. These effects would be short-term and discountable under Modified Alternative 2.

Hazard Tree Abatement

The amount of acreage treated in the Beaver Fire Area would not change under Modified Alternative 2 relative to Alternative 2 therefore; the effects are the same as described for the Beaver Fire for Alternative 2.

Roads, Landings and Water Drafting

Modified Alternative 2 drops 1.7 miles of temporary road construction and three landings in the Beaver Fire Area relative to Alternative 2. The temporary road actions that were dropped included existing sediment sources on old road beds that would be addressed after use of road beds in Alternative 2. There would be no short-term negative effects in Doggett Creek and Beaver Creek from use of these temporary roads; however, there would also be no long-term beneficial effects through addressing sediment sources on these road beds. Effects to Modified Alternative 2 from temporary road construction would be discountable to habitat indicators and minor to aquatic species.

Modified Alternative 2 would remove 3 landings from use in the Beaver Fire Area; as with all the alternatives, there are no new landings in Riparian Reserves proposed in the Beaver Fire Area. The effects described for landings for Alternative 2 would be reduced with Modified Alternative 2. Modified Alternative 2 is similar to Alternative 2 within the Beaver Fire Area with respect to the potential for indirect effects to aquatic resources from landings. Effects to habitat indicators would be discountable and effects to aquatic species would be minor.

Modified Alternative 2 includes water drafting, the effects of which are as described for the Beaver Fire Area for Alternative 2.

Cumulative Effects

The cumulative effects of Modified Alternative 2 would be roughly the same as described for the Beaver Fire Area for Alternative 2.

Project Area B: Happy Camp Fire

Threatened/Endangered/Forest Service Sensitive/Management Indicator Species

Direct Effects

Direct effects to aquatic species for Modified Alternative 2 would be the same as described for the Happy Camp Fire Area for Alternative 2. Additionally, Modified Alternative 2 does not change the scope or location of legacy sediment site treatments in the Elk Creek watershed and the effects described in Alternative 2 are the same for Modified Alternative 2.

Indirect Effects

Salvage Harvest and Reforestation

Modified Alternative 2 removes about 300 net acres of salvage in the Happy Camp Fire Area relative to Alternative 2. The discountable effects of salvage and reforestation on sediment, water quality and riparian function described for the Happy Camp Fire Area for Alternative 2 would be reduced under Modified Alternative 2. Minor effects to aquatic species and discountable effects to habitat indicators are expected due to exclusion of stream source Riparian Reserves and inner gorges and implementation of project design features. Outside of Riparian Reserves, Modified Alternative 2 includes the same amount of site-preparation, planting, and release relative to Alternative 2 and the effects will be the same as described for Alternative 2.

Like Alternative 2, Modified Alternative 2 includes hand treatments in some Riparian Reserves within Happy Camp and Whites Fire areas; in Modified Alternative 2 these treatments are proposed within Riparian Reserves within salvage or site prep and plant units, and only where they occur on the upper 1/3 of slopes. Based on field reviews, Riparian Reserves in lower slope positions could also benefit from this treatment as described for Modified Alternative 3. Also, as described for Alternative 4, the feasibility of implementing these actions within Riparian Reserve of salvage harvest units is questionable due to the likelihood of substantial overhead hazards and economic and efficiency considerations. Short term effects of these actions to aquatic habitat indicators would be discountable and effects to aquatic species would be minor; long term benefits to watershed condition indicators are likely for drainages where these treatments occur. The long term benefits are more likely as the amount of this treatment across the post fire landscape increases, therefore Alternative 2, Alternative 4, and Modified Alternative 3 all of which have more acreage of this treatment proposed, would be more beneficial to watershed condition including fire resiliency.

Fuels Reduction

Modified Alternative 2 includes the same amount of fuels reduction actions relative to Alternative 2, therefore, the effects will be the same as described for the Happy Camp Fire Area for Alternative 2.

Hazard Tree Abatement

The amount of acreage treated in the Happy Camp Fire Area would not change under Modified Alternative 2 relative to Alternative 2; therefore, the effects will be the same as described for the Happy Camp Fire Area for Alternative 2.

Roads, Landings and Water Drafting

Modified Alternative 2 drops approximately 0.2 miles of new temporary road construction and drops about 5 miles of reopening of decommissioned roads in the Happy Camp Fire. Temporary road actions dropped include mostly short ridge-top segments; however, reopening the Caroline Creek road (46N62) is also dropped from Modified Alternative 2. The Caroline Creek road is a mid-slope decommissioned road that is associated with several stream crossings and active landslide features. Under Modified Alternative 2 the potential adverse impacts to aquatic habitat associated with the Caroline Creek Road are avoided. Because of the deletion of this road segment and reduction in mileage of temporary road actions, Modified Alternative 2 would have fewer impacts upon aquatic resources.

Modified Alternative 2 also drops approximately 14 landings from the Happy Camp Fire Area, however, the six new landings in Riparian Reserves proposed under Alternative 2 remained under Modified Alternative 2. The effects of landings remains as described for the Happy Camp Fire for Alternative 2. Potential effects of water drafting are as described for the Happy Camp Fire Area for Alternative 2.

Legacy Sites

Elk Creek watershed legacy sediment site treatment, and potential effects, are described in the Aquatic Resources Report and are the same across all action alternatives including Modified Alternative 2.

Cumulative Effects

Potential adverse effects to aquatic resources, as described for Alternative 2, are avoided with this alternative. As described for Alternative 2, ongoing and future actions are not likely to cause negative effects to aquatic resources that could be additive to the effects of this project.

Project Area C: Whites Fire

Threatened/Endangered/Forest Service Sensitive/Management Indicator Species

Direct Effects

Direct effects of Modified Alternative 2 to aquatic species are the same as described for the Whites Fire Area for Alternative 2. Modified Alternative 2 does not include any near stream temporary road actions or legacy sediment site treatments; there would be no potential effects of these actions in the Whites Fire Area.

Indirect Effects

Salvage Harvest and Reforestation

Modified Alternative 2 proposes a net reduction of 20 acres of salvage harvest acres in the Whites Fire Area. Therefore, the discountable effects of salvage and reforestation on sediment, water quality and riparian function as described for the Whites Fire Area for Alternative 2 would be reduced under Modified Alternative 2. Minor effects to aquatic species and discountable effects to habitat indicators are expected due to implementation of project design features and the reduction in acres treated.

Modified Alternative 2 includes the same amount of site preparation, planting, and release outside of Riparian Reserves relative to Alternative 2 and the effects will be as described for the Whites Fire Area for Alternative 2. Like Alternative 2, Modified Alternative 2 includes hand treatments in some Riparian Reserves within Happy Camp and Whites Fire areas. As shown in Table 3, these treatments are proposed on only one acre in Modified Alternative 2 (Near the top of Applesauce Gulch in Robinson Gulch 7th field watershed). As described above for the Happy Camp Fire area, and for the other alternatives where this treatment is proposed, these actions are likely to have no short term negative effects to aquatic habitat and long term benefits to watershed condition. For Modified Alternative 2 these potential beneficial effects are foregone as the one acre of treatment would be inconsequential.

Fuels Reduction

Modified Alternative 2 includes the same fuels reduction treatments as Alternative 2 and the effects of these actions will be as described for the Whites Fire Area for Alternative 2.

Hazard Tree Abatement

The amount of acreage treated in the Whites Fire would not change under Modified Alternative 2 relative to Alternative 2 and the effects of these actions will be the same as described for the Whites Fire Area for Alternative 2.

Roads, Landings and Water Drafting

Temporary road actions in the Whites Fire Area are the same as proposed in Alternative 2. There are no near stream temporary road actions in the Whites Fire in any alternative. Effects on habitat indicators would be as described for the Whites Fire Area for Alternative 2; effects to habitat indicators would be discountable and effects to aquatic species would be minor.

Four new landings would be dropped under Modified Alternative 2 in the Whites Fire Area, and the one new landing initially proposed in Riparian Reserve (L072) is relocated to outside of the Riparian Reserve. Modified Alternative 2 further reduces the effects of landings that were described for Alternative 2 for the Whites Fire Area. Modified Alternative 2 includes water drafting, the effects of which are as described for the Whites Fire Area for Alternative 2.

Cumulative Effects

The cumulative effects of Modified Alternative 2 would be roughly the same as described for the Whites Fire Area for Alternative 2.

Modified Alternative 3

Project Area A: Beaver Fire

Threatened/Endangered/Forest Service Sensitive/Management Indicator Species

Direct Effects

Modified Alternative 3 does not include any near stream temporary road actions or legacy sediment site treatments; there would be no potential effects of these actions in the Beaver Fire Area. Potential direct effects due to water drafting would be as described for Alternative 2. However, because all salvage harvest, temporary road actions, and landings have been dropped, there will be reduced need for water drafting and therefore less potential effect to aquatic resources relative to Alternative 2.

Indirect Effects

Salvage Harvest and Reforestation

Modified Alternative 3 removes all salvage harvest from the Beaver Fire area, eliminating salvage harvest related environmental effects. Modified Alternative 3 reduces site preparation and planting in the Beaver Fire Area by 120 acres relative to Alternative 2. Most of the reduced salvage and site preparation and planting acreage in the Beaver Fire Area is within the Doggett Creek drainage so these actions would have less potential negative short-term impacts to aquatic habitat in Doggett Creek, relative to Alternative 2. However, the beneficial long-term effects of reforestation are foregone on these 610 acres that will not be included in Modified Alternative 3. Site preparation and planting still included with this alternative would cause a low level of short-term ground disturbance and will likely speed the recovery of mature forests on treated areas.

Modified Alternative 3 includes hand treatment in some Riparian Reserves within the Beaver Fire Area. These activities are proposed in Riparian Reserves that are within site

preparation and plantation units, and burned at moderate to high severity. Proposed treatments include cutting dead brush and trees less than 10 inches in diameter by hand; equipment will not leave roads in Riparian Reserves. The material would be lopped and scattered to achieve ground cover and various methods of burning would be used if fuel loading exceeds 7 tons per acre. As described for the other fire areas where Riparian Reserve hand treatments are proposed, these actions are likely to have an overall benefit to watershed condition in the drainages where they occur. Field review in the Beaver Fire area found that conditions in the Riparian Reserves would be improved by including hand treatments in heavily burned riparian areas. Particularly when more of these treatments occur within a given drainage, it increases the likelihood that these broader scale beneficial effects to watershed condition would occur.

Because Federal lands comprise a minority of this landscape, and all salvage harvest in Beaver Fire has been dropped with this alternative, the influence of the Project on aquatic habitat and watershed condition on this landscape are minor. Overall, proposed hand treatments that may involve planting if necessary to restore conifers as a component of forests, will be beneficial to aquatic habitat and watershed condition including fire resiliency and the sustainability of forests overtime.

Fuels Reduction

Modified Alternative 3 adds approximately 1,210 acres of fuels treatments within the Beaver Fire Area relative to Alternative 2. The potential effects of Modified Alternative 3 on aquatic resources are very similar to effects of Alternative 2 for the Beaver Fire Area. The discountable impacts of fuels reduction on sediment, water quality and riparian function described for Alternative 2 would be slightly increased due to the addition of 1,210 acres of treatments in the Beaver Creek watershed, a small amount of this overlaps with Riparian Reserves. Potential negative effects are minimal due to the relatively small amount of acreage treated, implementation of project design features, and the low level of ground disturbance involved with fuels treatments. Long-term benefits from fuels reduction associated with future fire behavior are expected.

Hazard Tree Abatement

The amount of roadside hazard tree removal is reduced with Modified Alternative 3 to 48 miles, or 2,190 acres; relative to 170 miles, or 5,800 acres, with Alternative 2. About 9 miles, or just over 1% of the total stream mileage in the Beaver Fire area, may be affected by these actions.

In the Beaver Fire area, roadside hazard tree removal is proposed in relatively close proximity to Coho salmon CH in mainstem reaches of Beaver Creek and the Klamath River. Fisheries biologists conducted field review of roadside hazard tree marking in these areas and confirmed that no hazard trees are marked in Riparian Reserve associated with Coho salmon CH. Roadside hazard tree removal would occur through Riparian Reserves associated with streams outside of CH in tributaries of Beaver, Doggett, and Kohl Creeks. Potential effects of roadside hazard tree removal on aquatic resources includes ground disturbance associated with felling trees and yarding up to roads, and localized loss of woody debris and potentially shade. project design features ensure a low level of ground disturbance and impacts to shade, they also ensure that future debris flows are likely to deliver intact large woody debris downstream to fish-bearing reaches, wherever future debris flows may occur. For these reasons, effects of roadside hazard tree

removal on aquatic habitat indicators would be discountable and effects on aquatic species would be minor.

Roads, Landings and Water Drafting

Modified Alternative 3 drops all temporary road action and landing actions in the Beaver Fire area; there would be no effect of these actions on aquatic habitat or species. As described for the Beaver Fire Area for Alternative 2, there would have been short-term negative effects to aquatic resources in Doggett Creek and one face drainage to Beaver Creek from use of these temporary roads, but long-term benefits to water quality through addressing sediment sources on these road beds. Because these road actions are dropped with Modified Alternative 3, there will be less short-term negative effects related to roads and sediment production, however, the opportunity to reduce sedimentation from these old road beds long-term would be foregone.

Modified Alternative 3 includes water drafting, the effects of which would be the same as described for the Beaver Fire Area for Alternative 2.

Cumulative Effects

Cumulative effects for Modified Alternative 3 would be roughly the same as described for the Beaver Fire Area for Modified Alternative 2.

Project Area B: Happy Camp Fire

Threatened/Endangered/Forest Service Sensitive/Management Indicator Species

Direct Effects

Direct effects to aquatic species for Modified Alternative 3 would be the same as described for the Happy Camp Fire Area for Modified Alternative 2. Additionally, Modified Alternative 2 does not change the legacy sediment site treatments in the Elk Creek watershed and the effects described in Alternative 2 are the same for Modified Alternative 2.

Indirect Effects

Salvage Harvest and Reforestation

Modified Alternative 3 reduces the net salvage harvest proposed by 510 acres relative to Alternative 2. Therefore, the discountable effects of salvage and reforestation on sediment, water quality and riparian function as described for the Happy Camp Fire Area for Alternative 2 would be reduced under Modified Alternative 3. Minor effects to aquatic species and discountable effects to habitat indicators are expected due to implementation of project design features and the reduction in acres treated.

Modified Alternative 3 proposes a net reduction of 520 acres of site preparation, planting, and release relative to Alternative 2, the effects of these actions will be as described for the Happy Camp Fire Area for Alternative 2 but on a slightly smaller scale. Like Alternative 2, Modified Alternative 3 includes hand treatments in some Riparian Reserves; in Modified Alternative 3 these treatments are proposed within Riparian Reserves within site prep and plant units in all fire areas. These treatments within Riparian Reserve would occur only where 2014 wildfires burned at moderate to high severity. These actions are designed to increase the likelihood and speed by which burned areas are reforested which is considered a positive effect to aquatic resources. Potential effects of Modified Alternative 3 are the same as those described for Alternative 2 in the

Aquatic Resources Report. Effects to habitat indicators would be discountable and effects to aquatic species would be minor. Long term beneficial effects are likely as these actions will reduce fuels and use fire to maintain and restore ecosystem function in Riparian Reserves.

Fuels Reduction

Modified Alternative 3 includes an additional 950 acres of fuels reduction treatments relative to Alternative 2. The potential effects of Modified Alternative 3 on aquatic resources are similar to effects of Alternative 2 for the Happy Camp Fire Area. The discountable impacts of fuels reduction on sediment, water quality and riparian function described for Alternative 2 would be slightly increased due to the addition of 950 acres of treatments with a small amount of overlap with Riparian Reserves. Effects are minimal due to the relatively small amount of acreage treated, implementation of project design features, and the low level of ground disturbance involved with fuels treatments. Long-term benefits from fuels reduction associated with future fire behavior are expected.

Hazard Tree Abatement

The amount of roadside hazard tree removal is reduced with Modified Alternative 3 to 215 miles, or maximum of 9,730 acres within Happy Camp Fire area; relative to 400 miles, or maximum of 14,000 acres, with Alternative 2. **Error! Reference source not found.** displays miles of stream within watersheds of the Happy Camp Fire that are within 200 feet of proposed hazard tree removal roads. About 30 miles, or just over 2% of the total stream mileage in the Happy Camp Fire area, may be affected by these actions.

In the Happy Camp Fire area, roadside hazard removal is proposed in relatively close proximity to Coho salmon CH in Tompkins Creek, Walker Creek, Grider Creek, (Little) Horse Creek, Elk Creek, East Fork Elk Creek, and Cougar Creek. Fisheries biologists conducted field reviews of roadside hazard tree marking in these areas and confirmed that hazard trees are marked according to description in this EIS including project design features. Due to the reduced extent of proposed roadside hazard tree removal, Modified Alternative 3 would have less effect on aquatic resources than Alternative 2. Areas dropped for roadside hazard removal with Modified Alternative 3 include a few reaches in close proximity to Coho salmon CH. These include reaches of the Scott River and Klamath River as well as Kelsey, China, Elk, and Doolittle Creeks. Effects of hazard tree removal along roads on habitat indicators would be discountable and effects on aquatic species would be minor; with Modified Alternative 3 these effects would not occur along roads in close proximity to the Klamath or Scott Rivers, as well as sections of China, Elk, and Doolittle Creeks.

Roads, Landings and Water Drafting

Modified Alternative 3 drops approximately 0.2 miles of new temporary road construction and drops approximately 4.2 miles of reopening of decommissioned roads in the Happy Camp Fire Area. Reopening the Caroline Creek road (46N62), as described for Alternative would likely cause adverse effects to aquatic resources, is also dropped from Modified Alternative 3. Deletion of proposed work on road 46N62, and reduction in mileage of temporary road actions contribute to reduced potential impacts of Modified Alternative 3 relative to Alternative 2. Effects would be discountable to habitat indicators and minor to aquatic species.

Other potential effects of these actions are as described for Modified Alternative 2.

Legacy Sites

Effects of these actions are as described for Alternative 2.

Cumulative Effects

Cumulative effects of Modified Alternative 3 to aquatic resources is the same as described for the Happy Camp Fire Area for Modified Alternative 2.

Project Area C: Whites Fire

Threatened/Endangered/Forest Service Sensitive/Management Indicator Species

Direct Effects

Direct effects of Modified Alternative 3 to aquatic species are the same as described for the Whites Fire Area for Alternative 2.

Indirect Effects

Salvage Harvest and Reforestation

Modified Alternative 3 adds about 40 net acres of site-preparation, planting, and release relative to Alternative 2. Like Alternative 2, Modified Alternative 3 includes hand treatments in Riparian Reserves within site prep and plant units of the Whites Fire area. These treatments within Riparian Reserve would occur only where 2014 wildfires burned at moderate to high severity. Dead trees up to 10 inches DBH and brush would be cut and scattered to achieve ground cover. If fuels loading would exceed seven tons per acre, pile burning or underburning would occur to maintain/restore desired fuel loading.

As described for Alternative 2, Riparian Reserve hand treatments are not likely to cause any negative effects to aquatic habitat and overall are likely to improve Riparian Reserve and watershed condition. These actions are designed to increase the likelihood and speed by which burned areas are reforested which is considered a positive effect to aquatic resources. Potential effects of Modified Alternative 3 are the same as those described for Alternative 2 but less acres would benefit from the treatment where site prep and plant units are dropped. Effects to habitat indicators would be discountable and effects to aquatic species would be minor. Long term beneficial effects are likely as these actions will reduce fuels and use fire to maintain and restore ecosystem function in Riparian Reserves.

In summary, the effects of salvage and reforestation on aquatic habitat indicators would be neutral or discountable and effects on aquatic species would be neutral or minor. Reforestation actions are designed to increase the likelihood and speed by which burned areas are reforested which is considered a long term positive effect to aquatic resources.

Fuels Reduction

Potential effects are the same as described for the Whites Fire Area for Modified Alternative 2.

Hazard Tree Abatement

The amount of roadside hazard tree removal is reduced with Modified Alternative 3 to 55 miles, or maximum of 2,400 acres; relative to 80 miles, or 2,700 acres, with Alternative 2. About 16 miles, or 2.4% of the total stream mileage in the North Fork Salmon River watershed, may be affected by these actions. In the Whites Fire area, roadside hazard tree

removal is proposed in relatively close proximity to Coho salmon CH in mainstem reaches of North Fork Salmon River, North Russian and South Russian Creeks, and Whites Gulch. Fisheries biologists conducted field review of roadside hazard tree marking in these areas and confirmed that hazard trees along roads in close proximity to Coho salmon CH are marked according to the description in this EIS including project design features.

Roads, Landings and Water Drafting

Potential effects are the same as described for the Whites Fire Area for Modified Alternative 2.

Cumulative Effects

The cumulative effects of Modified Alternative 3 would be roughly the same as described for the Whites Fire Area for Modified Alternative 2.

Comparison of Effects

Potential direct effects from all action alternatives are associated with water drafting and stream crossing work associated with temporary road actions and legacy sediment site repair. Indirect effects to aquatic habitat are primarily associated with stream crossing work, new landings within Riparian Reserves, as well as hazard tree removal/site preparation and planting/fuels treatments within Riparian Reserve. The implementation of project design features, in particular those developed to reduce negative impacts to watershed values, minimizes potential negative direct and indirect effects to aquatic habitat indicators (sediment, water temperature and large wood) under all action alternatives. Near stream temporary road and landing actions are proposed under all action alternatives, with the exception of Alternative 4 which limits temporary road building and eliminates stream crossings and new landings in Riparian Reserve.

Alternatives 2 and 3 involve potential adverse effects to aquatic habitat, including designated Critical Habitat for SONCC Coho salmon due to temporary road actions, particularly re-opening of road 46N62 in Caroline Creek-Klamath River drainage. These impacts are expected in large part due to the vulnerable post-fire condition and geology of project area watersheds and streams where project disturbance would occur. With Alternatives 4, 5, Modified 2, and Modified 3, these potential adverse impacts to aquatic habitat are avoided; however with all alternatives, except Alternative 4, there would be short term site level negative effects to aquatic habitat at several locations as described above. For several temporary road actions that involve current legacy sediment sources, long term benefits would occur because after use in the project these sites would be appropriately hydrologically stabilized and would no longer pose a threat to water quality. With Alternative 4, only one of these temporary roads with existing legacy sediment sources remains (temp road 16 near Kuntz Creek); potential long term benefits of reducing chronic erosion on the other sites as described in the other alternatives, would be foregone with Alternative 4. All action alternatives include legacy sediment site treatments in Elk Creek watershed; the potential short term impacts and long term benefits to aquatic resources would occur with all alternatives.

Alternatives 2, 4, Modified 2, and Modified 3 include hand treatments in Riparian Reserves, where safety allows. Given post fire conditions across the landscape, these treatments may provide meaningful benefit to downstream aquatic habitat, depending on

the proportion of any given drainage that receives the treatment; and would provide for improved watershed condition long term by allowing for maintenance underburning opportunities as well as planting if necessary to provide for more timely restoration of conifers where they were a natural component of forested stands. The long term benefits are more likely as the amount of this treatment across the post fire landscape increases, therefore Alternative 2, Alternative 4, and Modified Alternative 3 would be more beneficial to watershed condition including fire resiliency than the other alternatives.

The following tables summarize effects determinations for special status aquatic species, by fire area. More detailed tables describing effects of the alternatives to aquatic habitat indicators, by fire area, are in the Aquatics Resource Report Amendment.

Project Area A: Beaver Fire

Table 3-48: Summary of effect determination in the Beaver fire area.

Species	Special Status	BEAVER FIRE Alternative	Effects Determination
Fish			
Coho Salmon and designated Critical Habitat	Endangered Species Act Threatened	All Action Alternatives	May affect, but is not likely to adversely affect
Upper Klamath-Trinity Rivers Chinook Salmon	FS Sensitive	All Action Alternatives	May affect individuals, but is not likely to lead to a trend towards listing
Klamath Mountains Province Steelhead Trout	FS Sensitive, MIS	All Action Alternatives	May affect individuals, but is not likely to lead to a trend towards listing
Rainbow Trout	MIS	All Action Alternatives	Determinations are not applicable to MIS, effects to habitat have been disclosed
Pacific Lamprey	FS Sensitive	All Action Alternatives	May affect individuals, but is not likely to lead to a trend towards listing
Klamath River Lamprey	FS Sensitive	All Action Alternatives	May affect individuals, but is not likely to lead to a trend towards listing
Foothill yellow legged frog, and Western pond turtle	FS Sensitive	All Action Alternatives	May affect individuals, but is not likely to lead to a trend towards listing
Cascade frog and Southern torrent salamander	FS Sensitive	All Action Alternatives	No effect
Other Habitat			
Essential Fish Habitat (Coho/Chinook)	All Action Alternatives	All Action Alternatives	May adversely affect

Project Area B: Happy Camp Fire

Table 3-49: Summary of effect determination in the Happy Camp fire area.

Species	Special Status	HAPPY CAMP FIRE Alternative	Effects Determination
Fish			

Species	Special Status	HAPPY CAMP FIRE Alternative	Effects Determination
Coho Salmon and designated Critical Habitat	Endangered Species Act Threatened	Alternative 4 Alternative 5 Modified Alternative 2 Modified Alternative 3	May affect, but is not likely to adversely affect
		Alternative 2 Alternative 3	May affect, and is likely to adversely affect
Upper Klamath-Trinity Rivers Chinook Salmon	FS Sensitive	All Action Alternatives	May affect individuals, but is not likely to lead to a trend towards listing
Klamath Mountains Province Steelhead Trout	FS Sensitive, MIS	All Action Alternatives	May affect individuals, but is not likely to lead to a trend towards listing
Rainbow Trout	MIS	All Action Alternatives	Determinations are not applicable to MIS, effects to habitat have been disclosed
Pacific Lamprey	FS Sensitive	All Action Alternatives	May affect individuals, but is not likely to lead to a trend towards listing
Klamath River Lamprey	FS Sensitive	All Action Alternatives	May affect individuals, but is not likely to lead to a trend towards listing
Foothill yellow legged frog, Cascade frog, Western pond turtle, southern torrent salamander	FS Sensitive	All Action Alternatives	May affect individuals, but is not likely to lead to a trend towards listing
Other Habitat			
Essential Fish Habitat (Coho/Chinook)	All Action Alternatives	All Action Alternatives	May adversely affect

Project Area A: Whites Fire

Table 3-50: Summary of effect determination in the Whites fire area.

Species	Special Status	WHITES FIRE Alternative	Effects Determination
Fish			
Coho Salmon and designated Critical Habitat	Endangered Species Act Threatened	All Action Alternatives	May affect, but is not likely to adversely affect
Upper Klamath-Trinity Rivers Chinook Salmon	FS Sensitive	All Action Alternatives	May affect individuals, but is not likely to lead to a trend towards listing
Klamath Mountains Province Steelhead Trout	FS Sensitive, MIS	All Action Alternatives	May affect individuals, but is not likely to lead to a trend towards listing
Rainbow Trout	MIS	All Action Alternatives	Determinations are not applicable to MIS, effects to habitat have been disclosed
Pacific Lamprey	FS Sensitive	All Action Alternatives	May affect individuals, but is not likely to lead to a trend towards listing
Klamath River Lamprey	FS Sensitive	All Action Alternatives	May affect individuals, but is not likely to lead to a trend towards listing

Species	Special Status	WHITES FIRE Alternative	Effects Determination
Foothill yellow legged frog, Cascade frog, and Western pond turtle	FS Sensitive	All Action Alternatives	May affect individuals, but is not likely to lead to a trend towards listing
Southern torrent salamander	FS Sensitive	All Action Alternatives	No effect
Other Habitat			
Essential Fish Habitat (Coho/Chinook)	All Action Alternatives	All Action Alternatives	May adversely affect

Compliance with law, regulation, policy, and the Forest Plan

The Forest Plan consistency checklist reflects how the project meets specific standards and guidelines from the Forest Plan. Interagency consultation under Endangered Species Act section 7 is currently in progress with National Marine Fisheries Service; this will also include consultation under the Magnuson-Steven Fishery Conservation and Management Act.

Soil

This section describes the current situation and effects of the project on soil resources.

Methodology and Analysis Indicators

Analysis of the effects of individual management activities on the soil resource (soil productivity and soil ecosystem functionality) is guided by the Forest Plan Standards and Guidelines and FSM 2500, Chapter 2550, Supplement 2500-2012-1. Four indicators were chosen that address relevant issues in the Westside Fire Recovery project and measure compliance with Forest Plan Standard and Guidelines. The indicators include: soil stability, surface organic matter, soil organic matter, and soil structure.

The unit measure for each indicator is acres meeting desired conditions, partially meeting desired conditions, and not meeting desired conditions. Soil stability desired conditions are not met when Erosion Hazard Ratings are high or when soil cover is less than the values listed in Table 3-51 (Forest Plan Standard and Guideline 4-2). The percent bare soil is an important control on sediment production following timber salvage (Chase 2006). The presence of even a thin litter layer can substantially reduce soil erosion (Peterson 2009).

Table 3-51: Soil Cover Guidelines for Vegetation and Fuels Management Projects (USDA 2010)

Soil Cover Guidelines for Projects		
Soil Texture Class	**Slope (%)**	**Minimum Total Soil Cover* (%)**
Guidelines for Projects Using Tractors:		
Sandy loam or coarser	0-25	70
	26-35	80
Loam or finer	0-35	70
Guidelines for Prescribed Burning Projects:		
Sandy loam or coarser	0-25	60

Soil Cover Guidelines for Projects		
	26-45	70
	46	80
Loam or finer	0-35	50
	36-60	60
	61	70

For this project, surface organic matter is coarse wood greater than 12 inches in diameter which is either down, or standing and dead. The surface organic matter indicator does not meet desired conditions when this material averages less than 200 cubic feet per acre, and partially meets desired conditions when it averages less than 500 cubic feet per acre (these values correspond to metrics in Forest Plan Standard and Guideline 6-16).

Soil organic matter desired conditions are not met when major portions of the area have had the upper soil layer displaced or removed to a depth of 8 inches on area large enough to affect productivity for the desired plant species (100 square feet).

Soil structure desired conditions are not met when major portions of the area have reduced infiltration and permeability capacity indicated by soil structure and macro-porosity changes. Infiltration is the process by which water on the ground surface enters the soil. Soil macro-porosity is the amount of the soil that is composed of larger pores which are important for soil water movement and gas exchange.

The projected acres not meeting desired conditions for each indicator and activity type were determined from monitoring data collected from previous salvage projects, and based on scientific research.

Spatial and Temporal Context

For all four soil indicators, the analysis area is bounded by the project activity units because this is where impacts to soil could occur. The analysis is further bounded in time by the foreseeable future period during which effects of this project can persist as detectable, significant effects. Soil cover, as it affects soil stability, can recover quickly if needle-cast is available, and grasses, forbs, and shrubs re-sprout. The temporal boundary for soil stability is five years. Soil organic matter can take a long time to rebuild after it is lost through displacement or erosion. Once compacted, soil structure can remain affected for decades. The temporal boundary for soil organic matter, surface organic matter, and soil structure is 30 years.

Forest Plan Standards and Guidelines

The project is required to meet the coarse woody debris Standard and Guideline 6-16. This standard and guideline would require five to 20 pieces of coarse woody debris (CWD) per acre in various states of decay. Large logs, both sound and cull of at least 20 inches in diameter and about 40 cubic feet in volume, should be left. Logs less than 12 inches in diameter or stumps do not count as CWD. Standard and Guideline 6-16 also acknowledges that these requirements may be waived in strategic fuelbreak areas.

Affected Environment

Project Area A: Beaver Fire

Soils within the Beaver Fire analysis area consist mostly of Holland, Skalan, Clallam, and Lithic Haploxeralfs (Table 3-52). These soil types are derived mainly from granitic rock, metamorphic rock, or ultramafic rock such as serpentine. Soil textures vary from loam to sandy loam with high percentages of rock fragments.

Table 3-52: Soil families and associated properties used in analysis in the Beaver Fire area

Family	Acres	Surface Texture	Soil Depth, inches	Compaction Hazard
Beaughton	1023	Gravelly loam	10-20	Moderate
Blusprin	786	Very cobbly loam	20-40	Moderate
Clallam	3190	Gravelly ashy sandy loam	40-60	Moderate
Coboc	1208	Gravelly loam	40-60	Moderate
Dubakella	721	Stony loam	20-40	Moderate
Holland	7773	Sandy loam	60+	Moderate
Kang	1705	Gravelly sandy clay loam	20-40	Moderate
Lithic Haploxeralfs	3299	----------	-------	----------
Skalan	6612	Gravelly ashy loam	<30	Moderate
Weitchpec	1097	Gravelly sandy loam	20-40	Moderate

Soil Stability

Currently, five acres of the Beaver fire project area do not meet desired conditions for soil stability (see Table 3-53). Compared to the Happy Camp and Whites Fire areas, slopes are more gradual on the Beaver Fire area and Erosion Hazard Ratings are mostly moderate. Erosion hazard ratings were high on 30 acres after the 2014 fires; since the fire, soil cover has increased from the return of vegetation and dead needles. Therefore, erosion hazard ratings have been reduced to moderate on 25 acres, which partially meets the desired condition for soil stability.

Table 3-53: Area (acres) meeting desired condition in the Beaver Fire area

Indicator	Meets	Partially meets	Not met
1. Acres meeting or not meeting desired conditions for soil stability	4,745	1,446	5
2. Acres meeting or not meeting desired conditions for surface matter	6,196	0	0
3. Acres meeting or not meeting desired conditions for soil organic matter	3,708	1,915	573
4. Acres meeting or not meeting desired conditions for soil structure	5,838	89	269

Surface Organic Matter

Surface organic matter is currently limited in severely burned areas but will recover as dead trees fall and leaf litter from early seral plant communities accumulates. Although many areas of the project have less than 200 cubic feet per acre of large woody debris, there is a high volume of standing dead trees, greater than 12 inches in diameter.

Soil Organic Matter

The current condition is that approximately 573 acres of the project area are not meeting desired conditions for soil organic matter because the Beaver Fire resulted in high Soil Burn Severity. Moderate soil burn severity occurred on 1,915 acres and this partially

meets the desired condition for soil organic matter. Low or very low soil burn severity occurred on 3,257 acres and this meets the desired condition.

Soil Structure

It's estimated approximately 269 acres of the project area are not meeting desired conditions for soil structure and 89 acres partially meet the desired condition for soil structure. This is based on the area disturbed by mechanical equipment during the last 30 years.

Project Area B: Happy Camp Complex

Soils within the Happy Camp Fire area consist mostly of Clallam, Jayar, Woodseye, Gilligan, Deadwood and Skalan (Table 3-54). These soil types are derived mainly from metamorphic or granitic rock. Soil textures vary from loam to sandy loam with high percentages of rock fragments.

Table 3-54: Soil families and associated properties used in analysis in the Happy Camp Complex area

		Soil Properties used in Analysis		
Family	Acres	Surface Texture	Soil Depth, inches	Compaction Hazard
Buell	250	Gravelly loam	60+	Moderate
Chawanakee	2,868	Coarse sandy loam	<20	Moderate
Clallam	41,816	Gr ashy sandy loam	40-60	Moderate
Coboc	466	Gravelly loam	40-60	Moderate
Deadwood	7,300	Gr sandy loam	<20	Moderate
Dubakella	999	Stony loam	20-40	Moderate
Endlich	874	Very stony loam	20-40	Moderate
Entic Xerumbrepts	286	Gravelly loam	<20	Moderate
Gerle	572	Sandy loam	40-60	Moderate
Gilligan	8,949	Ashy silt loam	40-60+	Moderate
Goldridge	472	Fine sandy loam	60-80+	Moderate
Holland	4,151	Sandy loam	60+	Moderate
Jayar	12,174	V gr loam	<30	Moderate
Lithic Haploxeralfs	107	Loam	<20	Moderate
Lithic Ruptic	5,595	V gr loam	<20	Moderate
Nanny	530	Gravelly loam	30-60	Moderate
Olete	4,497	V gr silt loam	<20	Moderate
Parks	2,144	v gr sandy clay loam	40-60	Moderate
Rock	869	----------	-------	Low
Skalan	2,477	Gr ashy loam	<30	Moderate
Typic Haploxerolls	766	Gr Loam	20-40	Moderate
Weitchpec	201	Gravelly sandy loam	20-40	Moderate
Woodseye	9,302	V gr sandy loam	<20	Moderate

Soil Stability

Currently, approximately 633 acres of the project area are not meeting desired conditions for soil stability (see Table 3-39). The areas that are not meeting the desired condition have high erosion hazard ratings due to recent wildfires which removed soil cover on steep slopes. Soil cover has remained deficient on this area because canopy cover was combusted and unavailable to provide soil cover. On 12,543 acres, erosion hazard ratings

were high; since the Happy Camp Fire, soil cover has increased from the return of vegetation and dead needles.

Table 3-39: Area (acres) meeting desired condition in the Happy Camp Complex area

Indicator	Meets	Partially Meets	Not Met
1. Acres meeting and not meeting desired conditions for soil stability	3,413	26,824	633
2. Acres meeting and not meeting desired conditions for surface matter	30,870	0	0
3. Acres meeting and not meeting desired conditions for soil organic matter	20,750	9,478	642
4. Acres meeting and not meeting desired conditions for soil structure	29,337	1,150	383

Surface Organic Matter

Surface organic matter is currently limited in severely burned areas but will recover as dead trees fall and leaf litter from early seral plant communities accumulates. Although most of the project analysis area has less than 200 cubic feet per acre of large woody debris, there is a high volume of standing dead trees, greater than 12 inches in diameter.

Soil Organic Matter

The current condition is that approximately 642 acres of the project area are not meeting desired conditions for soil organic matter because they have high soil burn severity. Moderate soil burn severity occurred on 9,478 acres and this partially meets the desired condition for soil organic matter. Low or very low soil burn severity occurred on 18,198 acres and this meets the desired condition.

Soil Structure

It's estimated that less than 383 acres of the project analysis area are not meeting desired conditions for soil structure. This is based on the area disturbed by mechanical equipment during the last 30 years.

Project Area C: Whites Fire

Soils within the Whites Fire area consist mostly of Clallam, Holland, Woodseye, Deadwood, Skalan, and Jayar (Table 3-55). These soil types are derived mainly from metamorphic or granitic rock. Soil textures vary from loam to sandy loam with high percentages of rock fragments.

Table 3-55: Soil families and associated properties used in analysis in the Whites Fire area

		Soil Properties used in Analysis		
Family	Acres	Surface Texture	Soil Depth, inches	Compaction Hazard
Chawanakee	51	Coarse sandy loam	<20	Moderate
Clallam	10310	Gr ashy sandy loam	40-60	Moderate
Coboc	1182	Gravelly loam	40-60	Moderate
Deadwood	4049	Gr sandy loam	<20	Moderate
Endlich	1200	Very stony loam	20-40	Moderate
Entic Xerumbrepts	809	----------	--------	--------
Gerle	1618	Sandy loam	40-60	Moderate
Gilligan	377	Ashy silt loam	40-60+	Moderate
Holland	4214	Sandy loam	60+	Moderate
Jayar	2370	V gr loam	<30	Moderate
Kang	45	Gravelly sandy clay loam	20-40	Moderate

		Soil Properties used in Analysis		
Lithic Xerumbrept	30	----------	--------	--------
Nanny	1835	Gravelly loam	30-60	Moderate
Rock	1414	----------	-------	--------
Skalan	2881	Gr ashy loam	<30	Moderate
Woodseye	4061	V gr sandy loam	<20	Moderate

Soil Stability

Currently, approximately 280 acres of the project analysis area are not meeting desired conditions for soil stability (see Table 3-56). The areas that are not meeting the desired condition have high erosion hazard ratings due to recent wildfires which combusted organic matter on top of the soil surface. Soil cover has remained deficient on this area because canopy cover was combusted and unavailable to provide soil cover. On 20,545 acres, erosion hazard ratings were high after the fires; since the fires, soil cover has increased from the return of vegetation and dead needles.

Table 3-56: Area (acres) meeting desired condition in the Whites Fire area

Indicator	Met	Partially Met	Not Met
1. Acres not meeting desired conditions for soil stability	2,215	9,662	280
2. Acres not meeting desired conditions for surface matter	12,157	0	0
3. Acres not meeting desired conditions for soil organic matter	8,997	2,880	280
4. Acres not meeting desired conditions for soil structure	11,956	151	50

Soil Organic Matter

The current condition is that approximately 280 acres of the project analysis area are not meeting desired conditions for soil organic matter because they have high soil burn severity. Moderate soil burn severity occurred on 2,880 acres and this partially meets the desired condition for soil organic matter (Table 3-56). Low or very low soil burn severity occurred on 18,198 acres and this meets the desired condition.

Surface Organic Matter

Surface organic matter is currently limited in severely burned areas but will recover as dead trees fall and leaf litter from early seral plant communities accumulates. Although many areas of the project have less than 200 cubic feet per acre of large woody debris, there is a high volume of standing dead trees, greater than 12 inches in diameter.

Soil Structure

It's estimated that less than 50 acres of the project analysis area are not meeting desired conditions for soil structure.

Environmental Consequences

Alternative 1

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

Immediately following the 2014 fires, erosion hazard ratings were high on less than one percent of the project analysis area. Within one year following the fire, soil cover has increased on areas with low to moderate soil burn severities. Therefore, erosion hazard

ratings have been reduced to moderate on 25 acres, which partially meets the desired condition for soil stability. Soil cover is less likely to increase on five acres with high soil burn severity because tree canopy has been consumed.

These areas would not meet the desired condition for soil stability. Based on field data collected, it is estimated that soil cover is less than 30 percent on this same area. Effective soil cover will only be fully reestablished after surface vegetation recovers. This will expose the soil to higher erosion potential over the next three to six years (Berg and Azuma 2010).

Under Alternative 1, large surface organic matter could reach sufficient levels within approximately five years and contribute to the recovery of soil productivity. It is possible that the surface organic matter indicator would not be met if material greater than 12 inches in diameter exceeds 800 cubic feet. If a wildfire occurs during the next 10 to 15 years, soils would burn with a high soil burn severity directly beneath this large woody debris. This could occur on approximately 2,500 acres of the project area and it is estimated that large wood could cover five to ten percent of this area.

Soil organic matter will remain intact unless severe storm events result in the loss of large amounts of topsoil. Soil structure conditions will remain the same in the short term, with very slow long-term natural recovery of old skid trails and landings.

Cumulative Effects

Grazing is the only reasonably foreseeable future action that would occur within the same area as the analysis area for soils resources. Although minimal amounts of grazing activities are ongoing within allotments found within the project area, most of the project activities are proposed on steeper slopes which cattle use rarely, if ever, or are largely transitory in nature. Further, annual operating instructions provided to permittees will limit permitted grazing activities as needed to minimize impacts, not only to rangeland health but also to soil conditions (see range section of this chapter and the Rangeland resource report). For these reasons, no measurable cumulative impacts to soil indicators are anticipated as a result of ongoing grazing activities when added to the activities proposed with this project.

Wildfire and forest management are an ongoing impact to soil stability, surface organic matter, soil organic matter and soil structure. The effects from the 2014 wildfires overwhelm effects from past management practices. The cumulative effects for Alternative 1 would be a continued increase in soil stability due to falling needles, branches, and eventually tree boles. This would result in decreased erosion hazard ratings and a gradual increase in soil organic matter as material decomposes. These processes would encourage the return of vegetation which would further increase soil cover and eventually soil organic matter. Soil organic matter would reach desired conditions more slowly in areas with high soil burn severity, and recovery could take several decades to a century. Surface organic matter would be expected to reach desired conditions within approximately 10 years. Damage to soil structure would continue to ameliorate, yet this process occurs slowly. The most compacted areas could take approximately 30 years to reach desired condition.

The natural falling of dead needles, branches, and eventually tree boles would continue to assist in the recovery of soil stability. Larger surface organic matter would be added from the falling of tree boles over the next five to ten years to meet the surface organic matter

indicator. The surface organic matter indicator may not be met if a wildfire occurs during the next 10 to 15 years, resulting in high soil burn severity directly beneath large woody material in contact with the soil. Soil organic matter will remain intact unless severe storm events result in the loss of large amounts of topsoil. Soil structure conditions will remain the same in the short term, with very slow long-term natural recovery of old skid trails and landings.

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

The effects to soil resources are the same as for the Beaver Fire area. The acres not meeting desired condition are different. Immediately following the 2014 fires, erosion hazard ratings were high on approximately 45 percent of the project analysis area. Within one year following the fires, soil cover would increase on areas with low to moderate soil burn severities. Soil cover is less likely to increase on areas with high soil burn severity because tree canopy has been consumed. Therefore, erosion hazard ratings have been reduced to moderate on 28,824 acres, which partially meets the desired condition for soil stability. Erosion hazard ratings have remained high on 633 acres which do not meet the desired condition for soil stability.

Cumulative Effects

The effects are the same as described in the Beaver fire area above.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

The effects to soil resources are the same as for the Beaver fire area. Immediately following the 2014 fires, erosion hazard ratings were high on approximately 66 percent of the project analysis area. Within one year following the fires, soil cover would increase on areas with low to moderate soil burn severities. Soil cover is less likely to increase on areas with high soil burn severity because tree canopy has been consumed. Therefore, areas with high erosion hazard ratings would decrease to moderate. Erosion hazard ratings have remained high on 280 acres which do not meet the desired condition for soil stability.

Cumulative Effects

The effects are the same as described in the Beaver fire area above.

Alternative 2

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

Soil Stability

Soil stability and soil organic matter would be impacted on all areas occupied by new temporary roads and new landings, most of previously decommissioned roads, and portions of existing temporary roads and landings that have since stabilized. Construction of new temporary roads, associated with ground-based harvest, would have the highest impact to soil stability and sedimentation (Rice et al. 1972). Newly constructed roads are the largest source of erosion and this is exacerbated in a burned environment because the capacity of the landscape to moderate flow and trap sediment is greatly reduced (Peterson

et al. 2009). There are no new temporary roads being constructed in the Beaver Fire area and no previously decommissioned roads are being reopened in this area.

Ground-based harvest could be conducted using conventional or mechanized logging systems. A mechanized system could harvest material generally less than 26 inches in diameter and would gently fell trees. This would minimize limb breakage and additions of soil cover, yet feller-bunchers would cut and travel over smaller, non-merchantable material to incorporate it as soil cover. Mechanized systems would generally impact a larger percentage of a unit area. Conventional logging system would yard material that has been hand felled, thereby resulting in higher additions of soil cover. Conventional harvest would likely impact a smaller percentage of unit area, yet compaction would likely be higher on skid trails.

The return of vegetation and falling dead needles have increased soil cover and decreased erosion hazard ratings to moderate and rates of erosion are decreasing. On bare soil where mechanical equipment removes cover, rates of erosion could return to post-fire levels. Soil stability and soil organic matter would be impacted on about 40 percent of units where ground-based logging equipment removes soil cover due to the operation of feller-bunchers to harvest trees, skidding of fallen trees, and construction of temporary roads or landings. This estimated effect is based on personal observations on the American and Rim Fire salvages, and research discussed in the soil specialist report. For the total Beaver Fire area, erosion rates were modeled at an average of four tons per acre (model results ranged from zero to 22 tons per acre). Fuels treatments and site preparation using mechanical equipment would also impact soil stability on percentages of units. This would vary depending on existing soil cover, slope and operator experience. Ground-based harvest would result in the highest percent of ground disturbance (Beschta 2004). **Overall, ground-based harvest would be expected to disturb soil on approximately 30 percent, and up to 40 percent where roadside hazard, machine piling and pile burning treatments also occur. Mechanical disturbance or pile burning would remove soil cover and impact new vegetation growth.** Mastication would expect to impact less than five percent of units, machine piling ten percent, and mechanical thinning 15 percent. When these percentages are multiplied for all proposed treatments, an estimated 2,049 acres or 29 percent of the fire project analysis area would temporarily not meet the soil stability indicator.[37] This represents the high end estimate of disturbance after project activities take place. The

[37] This disturbance area was calculated using the following formula which applies to all alternatives where these activities are proposed: ((100% x new landing acres) + (50% x existing landing acres) + (100% x new temporary road acres) + (100% x reopen decommissioned road acres) + (75% x existing temporary road acres) + (5% x fuel break mechanical or hand acres) + (2% x hand thin pile burn acres) + (8% x machine pile burn fuels acres) + (15% x mastication or mechanical thin fuels acres) + (8% x machine pile burn fuels acres) + (15% x ridgetop fuels acres) + (10% x roadside fuels acres) + (2% x underburn acres) + (2% x understory thin, pile burn acres) + (10% x cable yard, plant acres) + (1% x hand cut and pile burn, plant acres) + (2% x masticate acres) + (10% x masticate and subsoil, plant acres) + (1% x masticate, plant acres) + (15% x mechanical thin, pile burn, plant acres) + (20% x mechanical thin and pile, subsoil acres) + (40% x roadside ground based harvest acres) + (5% x roadside aerial harvest acres) + (35% x ground-based, hand pile, pile burn acres) + (10% x skyline harvest, hand pile, pile burn acres) + (10% x machine pile burn fuels acres) + (1% x helicopter harvest, hand pile, pile burn acres) + (15% x helicopter, machine pile, pile burn acres) = 2,054 acres affected for Alternative 2 Beaver Fire area – 5 acres currently not meeting desired condition = 2,049 acres affected by proposed project activities.)

project design features described below will take place during and after soil-disturbing activities and will result in a large reduction in acres not meeting desired conditions for analysis indicators. This affected area is much higher compared to the other fires and other alternatives because of the large number of acres proposed for ground-based harvest in Alternative 2 in the Beaver Fire area.

For any tractor harvest unit that does not meet the soil cover standards in table 4-2 of the Forest Plan upon completion of treatments, areas where soil cover is deficient will be mulched so that soil cover standards are met. Mulching is generally the most effective treatment in reducing post-fire runoff and erosion (Robichaud 2013). Compared to undisturbed areas, ground-based harvest would result in approximately 20 to 30 times higher sediment yields on compacted, mulched areas; however, at the watershed scale, surface runoff and sediment would be trapped, leading to localized deposition and a lower sediment yield per unit area. Rapid vegetation regrowth is expected on undisturbed areas and this would reduce the potential for this sediment to be delivered to the stream network (Wagenbrenner 2014). Tractor harvest would, therefore, have a shorter-term effect on larger-scale runoff.

During site preparation, manual felling of small diameter trees could also be accomplished to add soil cover on ground-based harvest units. Project design feature Watershed-11 would require site preparation to maintain adequate soil cover to maintain soil stability by not reducing the sum of one-hour, ten-hour, and 100-hour fuels to less than less than seven tons per acre

Project design features have been revised to require decompacting soils on new temporary roads to varying depths based on their surface texture and slope for project areas on which new temporary roads will be constructed (not in the Beaver Fire area). This would improve infiltration and permeability, while avoiding greater impacts to soil stability and soil organic matter. To speed the recovery of soil cover on new temporary roads, a project design feature would require maintaining at least 50 percent effective soil cover.

With the application of these measures, it is expected the soil stability indicator desired conditions would be met and Forest Plan soil cover Standard 3-2 would be met within proposed activity areas.

Surface Organic Matter

Coarse woody debris will be retained to meet Standard and Guideline 6-16 in the Forest Plan. Standing snags in snag retention areas and Riparian Reserves may contribute to meeting this standard. If necessary, the Forest will designate additional wood during implementation to be retained to meet this standard. A project design feature (Watershed-36) has been added to clarify this standard as follows:

> *Maintain 5 to 20 pieces of CWD per acre with a target size of 20 inches in diameter (or larger) and about 40 cubic feet in volume when they are available. The minimum piece size to count toward these objectives is > 15 inches diameter and 10 feet long. On upper slopes and south and west aspects, ~5 pieces > 15 inches diameter and 10 feet long would be retained. On north and east aspects and on lower slopes, up to 20 pieces >15 inches diameter and 10 feet long will be retained. Individual snags, clumps of snags, existing logs on the ground and green trees within units may count towards these targets.*

With the application of these measures, **it is expected the surface organic matter indicator desired conditions would be met within proposed activity areas.**

Soil Organic Matter

Approximately 383 acres, or five percent of the activity area, may not meet the desired condition for soil organic matter.[38] Soil organic matter could be removed due to displacement from mechanical equipment or could occur gradually due to accelerated erosion. Accelerated erosion would be expected where the soil stability indicator is not met as described above. Therefore, mitigations to maintain soil stability would also maintain soil organic matter. Mechanical displacement would occur mainly due to the construction of temporary roads, landings, and skid trails, and to a lesser extent from feller bunchers operating off of skid trails. It is anticipated that soil organic matter would not meet desired conditions on approximately 20 percent of units proposed for both ground-based harvest and mechanical fuel reduction or site preparation, 15 percent of ground-based harvest units, ten percent of skyline units, and less than one percent of proposed helicopter units for areas that have helicopter yarding (no helicopter logging is planned in the Beaver Fire area). The most severe displacement of soil organic matter is expected to occur during temporary road construction and on landings and main skid trails. Temporary road construction would result in the highest impacts to soil organic matter, especially on steeper side slopes which would require excavation of a cut slope. Ground-based skid trails would result in displacement of soil organic matter on skidder tracks, and where yarded trees dig into the mineral soil surface and wedge the surface to the side. This creates berms and piles along the edges of skid trails. Soil disturbance is greater on steeper slopes, and a project design feature would limit ground-based skidding to slopes less than 35 percent or short pitches of 100 feet on slopes less than 45 percent. Displacement caused by new skid trails and temporary road construction will be considered a long-term disturbance as no mitigations to replace displaced soil organic matter are planned. Approximately 20 percent of the proposed ground based units have forest survey site class ratings of 4 and 5, which are lower productivity on a scale of 1 to 7. On these more sensitive soils, fewer passes of mechanical equipment could result in detrimental impacts to soil organic matter and soil productivity.

On proposed harvest units, jackpot pile burning would be expected to produce enough heat to consume soil organic matter within the footprint of the piles.

[38] This disturbance area was calculated using the following formula which applies to all alternatives where these activities are proposed (100% x new landing acres) + (0% x existing landing acres) + (100% x new temporary road acres) + (0% x reopen decommissioned road acres) + (0% x existing temporary road acres) + (5% x fuel break mechanical or hand acres) + (2% x hand thin pile burn acres) + (8% x machine pile burn fuels acres) + (15% x mastication or mechanical thin fuels acres) + (8% x machine pile burn fuels acres) + (15% x ridgetop fuels acres) + (10% x roadside fuels acres) + (2% x underburn acres) + (2% x understory thin, pile burn acres) + (10% x cable yard, plant acres) + (1% x hand cut and pile burn, plant acres) + (2% x masticate acres) + (10% x masticate and subsoil, plant acres) + (1% x masticate, plant acres) + (15% x mechanical thin, pile burn, plant acres) + (20% x mechanical thin and pile, subsoil acres) + (40% x roadside ground based harvest acres) + (5% x roadside aerial harvest acres) + (35% x ground-based, hand pile, pile burn acres) + (10% x skyline harvest, hand pile, pile burn acres) + (10% x machine pile burn fuels acres) + (1% x helicopter harvest, hand pile, pile burn acres) + (15% x helicopter, machine pile, pile burn acres) = 956 acres affected for Alternative 2 Beaver Fire area – 573 acres currently not meeting desired condition = 383 acres affected by proposed project activities

With the application of soil stability measures described above, **it is expected Forest Plan Standard and Guideline 3-3 would be met within the proposed activity areas.**

Where underburning is proposed in areas that burned with low soil burn severity, and if a wildfire burns through the area, this treatment would provide a benefit to soil productivity by decreasing the soil burn severity of a future fire. Because this is an unpredictable event, this potential benefit has not been factored into area meeting desired conditions.

Soil Structure

The use of ground-based equipment, opening and using temporary road access and building new landings can affect soil structure. It is expected soil structure would not meet desired conditions on approximately 250 acres or four percent of the fire area.

Cumulative Effects

Past effects due to forest management and the 2014 fires have been considered and discussed in the affected environment and the effects to soil stability, surface organic matter, soil organic matter and soil structure addressed there. There are five acres not meeting desired condition for soil stability; when added to the 2,049 acres not meeting desired condition there are 2,054 acres or 29 percent not meeting desired condition cumulatively for soil stability. All acres are meeting desired condition currently for surface organic matter; the project will lead to 674 acres or ten percent not meeting desired condition. There are currently 573 acres not meeting desired condition for soil organic matter as a result of past action. This project will result in 383 additional acres not meeting desired condition for a total of 956 acres or 14 percent. Finally, there are 269 acres not meeting desired condition when added to the 250 acres from the alternative the total acres not meeting desired condition for soil structure is 519 or seven percent. Grazing is the only on-going action that could lead to cumulative effects. There are no measurable cumulative effects from grazing (as described in Alternative 1).

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

Soil Stability

The effects to soil resources affected by the alternative are the same as described for the Beaver Fire area and would occur over the same percentages of those proposed actions. An estimated 2,001 acres or seven percent of the fire project analysis area would temporarily not meet the soil stability indicator. For any tractor harvest unit that does not meet the soil cover standards in table 4-2 of the Forest Plan upon completion of treatments, areas where soil cover is deficient will be mulched so that soil cover standards are met. Therefore, as described in the Beaver Fire area section, tractor harvest would have a shorter term effect on larger-scale runoff. A loss of soil cover on this area would likely result in rates of long-term accelerated erosion similar to those modeled following the Happy Camp Fire of 18 to 109 tons per acre. Erosion could remain elevated for ten years until trees are planted, yet the success of conifers or brush vegetation could be delayed if soil productivity has declined due to soil erosion.

With the application of measures described above, it is expected the soil stability indicator desired conditions would be met and Forest Plan soil cover Standard 3-2 would be met within proposed activity areas.

Surface Organic Matter

Coarse woody debris will be retained to meet Standard and Guideline 6-16 in the Forest Plan. Standing snags in snag retention areas and Riparian Reserves may contribute to this standard. If necessary the Forest Service will designate additional wood during implementation to be retained to meet this standard. A project design feature (Watershed-36) has been added to clarify this standard as discussed for the Beaver Fire area.

With the application of measures described above, **it is expected the surface organic matter indicator desired conditions would be met within proposed activity areas.**

Soil Organic Matter

The effects to soil resources affected by the alternative are the same as described for the Beaver Fire area. Approximately 2,106 acres or seven percent may not meet the desired condition for soil organic matter due to the same proposed actions and over the same percentages as described in Alternative 2, Beaver Fire area. Soil organic matter could be removed due to displacement from mechanical equipment or could occur gradually over time due to accelerated erosion. Accelerated erosion would be expected to decrease soil organic matter where the soil stability indicator is not met as described above. Therefore, mitigations to maintain soil stability would also maintain soil organic matter.

With the application of soil stability measures described above, **it is expected Forest Plan Standard and Guideline 3-3 would be met within the proposed activity areas.**

Soil Structure

The effects to soil resources affected by the alternative are the same as described in the Beaver Fire area. It is expected soil structure would not meet desired conditions on approximately 1,346 acres or five percent of the fire area.

Cumulative Effects

Past effects due to forest management and the 2014 fires have been considered and discussed in the affected environment and the effects to soil stability, surface organic matter, soil organic matter and soil structure addressed there. There are 633 acres not meeting desired condition for soil stability when added to the 2,001 acres not meeting desired condition. All together there are 2,634 acres or nine percent not meeting desired condition cumulatively for soil stability. All acres are meeting desired condition currently for surface organic matter; the project will lead to 534 acres or two percent not meeting desired condition. There are currently 642 acres not meeting desired condition for soil organic matter as a result of past action. This project will result in 2,106 additional acres not meeting desired condition for a total of 2,748 acres or nine percent. Finally, there are 383 acres not meeting desired condition when added to the 1,346 acres from the alternative the total acres not meeting desired condition for soil structure is 1,729 or six percent. Grazing is the only on-going action that could lead to cumulative effects. There are no measurable cumulative effects from grazing (as described in Alternative 1).

Project Area C: Whites Fire

Direct Effects and Indirect Effects

Soil Stability

The effects to soil resources affected by the alternative are the same as described in the Beaver Fire area. An estimated 519 acres or five percent of the fire project analysis area

would temporarily not meet the soil stability indicator. For any tractor harvest unit that does not meet the soil cover standards in table 4-2 of the Forest Plan upon completion of treatments, areas where soil cover is deficient will be mulched so that soil cover standards are met. Therefore, as described in the Beaver Fire area section, tractor harvest would have a shorter term effect on larger-scale runoff.

With the application of measures described above, it is expected the soil stability indicator desired conditions would be met and Forest Plan soil cover Standard 3-2 would be met within proposed activity areas.

Surface Organic Matter

Coarse woody debris will be retained to meet Standard and Guideline 6-16 in the Forest Plan. Standing snags in snag retention areas and Riparian Reserves may contribute to this standard. If necessary, the Forest will designate additional wood during implementation to be retained to meet this standard. A project design feature (Watershed-36) has been added to clarify this standard as discussed for the Beaver Fire area.

With the application of measures described above, **it is expected the surface organic matter indicator desired conditions would be met within proposed activity areas.**

Soil Organic Matter

The effects to soil resources affected by the alternative are the same as described in the Beaver Fire area. Approximately 385 acres or three percent may not meet the desired condition for soil organic matter due to the same proposed actions and over the same percentages as described in Alternative 2, Beaver Fire area. Accelerated erosion would be expected to decrease soil organic matter where the soil stability indicator is not met as described above. Therefore, mitigations to maintain soil stability would also maintain soil organic matter. With the application of soil stability measures described above, **it is expected Forest Plan Standard and Guideline 3-3 would be met within the proposed activity areas.**

Soil Structure

The effects to soil resources affected by the alternative are the same as described in the Beaver Fire area. It is expected soil structure would not meet desired conditions on approximately 301 acres or three percent of the Whites Fire area.

Cumulative Effects

Past effects due to forest management and the 2014 fires have been considered and discussed in the affected environment and the effects to soil stability, surface organic matter, soil organic matter and soil structure addressed there. There are 280 acres not meeting desired condition for soil stability when added to the 519 acres not meeting desired condition. All together there are 799 acres or seven percent not meeting desired condition cumulatively for soil stability. All acres are meeting desired condition currently for surface organic matter; the project will lead to 33 acres or less than one percent not meeting desired condition. There is currently 280 acres not meeting desired condition for soil organic matter as a result of past action. This project will result in 385 additional acres not meeting desired condition for a total of 665 acres or six percent. Finally, there are 50 acres not meeting desired condition when added to the 301 acres from the alternative the total acres not meeting desired condition for soil structure is 351 or three

percent. Grazing is the only on-going action that could lead to cumulative effects. There are no measurable cumulative effects from grazing (as described in Alternative 1).

Alternative 3

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

Soil Stability

The effects to soil resources affected by the alternative are the same as described in Alternative 2. An estimated 1,134 acres or 15 percent of the fire project analysis area would temporarily not meet the soil stability indicator. For any tractor harvest unit that does not meet the soil cover standards in table 4-2 of the Forest Plan upon completion of treatments, areas where soil cover is deficient will be mulched so that soil cover standards are met. Therefore, as described in the Alternative 2 of the Beaver Fire area section, tractor harvest would have a shorter term effect on larger-scale runoff.

With the application of measures described above, it is expected the soil stability indicator desired conditions would be met and Forest Plan soil cover Standard 3-2 would be met within proposed activity areas.

Surface Organic Matter

Coarse woody debris will be retained to meet Standard and Guideline 6-16 in the Forest Plan. Standing snags in snag retention areas and Riparian Reserves may contribute to this standard. If necessary, the Forest will designate additional wood during implementation to be retained to meet this standard. A project design feature (Watershed-36) has been added to clarify this standard as discussed for the Beaver Fire area.

With the application of measures described above, **it is expected the surface organic matter indicator desired conditions would be met within proposed activity areas.**

Soil Organic Matter

The effects to soil resources affected by the alternative are the same as described in Alternative 2. Approximately 211 acres or three percent may not meet the desired condition for soil organic due to the same proposed actions and over the same percentages as described in the Alternative 2, Beaver Fire area. Soil organic matter could be removed due to displacement from mechanical equipment or could occur gradually over time due to accelerated erosion. Accelerated erosion would be expected to decrease soil organic matter where the soil stability indicator is not met as described above. Therefore, mitigations to maintain soil stability would also maintain soil organic matter.

With the application of soil stability measures described above, **it is expected Forest Plan Standard and Guideline 3-3 would be met within the proposed activity areas.**

Soil Structure

The effects to soil resources affected by the alternative are the same as described in Alternative 2. It is expected soil structure would not meet desired conditions on approximately 109 acres or two percent of the fire area.

Cumulative Effects

Past effects due to forest management and the 2014 fires have been considered and discussed in the affected environment and the effects to soil stability, surface organic matter, soil organic matter and soil structure addressed there. There are five acres not

meeting desired condition for soil stability when added to the 1,134 acres not meeting desired condition. All together there are 1,139 acres or 15 percent not meeting desired condition cumulatively for soil stability. All acres are meeting desired condition currently for surface organic matter; the project will lead to 143 acres or two percent not meeting desired condition. There is currently 573 acres not meeting desired condition for soil organic matter as a result of past action. This project will result in 211 additional acres not meeting desired condition for a total of 784 acres or ten percent. Finally, there are 269 acres not meeting desired condition when added to the 109 acres from the alternative the total acres not meeting desired condition for soil structure is 378 or three percent. Grazing is the only on-going action that could lead to cumulative effects. There are no measurable cumulative effects from grazing (as described in Alternative 1).

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

Soil Stability

The effects to soil resources affected by the alternative are the same as described in Alternative 2. An estimated 1,957 acres or seven percent of the fire project analysis area would temporarily not meet the soil stability indicator. For any tractor harvest unit that does not meet the soil cover standards in table 4-2 of the Forest Plan upon completion of treatments, areas where soil cover is deficient will be mulched so that soil cover standards are met. Therefore, as described in the Alternative 2 of the Beaver Fire area section, tractor harvest would have a shorter term effect on larger-scale runoff. A loss of soil cover on this area would likely result in rates of long term accelerated erosion similar to those modeled following the Happy Camp Fire of 18 to 109 tons per acre. Erosion could remain elevated for ten years until trees are planted, yet the success of conifers or brush vegetation could be delayed if soil productivity has declined due to soil erosion.

With the application of measures described above, it is expected the soil stability indicator desired conditions would be met and Forest Plan soil cover Standard 3-2 would be met within proposed activity areas.

Surface Organic Matter

Coarse woody debris will be retained to meet Standard and Guideline 6-16 in the Forest Plan. Standing snags in snag retention areas and Riparian Reserves may contribute to this standard. If necessary, the Forest will designate additional wood during implementation to be retained to meet this standard. A project design feature (Watershed-36) has been added to clarify this standard as discussed for the Beaver Fire area.

With the application of measures described above, **it is expected the surface organic matter indicator desired conditions would be met within proposed activity areas.**

Soil Organic Matter

The effects to soil resources affected by the alternative are the same as described in Alternative 2. Approximately 2,055 acres or seven percent may not meet the desired condition for soil organic matter due to the same proposed actions and over the same percentages as described in Alternative 2, Beaver Fire area. Soil organic matter could be removed due to displacement from mechanical equipment or could occur gradually over time due to accelerated erosion. Accelerated erosion would be expected to decrease soil organic matter where the soil stability indicator is not met as described above. Therefore, mitigations to maintain soil stability would also maintain soil organic matter. With the

application of soil stability measures described above, **it is expected Forest Plan Standard and Guideline 3-3 would be met within the proposed activity areas.**

Soil Structure

The effects to soil resources affected by the alternative are the same as described in Alternative 2. It is expected soil structure would not meet desired conditions on approximately 1,322 acres or five percent of the fire area.

Cumulative Effects

Past effects due to forest management and the 2014 fires have been considered and discussed in the affected environment and the effects to soil stability, surface organic matter, soil organic matter and soil structure addressed there. There are 633 acres not meeting desired condition for soil stability when added to the 1,957 acres not meeting desired condition. All together there are 2,590 acres or eight percent not meeting desired condition cumulatively for soil stability. All acres are meeting desired condition currently for surface organic matter; the project will lead to 438 acres or less than one percent not meeting desired condition. There are currently 642 acres not meeting desired condition for soil organic matter as a result of past action. This project will result in 2,055 additional acres not meeting desired condition for a total of 2697 acres or nine percent. Finally, there are 383 acres not meeting desired condition when added to the 1,322 acres from the alternative the total acres not meeting desired condition for soil structure is 1,705 or six percent. Grazing is the only on-going action that could lead to cumulative effects. There are no measurable cumulative effects from grazing (as described in Alternative 1).

Project Area B: Whites Fire

Direct Effects and Indirect Effects

Soil Stability

The effects to soil resources affected by the alternative are the same as described in Alternative 2. An estimated 514 acres or five percent of the fire project analysis area would temporarily not meet the soil stability indicator. For any tractor harvest unit that does not meet the soil cover standards in table 4-2 of the Forest Plan upon completion of treatments, areas where soil cover is deficient will be mulched so that soil cover standards are met. Therefore, as described in Alternative 2 for the Beaver Fire area, tractor harvest would have a shorter term effect on larger-scale runoff. A loss of soil cover on this area would likely result in rates of long term accelerated erosion similar to those modeled following the Whites Fire of between four and 16 tons per acre. Erosion could remain elevated for ten years until trees are planted, yet the success of conifers or brush vegetation could be delayed if soil productivity has declined due to soil erosion.

With the application of measures described above, it is expected the soil stability indicator desired conditions would be met and Forest Plan soil cover Standard 3-2 would be met within proposed activity areas.

Surface Organic Matter

Coarse woody debris will be retained to meet Standard and Guideline 6-16 in the Forest Plan. Standing snags in snag retention areas and Riparian Reserves may contribute to this standard. If necessary, the Forest will designate additional wood during implementation to be retained to meet this standard. A project design feature (Watershed-36) has been added to clarify this standard as discussed for the Beaver Fire area.

With the application of measures described above, **it is expected the surface organic matter indicator desired conditions would be met within proposed activity areas.**

Soil Organic Matter

The effects to soil resources affected by the alternative are the same as described in Alternative 2. Approximately 376 acres or three percent may not meet the desired condition for soil organic matter due to mechanical disturbance which could result in the displacement of soil organic matter.

With the application of soil stability measures described above, **it is expected Forest Plan Standard and Guideline 3-3 would be met within the proposed activity areas.**

Soil Structure

The effects to soil resources affected by the alternative are the same as described in Alternative 2. It is expected soil structure would not meet desired conditions on approximately 298 acres or three percent of the Whites fire area.

Cumulative Effects

Past effects due to forest management and the 2014 fires have been considered and discussed in the affected environment and the effects to soil stability, surface organic matter, soil organic matter and soil structure addressed there. There are 280 acres not meeting desired condition for soil stability when added to the 514 acres not meeting desired condition. All together there are 794 acres or seven percent not meeting desired condition cumulatively for soil stability. All acres are meeting desired condition currently for surface organic matter; the project will lead to 12 acres or less than one percent not meeting desired condition. There is currently 280 acres not meeting desired condition for soil organic matter as a result of past action. This project will result in 376 additional acres not meeting desired condition for a total of 656 acres or five percent. Finally, there are 50 acres not meeting desired condition when added to the 298 acres from the alternative the total acres not meeting desired condition for soil structure is 348 or three percent. Grazing is the only on-going action that could lead to cumulative effects. There are no measurable cumulative effects from grazing (as described in Alternative 1).

Alternative 4

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

Soil Stability

The effects to soil resources affected by the alternative are the same as described in Alternative 2. An estimated 1,366 acres or 18 percent of the fire project analysis area would temporarily not meet the soil stability indicator. For any tractor harvest unit that does not meet the soil cover standards in table 4-2 of the Forest Plan upon completion of treatments, areas where soil cover is deficient will be mulched so that soil cover standards are met. Therefore, as described in the Alternative 2 of the Beaver Fire area section, tractor harvest would have a shorter term effect on larger-scale runoff.

With the application of measures described above, it is expected the soil stability indicator desired conditions would be met and Forest Plan soil cover Standard 3-2 would be met within proposed activity areas.

Surface Organic Matter

Coarse woody debris will be retained to meet Standard and Guideline 6-16 in the Forest Plan. Standing snags in snag retention areas and Riparian Reserves may contribute to this standard. If necessary, the Forest will designate additional wood during implementation to be retained to meet this standard. A project design feature (Watershed-36) has been added to clarify this standard as discussed for the Beaver Fire area.

With the application of measures described above, **it is expected the surface organic matter indicator desired conditions would be met within proposed activity areas.**

Soil Organic Matter

The effects to soil resources affected by the alternative are the same as described in Alternative 2. Approximately 374 acres or five percent may not meet the desired condition for soil organic matter due to mechanical disturbance which could result in the displacement of soil organic matter.

With the application of soil stability measures described above, **it is expected Forest Plan Standard and Guideline 3-3 would be met within the proposed activity areas.**

Soil Structure

The effects to soil resources affected by the alternative are the same as described in Alternative 2. It is expected soil structure would not meet desired conditions on approximately 237 acres or three percent of the fire area.

Cumulative Effects

Past effects due to forest management and the 2014 fires have been considered and discussed in the affected environment and the effects to soil stability, surface organic matter, soil organic matter and soil structure addressed there. There are five acres not meeting desired condition for soil stability when added to the 1,366 acres not meeting desired condition. All together there are 1,371 acres or 18 percent not meeting desired condition cumulatively for soil stability. All acres are meeting desired condition currently for surface organic matter; the project will lead to 619 acres or nine percent not meeting desired condition. There is currently 573 acres not meeting desired condition for soil organic matter as a result of past action. This project will result in 374 additional acres not meeting desired condition for a total of 947 acres or 12 percent. Finally, there are 269 acres not meeting desired condition when added to the 237 acres from the alternative the total acres not meeting desired condition for soil structure is 506 or seven percent. Grazing is the only on-going action that could lead to cumulative effects. There are no measurable cumulative effects from grazing (as described in Alternative 1).

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

Soil Stability

The effects to soil resources affected by the alternative are the same as described in Alternative 2. An estimated 1,838 acres or six percent of the fire project analysis area would temporarily not meet the soil stability indicator. For any tractor harvest unit that does not meet the soil cover standards in table 4-2 of the Forest Plan upon completion of treatments, areas where soil cover is deficient will be mulched so that soil cover standards are met. Therefore, as described in the Alternative 2 of the Beaver Fire area section, tractor harvest would have a shorter term effect on larger-scale runoff.

With the application of measures described above, it is expected the soil stability indicator desired conditions would be met and Forest Plan soil cover Standard 3-2 would be met within proposed activity areas.

Surface Organic Matter

Coarse woody debris will be retained to meet Standard and Guideline 6-16 in the Forest Plan. Standing snags in snag retention areas and Riparian Reserves may contribute to meeting this standard. If necessary, the Forest will designate additional wood during implementation to be retained to meet this standard. A project design feature (Watershed-36) has been added to clarify this standard as discussed for the Beaver Fire area.

With the application of measures described above, **it is expected the surface organic matter indicator desired conditions would be met within proposed activity areas.**

Soil Organic Matter

The effects to soil resources affected by the alternative are the same as described in Alternative 2. Approximately 1,999 acres or seven percent may not meet the desired condition for soil organic matter due to mechanical disturbance which could result in the displacement of soil organic matter.

With the application of soil stability measures described above, **it is expected Forest Plan Standard and Guideline 3-3 would be met within the proposed activity areas.**

Soil Structure

The effects to soil resources affected by the alternative are the same as described in Alternative 2. It is expected soil structure would not meet desired conditions on approximately 1,251 acres or four percent of the fire area.

Cumulative Effects

Past effects due to forest management and the 2014 fires have been considered and discussed in the affected environment and the effects to soil stability, surface organic matter, soil organic matter and soil structure addressed there. There are 633 acres not meeting desired condition for soil stability when added to the 1,838 acres not meeting desired condition. All together there are 2,471 acres or eight percent not meeting desired condition cumulatively for soil stability. All acres are meeting desired condition currently for surface organic matter; the project will lead to 418 acres or less than one percent not meeting desired condition. There is currently 642 acres not meeting desired condition for soil organic matter as a result of past action. This project will result in 1,999 additional acres not meeting desired condition for a total of 2,641 acres or nine percent. Finally, there are 383 acres not meeting desired condition when added to the 1,251 acres from the alternative the total acres not meeting desired condition for soil structure is 1,634 or five percent. Grazing is the only on-going action that could lead to cumulative effects. There are no measurable cumulative effects from grazing (as described in Alternative 1).

Project Area B: Whites Fire

Direct Effects and Indirect Effects

Soil Stability

The effects to soil resources affected by the alternative are the same as described in Alternative 2. An estimated 520 acres or five percent of the fire project analysis area would temporarily not meet the soil stability indicator. For any tractor harvest unit that does not meet the soil cover standards in table 4-2 of the Forest Plan upon completion of

treatments, areas where soil cover is deficient will be mulched so that soil cover standards are met. Therefore, as described in the Alternative 2 of the Beaver Fire area section, tractor harvest would have a shorter term effect on larger-scale runoff.

With the application of measures described above, it is expected the soil stability indicator desired conditions would be met and Forest Plan soil cover Standard 3-2 would be met within proposed activity areas.

Surface Organic Matter

Coarse woody debris will be retained to meet Standard and Guideline 6-16 in the Forest Plan. Standing snags in snag retention areas and Riparian Reserves may contribute to meeting this standard. If necessary, the Forest will designate additional wood during implementation to be retained to meet this standard. A project design feature (Watershed-36) has been added to clarify this standard as discussed for Alternative 2, the Beaver Fire area.

With the application of measures described above, **it is expected the surface organic matter indicator desired conditions would be met within proposed activity areas.**

Soil Organic Matter

The effects to soil resources affected by the alternative are the same as described in Alternative 2. Approximately 389 acres or three percent may not meet the desired condition for soil organic matter due to the same proposed actions and over the same percentages as described in Alternative 2, Beaver Fire area. Soil organic matter could be removed due to displacement from mechanical equipment or could occur gradually over time due to accelerated erosion. Accelerated erosion would be expected to decrease soil organic matter where the soil stability indicator is not met as described above. Therefore, mitigations to maintain soil stability would also maintain soil organic matter. With the application of soil stability measures described above, **it is expected Forest Plan Standard and Guideline 3-3 would be met within the proposed activity areas.**

Soil Structure

The effects to soil resources affected by the alternative are the same as described in Alternative 2. It is expected soil structure would not meet desired conditions on approximately 305 acres or three percent of the Whites fire area.

Cumulative Effects

Past effects due to forest management and the 2014 fires have been considered and discussed in the affected environment and the effects to soil stability, surface organic matter, soil organic matter and soil structure addressed there. There are 280 acres not meeting desired condition for soil stability when added to the 520 acres not meeting desired condition. All together there are 800 acres or seven percent not meeting desired condition cumulatively for soil stability. All acres are meeting desired condition currently for surface organic matter; the project will lead to 12 acres or less than one percent not meeting desired condition. There is currently 280 acres not meeting desired condition for soil organic matter as a result of past action. This project will result in 389 additional acres not meeting desired condition for a total of 669 acres or six percent. Finally, there are 50 acres not meeting desired condition when added to the 305 acres from the alternative the total acres not meeting desired condition for soil structure is 355 or three

percent. Grazing is the only on-going action that could lead to cumulative effects. There are no measurable cumulative effects from grazing (as described in Alternative 1).

Alternative 5

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

Soil Stability

The effects to soil resources affected by the alternative are the same as described in Alternative 2. An estimated 1,406 acres or 20 percent of the fire project analysis area would temporarily not meet the soil stability indicator. For any tractor harvest unit that does not meet the soil cover standards in table 4-2 of the Forest Plan upon completion of treatments, areas where soil cover is deficient will be mulched so that soil cover standards are met. Therefore, as described in the Alternative 2 of the Beaver Fire area section, tractor harvest would have a shorter term effect on larger-scale runoff.

With the application of measures described above, it is expected the soil stability indicator desired conditions would be met and Forest Plan soil cover Standard 3-2 would be met within proposed activity areas.

Surface Organic Matter

Coarse woody debris will be retained to meet Standard and Guideline 6-16 in the Forest Plan. Standing snags in snag retention areas and Riparian Reserves may contribute to meeting this standard. If necessary, the Forest will designate additional wood during implementation to be retained to meet this standard. A project design feature (Watershed-36) has been added to clarify this standard as discussed for Alternative 2, the Beaver Fire area.

With the application of measures described above, **it is expected the surface organic matter indicator desired conditions would be met within proposed activity areas.**

Soil Organic Matter

The effects to soil resources affected by the alternative are the same as described in Alternative 2. Approximately 435 acres or six percent may not meet the desired condition for soil organic matter due to the same proposed actions and over the same percentages as described in Alternative 2, Beaver Fire area. Soil organic matter could be removed due to displacement from mechanical equipment or could occur gradually over time due to accelerated erosion. Accelerated erosion would be expected to decrease soil organic matter where the soil stability indicator is not met as described above. Therefore, mitigations to maintain soil stability would also maintain soil organic matter. With the application of soil stability measures described above, **it is expected Forest Plan Standard and Guideline 3-3 would be met within the proposed activity areas.**

Soil Structure

The effects to soil resources affected by the alternative are the same as described in Alternative 2. It is expected soil structure would not meet desired conditions on approximately 260 acres or three percent of the fire area.

Cumulative Effects

Past effects due to forest management and the 2014 fires have been considered and discussed in the affected environment and the effects to soil stability, surface organic

matter, soil organic matter and soil structure addressed there. There are five acres not meeting desired condition for soil stability when added to the 1,406 acres not meeting desired condition. All together there are 1,411 acres or 20 percent not meeting desired condition cumulatively for soil stability. All acres are meeting desired condition currently for surface organic matter; the project will lead to 673 acres or nine percent not meeting desired condition. There is currently 573 acres not meeting desired condition for soil organic matter as a result of past action. This project will result in 453 additional acres not meeting desired condition for a total of 1,026 acres or 14 percent. Finally, there are 269 acres not meeting desired condition when added to the 260 acres from the alternative the total acres not meeting desired condition for soil structure is 529 or seven percent. Grazing is the only on-going action that could lead to cumulative effects. There are no measurable cumulative effects from grazing (as described in Alternative 1).

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

Soil Stability

The effects to soil resources affected by the alternative are the same as described in Alternative 2. An estimated 1,240 acres or four percent of the fire project analysis area would temporarily not meet the soil stability indicator. For any tractor harvest unit that does not meet the soil cover standards in table 4-2 of the Forest Plan upon completion of treatments, areas where soil cover is deficient will be mulched so that soil cover standards are met. Therefore, as described in the Alternative 2 of the Beaver Fire area section, tractor harvest would have a shorter term effect on larger-scale runoff.

With the application of measures described above, it is expected the soil stability indicator desired conditions would be met and Forest Plan soil cover Standard 3-2 would be met within proposed activity areas.

Surface Organic Matter

Coarse woody debris will be retained to meet Standard and Guideline 6-16 in the Forest Plan. Standing snags in snag retention areas and Riparian Reserves may contribute to meeting this standard. If necessary, the Forest will designate additional wood during implementation to be retained to meet this standard. A project design feature (Watershed-36) has been added to clarify this standard as discussed for Alternative 2, the Beaver Fire area.

With the application of measures described above, **it is expected the surface organic matter indicator desired conditions would be met within proposed activity areas.**

Soil Organic Matter

The effects to soil resources affected by the alternative are the same as described in Alternative 2. Approximately 1,529 acres or seven percent may not meet the desired condition for soil organic matter due to the same proposed actions and over the same percentages as described in the Alternative 2, Beaver Fire area. Soil organic matter could be removed due to displacement from mechanical equipment or could occur gradually over time due to accelerated erosion. Accelerated erosion would be expected to decrease soil organic matter where the soil stability indicator is not met as described above. Therefore, mitigations to maintain soil stability would also maintain soil organic matter. With the application of soil stability measures described above, **it is expected Forest Plan Standard and Guideline 3-3 would be met within the proposed activity areas.**

Soil Structure

The effects to soil resources affected by the alternative are the same as described in Alternative 2. It is expected soil structure would not meet desired conditions on approximately 926 acres or three percent of the fire area.

Cumulative Effects

Past effects due to forest management and the 2014 fires have been considered and discussed in the affected environment and the effects to soil stability, surface organic matter, soil organic matter and soil structure addressed there. There are 633 acres not meeting desired condition for soil stability when added to the 1,240 acres not meeting desired condition. All together there are 1,873 acres or six percent not meeting desired condition cumulatively for soil stability. All acres are meeting desired condition currently for surface organic matter; the project will lead to 182 acres or less than one percent not meeting desired condition. There is currently 642 acres not meeting desired condition for soil organic matter as a result of past action. This project will result in 1,529 additional acres not meeting desired condition for a total of 2,171 acres or seven percent. Finally, there are 383 acres not meeting desired condition when added to the 926 acres from the alternative the total acres not meeting desired condition for soil structure is 1,309 or four percent. Grazing is the only on-going action that could lead to cumulative effects. There are no measurable cumulative effects from grazing (as described in Alternative 1).

Project Area B: Whites Fire

Direct Effects and Indirect Effects

Soil Stability

The effects to soil resources affected by the alternative are the same as described in Alternative 2. An estimated 464 acres or four percent of the fire project analysis area would temporarily not meet the soil stability indicator. For any tractor harvest unit that does not meet the soil cover standards in table 4-2 of the Forest Plan upon completion of treatments, areas where soil cover is deficient will be mulched so that soil cover standards are met. Therefore, as described in Alternative 2 of the Beaver Fire area section, tractor harvest would have a shorter term effect on larger-scale runoff.

With the application of measures described above, it is expected the soil stability indicator desired conditions would be met and Forest Plan soil cover Standard 3-2 would be met within proposed activity areas.

Surface Organic Matter

Coarse woody debris will be retained to meet Standard and Guideline 6-16 in the Forest Plan. Standing snags in snag retention areas and Riparian Reserves may contribute to meeting this standard. If necessary, the Forest will designate additional wood during implementation to be retained to meet this standard. A project design feature (Watershed-36) has been added to clarify this standard as discussed for Alternative 2, the Beaver Fire area.

With the application of measures described above, **it is expected the surface organic matter indicator desired conditions would be met within proposed activity areas.**

Soil Organic Matter

The effects to soil resources affected by the alternative are the same as described in Alternative 2. Approximately 326 acres or three percent may not meet the desired

condition for soil organic matter due to the same proposed actions and over the same percentages as described in Alternative 2, Beaver Fire area. Soil organic matter could be removed due to displacement from mechanical equipment or could occur gradually over time due to accelerated erosion. Accelerated erosion would be expected to decrease soil organic matter where the soil stability indicator is not met as described above. Therefore, mitigations to maintain soil stability would also maintain soil organic matter. With the application of soil stability measures described above, **it is expected Forest Plan Standard and Guideline 3-3 would be met within the proposed activity areas.**

Soil Structure

The effects to soil resources affected by the alternative are the same as described in Alternative 2. It is expected soil structure would not meet desired conditions on approximately 268 acres or three percent of the Whites fire area.

Cumulative Effects

Past effects due to forest management and the 2014 fires have been considered and discussed in the affected environment and the effects to soil stability, surface organic matter, soil organic matter and soil structure addressed there. There are 280 acres not meeting desired condition for soil stability when added to the 464 acres not meeting desired condition. All together there are 744 acres or six percent not meeting desired condition cumulatively for soil stability. All acres are meeting desired condition currently for surface organic matter; the project will lead to 12 acres or less than one percent not meeting desired condition. There is currently 280 acres not meeting desired condition for soil organic matter as a result of past action. This project will result in 326 additional acres not meeting desired condition for a total of 606 acres or five percent. Finally, there are 50 acres not meeting desired condition when added to the 301 acres from the alternative the total acres not meeting desired condition for soil structure is 351 or three percent. Grazing is the only on-going action that could lead to cumulative effects. There are no measurable cumulative effects from grazing (as described in Alternative 1).

Alternative 2 Modified

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

Soil Stability

The effects to soil resources affected by the alternative are the same as described in Alternative 2. An estimated 1,219 acres or 17 percent of the fire project analysis area would temporarily not meet the soil stability indicator. For any tractor harvest unit that does not meet the soil cover standards in table 4-2 of the Forest Plan upon completion of treatments, areas where soil cover is deficient will be mulched so that soil cover standards are met. Therefore, as described in Alternative 2 of the Beaver Fire area section, tractor harvest would have a shorter term effect on larger-scale runoff.

With the application of measures described above, it is expected the soil stability indicator desired conditions would be met and Forest Plan soil cover Standard 3-2 would be met within proposed activity areas.

Surface Organic Matter

Coarse woody debris will be retained to meet Standard and Guideline 6-16 in the Forest Plan. Standing snags in snag retention areas and Riparian Reserves may contribute to

meeting this standard. If necessary, the Forest will designate additional wood during implementation to be retained to meet this standard. A project design feature (Watershed-36) has been added to clarify this standard as discussed for Alternative 2, the Beaver Fire area.

With the application of measures described above, **it is expected the surface organic matter indicator desired conditions would be met within proposed activity areas.**

Soil Organic Matter

The effects to soil resources affected by the alternative are the same as described in Alternative 2. Approximately 247 acres or three percent may not meet the desired condition for soil organic matter due to the same proposed actions and over the same percentages as described in Alternative 2, Beaver Fire area. Soil organic matter could be removed due to displacement from mechanical equipment or could occur gradually over time due to accelerated erosion. Accelerated erosion would be expected to decrease soil organic matter where the soil stability indicator is not met as described above. Therefore, mitigations to maintain soil stability would also maintain soil organic matter. With the application of soil stability measures described above, **it is expected Forest Plan Standard and Guideline 3-3 would be met within the proposed activity areas.**

Soil Structure

The effects to soil resources affected by the alternative are the same as described in Alternative 2. It is expected soil structure would not meet desired conditions on approximately 432 acres or six percent of the fire area.

Cumulative Effects

Past effects due to forest management and the 2014 fires have been considered and discussed in the affected environment and the effects to soil stability, surface organic matter, soil organic matter and soil structure addressed there. There are five acres not meeting desired condition for soil stability when added to the 1,219 acres not meeting desired condition. All together there are 1,224 acres or 17 percent not meeting desired condition cumulatively for soil stability. All acres are meeting desired condition currently for surface organic matter; the project will lead to 413 acres or six percent not meeting desired condition. There is currently 573 acres not meeting desired condition for soil organic matter as a result of past action. This project will result in 247 additional acres not meeting desired condition for a total of 820 acres or 11 percent. Finally, there are 269 acres not meeting desired condition when added to the 163 acres from the alternative the total acres not meeting desired condition for soil structure is 432 or six percent. Grazing is the only on-going action that could lead to cumulative effects. There are no measurable cumulative effects from grazing (as described in Alternative 1).

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

Soil Stability

The effects to soil resources affected by the alternative are the same as described in Alternative 2. An estimated 2,001 acres or six percent of the fire project analysis area would temporarily not meet the soil stability indicator. For any tractor harvest unit that does not meet the soil cover standards in table 4-2 of the Forest Plan upon completion of

treatments, areas where soil cover is deficient will be mulched so that soil cover standards are met. Therefore, as described in Alternative 2 of the Beaver Fire area section, tractor harvest would have a shorter term effect on larger-scale runoff.

With the application of measures described above, it is expected the soil stability indicator desired conditions would be met and Forest Plan soil cover Standard 3-2 would be met within proposed activity areas.

Surface Organic Matter

Coarse woody debris will be retained to meet Standard and Guideline 6-16 in the Forest Plan. Standing snags in snag retention areas and Riparian Reserves may contribute to meeting this standard. If necessary, the Forest will designate additional wood during implementation to be retained to meet this standard. A project design feature (Watershed-36) has been added to clarify this standard as discussed for Alternative 2, the Beaver Fire area.

With the application of measures described above, **it is expected the surface organic matter indicator desired conditions would be met within proposed activity areas.**

Soil Organic Matter

The effects to soil resources affected by the alternative are the same as described in Alternative 2. Approximately 2,098 acres or seven percent may not meet the desired condition for soil organic matter due to the same proposed actions and over the same percentages as described in the Alternative 2, Beaver Fire area. Soil organic matter could be removed due to displacement from mechanical equipment or could occur gradually over time due to accelerated erosion. Accelerated erosion would be expected to decrease soil organic matter where the soil stability indicator is not met as described above. Therefore, mitigations to maintain soil stability would also maintain soil organic matter.

With the application of soil stability measures described above, **it is expected Forest Plan Standard and Guideline 3-3 would be met within the proposed activity areas.**

Soil Structure

The effects to soil resources affected by the alternative are the same as described in Alternative 2. It is expected soil structure would not meet desired conditions on approximately 1,337 acres or five percent of the fire area.

Cumulative Effects

Past effects due to forest management and the 2014 fires have been considered and discussed in the affected environment and the effects to soil stability, surface organic matter, soil organic matter and soil structure addressed there. There are 633 acres not meeting desired condition for soil stability when added to the 2,001 acres not meeting desired condition. All together there are 2,634 acres or nine percent not meeting desired condition cumulatively for soil stability. All acres are meeting desired condition currently for surface organic matter; the project will lead to 476 acres or less than one percent not meeting desired condition. There is currently 642 acres not meeting desired condition for soil organic matter as a result of past action. This project will result in 2,098 additional acres not meeting desired condition for a total of 2,740 acres or nine percent. Finally, there are 383 acres not meeting desired condition when added to the 1,337 acres from the alternative the total acres not meeting desired condition for soil structure is 1,720 or six

percent. Grazing is the only on-going action that could lead to cumulative effects. There are no measurable cumulative effects from grazing (as described in Alternative 1).

Project Area B: Whites Fire

Direct Effects and Indirect Effects

Soil Stability

The effects to soil resources affected by the alternative are the same as described in Alternative 2. An estimated 519 acres or five percent of the fire project analysis area would temporarily not meet the soil stability indicator. For any tractor harvest unit that does not meet the soil cover standards in table 4-2 of the Forest Plan upon completion of treatments, areas where soil cover is deficient will be mulched so that soil cover standards are met. Therefore, as described in Alternative 2 in the Beaver Fire area section, tractor harvest would have a shorter term effect on larger-scale runoff.

With the application of measures described above, it is expected the soil stability indicator desired conditions would be met and Forest Plan soil cover Standard 3-2 would be met within proposed activity areas.

Surface Organic Matter

Coarse woody debris will be retained to meet Standard and Guideline 6-16 in the Forest Plan. Standing snags in snag retention areas and Riparian Reserves may contribute to meeting this standard. If necessary, the Forest will designate additional wood during implementation to be retained to meet this standard. A project design feature (Watershed-36) has been added to clarify this standard as discussed for Alternative 2, the Beaver Fire area.

With the application of measures described above, **it is expected the surface organic matter indicator desired conditions would be met within proposed activity areas.**

Soil Organic Matter

The effects to soil resources affected by the alternative are the same as described in Alternative 2. Approximately 385 acres or three percent may not meet the desired condition for soil organic matter due to the same proposed actions and over the same percentages as described in Alternative 2, Beaver Fire area. Soil organic matter could be removed due to displacement from mechanical equipment or could occur gradually over time due to accelerated erosion. Accelerated erosion would be expected to decrease soil organic matter where the soil stability indicator is not met as described above. Therefore, mitigations to maintain soil stability would also maintain soil organic matter.

With the application of soil stability measures described above, **it is expected Forest Plan Standard and Guideline 3-3 would be met within the proposed activity areas.**

Soil Structure

The effects to soil resources affected by the alternative are the same as described in Alternative 2. It is expected soil structure would not meet desired conditions on approximately 301 acres or three percent of the fire area.

Cumulative Effects

Past effects due to forest management and the 2014 fires have been considered and discussed in the affected environment and the effects to soil stability, surface organic matter, soil organic matter and soil structure addressed there. There are 280 acres not

meeting desired condition for soil stability when added to the 519 acres not meeting desired condition. All together there are 799 acres or seven percent not meeting desired condition cumulatively for soil stability. All acres are meeting desired condition currently for surface organic matter; the project will lead to 12 acres or less than one percent not meeting desired condition. There is currently 280 acres not meeting desired condition for soil organic matter as a result of past action. This project will result in 385 additional acres not meeting desired condition for a total of 665 acres or five percent. Finally, there are 50 acres not meeting desired condition when added to the 301 acres from the alternative the total acres not meeting desired condition for soil structure is 351 or three percent. Grazing is the only on-going action that could lead to cumulative effects. There are no measurable cumulative effects from grazing (as described in Alternative 1).

Alternative 3 Modified

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

Soil Stability

An estimated 905 acres or 16 percent of the fire project analysis area would temporarily not meet the soil stability indicator. For any tractor harvest unit that does not meet the soil cover standards in table 4-2 of the Forest Plan upon completion of treatments, areas where soil cover is deficient will be mulched so that soil cover standards are met. Therefore, as described in Alternative 2 of the Beaver Fire area section, tractor harvest would have a shorter term effect on larger-scale runoff.

Compared to Alternative 2, long-term accelerated erosion is much less likely to continue downslope of treatments. This is because of the elimination of salvage harvest in the Beaver Fire area. Half of the impacts to soil stability would occur due to ground-based roadside hazard treatments, and half due to site preparation and fuels reduction activities. Ground-based roadside hazard treatments would occur on short lengths of less than 250 feet and at these shorter lengths lower rates of accelerated erosion would be expected, and further downslope transport of eroded soil is unlikely. Ground-based harvest during site preparation treatments would not use mortality guidelines and, therefore, retention of more trees would result in more potential soil cover. By design, fuels reduction treatments would be retain soil cover to meet Forest Plan standards for soil cover. Therefore, its likely soil stability desired conditions would return to acceptable levels on site preparation and fuels reduction treatments in less than five years.

With the application of measures described above, it is expected the soil stability indicator desired conditions would be met and Forest Plan soil cover Standard 3-2 would be met within proposed activity areas.

Surface Organic Matter

The surface organic matter indicator would be met or partially met on all treatment areas. Ground-based roadside hazard treatment would be expected to remove the highest amounts of surface organic matter and partially impact surface organic matter desired conditions. This would occur over on areas less than 500 feet wide, and adjacent areas would contribute large woody debris to provide nutrients and habitat for soil microorganisms.

With the application of measures described above, **it is expected the surface organic matter indicator desired conditions would be met within proposed activity areas.**

Soil Organic Matter

The effects to soil resources affected by the alternative are the same as described in Alternative 2. Approximately 333 acres or five percent may not meet the desired condition for soil organic matter due to the same proposed actions and over the same percentages as described in Alternative 2, Beaver Fire area. Soil organic matter could be removed due to displacement from mechanical equipment or could occur gradually over time due to accelerated erosion. Accelerated erosion would be expected to decrease soil organic matter where the soil stability indicator is not met as described above. Therefore, mitigations to maintain soil stability would also maintain soil organic matter. As described above, soil stability desired conditions are likely to return to acceptable levels within the short term. Therefore, although soil organic matter may be displaced due to mechanical disturbance, it is more likely to remain on site and not permanently lost due to accelerated erosion.

With the application of soil stability measures described above, **it is expected Forest Plan Standard and Guideline 3-3 would be met within the proposed activity areas.**

Soil Structure

The effects to soil resources affected by the alternative are the same as described in Alternative 2. It is expected soil structure would not meet desired conditions on approximately 123 acres or seven percent of the fire area.

Cumulative Effects

Past effects due to forest management and the 2014 fires have been considered and discussed in the affected environment and the effects to soil stability, surface organic matter, soil organic matter and soil structure addressed there. There are five acres not meeting desired condition for soil stability when added to the 905 acres not meeting desired condition. All together there are 910 acres or 16 percent not meeting desired condition cumulatively for soil stability. All acres are meeting desired condition currently for surface organic matter; the project will not contribute any acres not meeting desired condition. There is currently 573 acres not meeting desired condition for soil organic matter as a result of past action. This project will result in 333 additional acres not meeting desired condition for a total of 906 acres or 12 percent. Finally, there are 269 acres not meeting desired condition when added to the 123 acres from the alternative the total acres not meeting desired condition for soil structure is 392 or six percent. Grazing is the only on-going action that could lead to cumulative effects. There are no measurable cumulative effects from grazing (as described in Alternative 1).

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

Soil Stability

The effects to soil resources affected by the alternative are the same as described in Alternative 2. An estimated 1,565 acres or five percent of the fire project analysis area would not meet the soil stability indicator. A loss of soil cover on this area would likely result in rates of long term accelerated erosion similar to those modeled following the Happy Camp Fire of 18 to 109 tons per acre. Erosion could remain elevated for ten years

until trees are planted, yet the success of conifers or brush vegetation could be delayed if soil productivity has declined due to soil erosion.

With the application of measures described above, it is expected the soil stability indicator desired conditions would be met and Forest Plan soil cover Standard 3-2 would be met within proposed activity areas.

Surface Organic Matter

Coarse woody debris will be retained to meet Standard and Guideline 6-16 in the Forest Plan. Standing snags in snag retention areas and Riparian Reserves may contribute to meeting this standard. If necessary, the Forest will designate additional wood during implementation to be retained to meet this standard. A project design feature (Watershed-36) has been added to clarify this standard as discussed for Alternative 2, the Beaver Fire area.

With the application of measures described above, **it is expected the surface organic matter indicator desired conditions would be met within proposed activity areas.**

Soil Organic Matter

The effects to soil resources affected by the alternative are the same as described in Alternative 2. Approximately 1,675 acres or six percent may not meet the desired condition for soil organic matter due to the same proposed actions and over the same percentages as described in Alternative 2, Beaver Fire area. Soil organic matter could be removed due to displacement from mechanical equipment or could occur gradually over time due to accelerated erosion. Accelerated erosion would be expected to decrease soil organic matter where the soil stability indicator is not met as described above. Therefore, mitigations to maintain soil stability would also maintain soil organic matter. With the application of soil stability measures described above, **it is expected Forest Plan Standard and Guideline 3-3 would be met within the proposed activity areas.**

Soil Structure

The effects to soil resources affected by the alternative are the same as described in Alternative 2. It is expected soil structure would not meet desired conditions on approximately 875 acres or three percent of the fire area.

Cumulative Effects

Past effects due to forest management and the 2014 fires have been considered and discussed in the affected environment and the effects to soil stability, surface organic matter, soil organic matter and soil structure addressed there. There are 633 acres not meeting desired condition for soil stability when added to the 1,565 acres not meeting desired condition. All together there are 2,198 acres or seven percent not meeting desired condition cumulatively for soil stability. All acres are meeting desired condition currently for surface organic matter; the project will lead to 299 acres or less than one percent not meeting desired condition. There is currently 642 acres not meeting desired condition for soil organic matter as a result of past action. This project will result in 1,675 additional acres not meeting desired condition for a total of 2,317 acres or eight percent. Finally, there are 383 acres not meeting desired condition when added to the 854 acres from the alternative the total acres not meeting desired condition for soil structure is 1,237 or five percent. Grazing is the only on-going action that could lead to cumulative effects. There are no measurable cumulative effects from grazing (as described in Alternative 1).

Project Area C: Whites Fire

Direct Effects and Indirect Effects

Soil Stability

The effects to soil resources affected by the alternative are the same as described in Alternative 2. An estimated 443 acres or four percent of the fire project analysis area would temporarily not meet the soil stability indicator. For any tractor harvest unit that does not meet the soil cover standards in table 4-2 of the Forest Plan upon completion of treatments, areas where soil cover is deficient will be mulched so that soil cover standards are met. Therefore, as described in the Alternative 2 of the Beaver Fire area section, tractor harvest would have a shorter term effect on larger-scale runoff.

With the application of measures described above, it is expected the soil stability indicator desired conditions would be met and Forest Plan soil cover Standard 3-2 would be met within proposed activity areas.

Surface Organic Matter

Coarse woody debris will be retained to meet Standard and Guideline 6-16 in the Forest Plan. Standing snags in snag retention areas and Riparian Reserves may contribute to meeting this standard. If necessary, the Forest will designate additional wood during implementation to be retained to meet this standard. A project design feature (Watershed-36) has been added to clarify this standard as discussed for Alternative 2, the Beaver Fire area.

With the application of measures described above, **it is expected the surface organic matter indicator desired conditions would be met within proposed activity areas.**

Soil Organic Matter

The effects to soil resources affected by the alternative are the same as described in Alternative 2. Approximately 169 acres or one percent may not meet the desired condition for soil organic matter due to the same proposed actions and over the same percentages as described in the Alternative 2, Beaver Fire area. Soil organic matter could be removed due to displacement from mechanical equipment or could occur gradually over time due to accelerated erosion. Accelerated erosion would be expected to decrease soil organic matter where the soil stability indicator is not met as described above. Therefore, mitigations to maintain soil stability would also maintain soil organic matter.

With the application of soil stability measures described above, **it is expected Forest Plan Standard and Guideline 3-3 would be met within the proposed activity areas.**

Soil Structure

The effects to soil resources affected by the alternative are the same as described in Alternative 2. It is expected soil structure would not meet desired conditions on approximately 285 acres or less than three percent of the fire area.

Cumulative Effects

Past effects due to forest management and the 2014 fires have been considered and discussed in the affected environment and the effects to soil stability, surface organic matter, soil organic matter and soil structure addressed there. There are 280 acres not meeting desired condition for soil stability when added to the 443 acres not meeting desired condition. All together there are 723 acres or six percent not meeting desired condition cumulatively for soil stability. All acres are meeting desired condition currently

for surface organic matter; the project will lead to 12 acres or less than one percent not meeting desired condition. There is currently 280 acres not meeting desired condition for soil organic matter as a result of past action. This project will result in 169 additional acres not meeting desired condition for a total of 449 acres or two percent. Finally, there are 50 acres not meeting desired condition when added to the 285 acres from the alternative the total acres not meeting desired condition for soil structure is 335 or three percent. Grazing is the only on-going action that could lead to cumulative effects. There are no measurable cumulative effects from grazing (as described in Alternative 1).

Compliance with law, regulation, policy, and the Forest Plan

The greatest impacts to soil productivity would occur due to impacts to soil stability and soil organic matter on approximately 30 percent of ground-based harvest units and on new temporary roads and new landings associated with proposed ground-based, skyline, and helicopter harvest units. The soil stability indicator would not be met temporarily until the project design feature is implemented to meet the soil cover requirements described in Table 4-2 of Forest Plan Standard and Guideline 3-2. Standard and Guideline 3-6 would be met by following the project design feature that clarifies this standard. A forest consistency checklist has been completed that reviews the soil standards and guidelines; this is available in the project record. Standard and Guidelines 3-3 through 3-6 would be met because project activities, including effective implementation of project design features, are not expected to result in major decreases to surface organic matter and soil organic matter. Standard and Guideline 3-7 has been met by the selection of soil plots where soils were field verified. Standard and Guideline 3-1 would be met by effectively implementing project design features described in each alternative.

Geology

Methodology

Ten days of field review were completed to validate geologic and geomorphic mapping. Unstable lands are designated as Riparian Reserves in the Forest Plan (Standard and Guideline MA 10-2, pg. 4-108). The unstable lands component of Riparian Reserves includes active landslides, inner gorges, toe zones of dormant landslides and severely weathered and dissected granitic lands. List of actions considered for cumulative effects in Appendix C (map project record). This analysis assumes that if less than one percent of the 7th field watershed is in the project boundary there will be no effect to landslide risk. So only the sixty-seven watersheds with greater than one percent of their area in the project boundary are analyzed (see Appendix B of the Geology resource report for list of watersheds analyzed).

The cumulative watershed effects GEO model is used to estimate the landslide potential. The geology analysis only uses the cumulative watershed effects model for Alternative 2 in the landslide risk assessment (Geology report page 8). The differences between alternatives are less than 0.05. This is not enough to change the landslide risk for any 7th field watershed in the analysis area. The risk ratios are for Alternatives 2, 3, 4, 5, Alternative 2 Modified and Alternative 3 Modified are not enough to change the risk ratios for any watershed (See Appendix A of the Hydrology report for model results for all alternatives).

The acres of salvage harvest on unstable lands for Alternatives 2, 3, 4, 5, Alternative 2 Modified and Alternative 3 Modified excludes stream course Riparian Reserves and inner gorges and areas where RAVG predicted less than 50 percent basal area loss. The acres of unstable lands for other treatments for all action alternatives were calculated excluded stream course Riparian Reserves and inner gorges as mapped in the corporate GIS layer

because only hand treatments of the understory are proposed in these landforms. There were exemptions made for the prohibition of salvage harvest on active landslides and toe zones of dormant landslides per field work (See project design feature Table in Chapter 2 of the final EIS). The treatments on unstable lands in discussion below include steep, weathered granitic lands, active landslides and toe zones of dormant landslides.

The detailed methods are in the methods section of the Geology report and amendment.

Unstable Lands

The model uses mapping of the geomorphology, past and present disturbances, and coefficients developed using research on the effects of the 1964 flood event on landslide rates. The output from the model is volume of sediment delivered to the mouth of the 7th field watershed during a 10-year storm event (cubic yards per decade). The volumes are converted into a risk ratio to estimate landslide potential across the Forest and among project alternatives. A threshold of concern for the risk ratio is 1.0. This is not the point at which significant effects occur but a yellow flag indicating that additional impacts need to be considered closely for resource degradation and impacts to beneficial uses of water. Mitigations to prevent unacceptable negative impacts will be considered for watersheds with proposed activities that are over the threshold of concern. A more detailed description of the cumulative watershed effects modeling process is available in a Forest-wide document *Cumulative Watershed Effects: The Abridged Version* (Bell, 2012).

The indicator used in this analysis for effects on unstable lands is landslide risk. Risk is the intersection between the potential of landsliding and the consequence of landsliding. Landslide potential is estimated from the GEO model risk ratio. Consequences analyzed include: 1) impacts to human health and safety; 2) impacts to infrastructure; and 3) impacts to natural resources. Landslide risk ranges from very high, which indicates an immediate need for mitigation of the risk, to very low, which indicates a nuisance disruption. This assessment used soil burn severity (Geology report page 9) which was finalized by the burned area emergency response team for each fire. The soil burn severity model represents the change in ground surface characteristics which is used to estimate hydrologic and erosive response of the watersheds (Parsons et al 2010). The long-term elevated risk of landslide in a 7th field watershed is related to tree root support. Areas with compromised root support (due to fire or forest management) have about 6.5 times higher landslide rate than areas with intact roots (Amarathus et al. 1985).

The duration of elevated risk used rapid assessment of vegetation condition (RAVG) to estimate where the percent of trees killed by fire is enough to compromise root support. After trees die the root support begins to decline immediately and provide almost no support after about a decade. Duration of elevated risk is analyzed using the state of vegetation in a 7th field watershed. The measure of duration of elevated risk is the percent of the watershed with moderate or high severity wildfire left to naturally regenerate (or left unplanted). So, if a 7th field watershed has more than 25 percent of the area burned at high and moderate vegetation severity and is planted the duration of elevated risk is reduced to about 30 years. If less than 25 percent of the high and moderate severity areas are planted the duration of elevated risk will be greater than 80 years. The exception is if a watershed has less than 10 percent high and moderate vegetation burn severity overall, then the landslide rate at the watershed scale will be recovered within two to five years.

The watersheds with very high landslide risk means that should a landslide event occur it could potentially put human safety and private property at risk. Watersheds with high landslide risk could have landslide events that affect essential infrastructure (power lines, municipal water supplies, major roadways, etc.). These situations call for immediate mitigation of the landslide risk where possible. The best mitigation for wildfire effects to landslide processes on this scale is reforestation.

The long-term effects to landslide processes are related to the large-scale loss of forest vegetation due to the wildfire event. In the Klamath Mountains, areas that have been deforested have about a 6.5 times higher landslide rate than areas with intact forest vegetation (Amarathus et al 1985). The roots of forest vegetation, especially trees, help stabilize slopes by providing additional strength to the soil (Ziemer 1981; Ziemer and Swanston 1977; Ammann et al. 2009). Once trees are killed, even their largest roots start to decay and lose strength within a decade (Ziemer and Swanston 1977). In the Klamath Mountains, about half of reinforcement from tree roots is lost within two to three years of death and nearly three-fourths of the strength is gone within eight years (Ziemer 1981). Brendt and Gibbon (1958) found that conifers with about a five inches diameter at breast height have roots about five feet deep and up to 20 feet lateral spread. With those dimensions in mind, 10 inch diameter at breast height trees will likely have roots with a lateral spread of at least 20 feet, which will provide nearly full-root coverage even if the trees are 40 feet apart. Finally, Reid and Page (2002) found that about 25 percent of the watershed must be reforested in order to see a 40 percent reduction in the landslide sediment rate. This supports the assumption that the landslide rate will be reduced, and thus the landslide risk, if 25 percent of the areas deforested by the wildfire are replanted.

The spatial scale for the landslide risk and cumulative effects analysis is the 7th field watershed because the models used for analysis are calibrated at the 7th field scale. The temporal scale is from the present to 10 years for short-term and 10 to 50 years for long-term. Elevated landslide rates due to forest management in Northern California have been shown to begin to decrease around 7 to 12 years after a disturbance and recover in about 50 years (Ziemer 1981).

Effects to Unique Geologic Areas

There are no treatments proposed within the boundary of the Marble Caves RNA. There is roadside treatment and underburning within the North Russian Landslide Dam Special Interest Area but no treatments on the landslide for which the special interest area was designated. There will be no effect to the character of the Geologic Research Natural Areas or the Geologic Special Interest Areas, so it is not discussed in any additional detail.

Likelihood of Effects to Cave Resources

The areas where limestone or marble bedrock overlapped with salvage, mechanical site preparation or hazard tree removal were field reviewed and assessed for the potential for cave resources to be present and the likelihood that should any caves occur in the area they would meet the requirements for significant caves.

The spatial scale for the analysis is the project boundary. Caves are non-renewable resources so once it is effected it will not recovery to pre-impact condition.

Likelihood of Effects to Groundwater Resources

Most of the vegetation being removed by the Westside Fire Recovery project is dead or dying. These trees are not using any groundwater. There is no likely to be any effect to groundwater resources from the project and it is not analyzed any further in this report.

Likelihood of Effect to Rock Material Sources

There is no proposal to use or develop rock sources in the Westside Fire Recovery project. There will be no effect to rock material sources and it will not be discussed further in the analysis.

Disturbance of Naturally Occurring Asbestos

There is one regulation that is applicable to the project regarding naturally occurring asbestos. This is the Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations (Section 93105) (http://www.arb.ca.gov/toxics/atcm/asb2atcm.htm). Timber harvest activities are explicitly exempt from this regulation (Section 3) except for new road construction. There is no new road construction in this project as defined in the regulation. This project does propose temporary access road construction to allow for timber harvest, but these roads will be used to allow for temporary access to the units for harvest activities and closed after the project is complete. Their use will be temporary (less than one to two months) and they will never be open to public use. There are no regulations on Naturally Occurring Asbestos for this project. Disturbance of ultramafic rock (proxy for naturally occurring asbestos) will be analyzed per public comment.

The acres and length of temporary access roads proposed on ultramafic rock will be reported for each alternative by fire area environmental consequences section. The temporal boundary for the effects is during the ground disturbance plus about 10 minutes for the dust to settle. The spatial boundary for the effects is the road bed plus 100 feet on either side because that is all the further the asbestiform mineral dust is likely to travel.

Affected Environment

Of the sixty-seven 7th field watersheds analyzed for this project, three currently have a very high landslide risk. These are Rancheria Creek, Walker Creek and Lower Grider Creek. The likelihood that a landslide event will occur in Lower Grider and Walker Creek is almost certain and highly likely in Rancheria Creek. These three watersheds have a catastrophic consequence if a landslide (specifically a debris flow) occurs due to the proximity to the creek of private property with residential structures. There are twenty watersheds with a high landslide risk mainly due to the susceptibility of municipal water supplies, fish habitat and access to landslide events. Thirty of the watersheds analyzed have a moderate landslide risk and twelve have a low landslide risk.

There are thirty-eight 7th field watersheds that have more than 10 percent high or moderate vegetation burn severity. These watersheds will have an elevated landslide risk of greater than 80 years. These include Rancheria Creek, Lower Grider Creek, and Walker Creek which have very high landslide risks and 13 of the watersheds with high landslide risks. The other 27 watersheds are assumed to have acute elevated landslide risk that will last about 2 to 5 years. Maps of the geomorphology and bedrock are in the Geology resource report on the project website. A list of projects that were included in the affected environment analysis for each fire area are in the Geology amendment on the project website, below is a summary of affected environment broken down by fire area.

During the week of July 6, 2015 there were rain events that, along with the fire effects, produced debris flow events and sediment laden flows in Fish Gulch, Music Creek, Grider Creek, and Walker Creek. Field observations indicate that the sediment laden flows were a result of the mobilization of the bulked sediment in the channel. The loss of tree canopy interception and water repelling (hydrophobic) soils lead to an increase in water delivered to the channel. This in combination with the increase in sediment in the channel from fire related soil erosion is the primary drivers of the debris flow event. In other words, the fire effects lead to more water and sediment in the stream channels than under pre-fire conditions. There is no evidence of landsliding (debris slide or translational/rotational landslides) associated with this event.

Project Area A: Beaver Fire

The Beaver portion of the project area is mainly underlain by Condrey Mountain Schist bedrock. The schist contains graphite (which is commonly used as a lubricant) which makes the area susceptible to large scale deep-seated landslides. The large dormant landslide deposits in the Beaver fire area are due to a combination of the graphitic schist and past climatic and seismic activity (more than 1,000 years ago). There are small portions of dormant landslide deposits that have experienced active landsliding in recent history (less than 100 years).

Project Area B: Happy Camp Complex

The Happy Camp portion of the project area has three distinct geologic types. The Elk Creek area is primarily metasedimentary and metavolcanic bedrock. These areas have few landslides and the primary landslide mechanism is debris flow of sediment stored in the stream channels. There are areas of ultramafic rock that have small dormant landslides but few have active landslides within them. The Grider/Walker Creek area is underlain by highly weathered and dissected granitic lands. The watersheds are susceptible to shallow landsliding such as debris slides and debris flows. The Tompkins Creek area is underlain by a mosaic of bedrocks including ultramafic, granitic and metasedimentary bedrock. The actual landslide rate is low with only a handful of active landslides in the area.

Project Area C: Whites Fire

The Whites portion of the project area is mainly underlain by metasedimentary and metavolcanic bedrock. These rocks are ancient ocean floor and tend to be fairly stable (low landslide potential). The headwaters of Music Creek and Taylor Creek are underlain by granitic bedrock which has been highly weathered. This led to the development of highly weathered and dissected granitic lands, susceptible to shallow landsliding such as debris slides and debris flows.

Environmental Consequences

Alternative 1

Direct Effects and Indirect Effects

There are no direct effects to landslide risk under this alternative. The area will recover naturally including the re-establishment of vegetation and ground-cover, increasing root support and intercepting precipitation which reduces landslide risk and potential.

However, prolonged hardwood and brush dominated occupancy will not provide the root support to maintain stable slopes (Jackson and Roering 2009). The landslide risk will remain the same as current conditions for about 10 to 12 years (Zeimer 1981) and slowly begin to reduce as conifer forest begins to be established. The project area may take up to 80 years to recover to a pre-fire landslide risk level. It could take longer in areas where seed sources have been eliminated due to large pockets of high and moderate severity vegetation burn such as Walker, Grider and O'Neil Creek.

Project Area A: Beaver Fire

The effects of taking no action for the Beaver Fire area are the same as for the other fire areas as described in the environmental consequences section of the Geology Resource report.

Project Area B: Happy Camp Complex

The effects of taking no action for the Happy Camp Fire area are the same as for the other fire areas as described in the Geology Resource report.

Project Area C: Whites Fire

The effects of taking no action for the Whites Fire area are the same as for the other fire areas as described in the Geology Resource report.

Cumulative Effects

The projects added to the effects of the past actions (the affected environment) and the direct and indirect effects of the project are portions of the Jess project, Scott Bar Underburn, Lovers Canyon, McCollins and Sawyers Bar Fuels Reduction Project that are in the 7th field watersheds analyzed. The Jess project and Lovers Canyon project are the only two future projects that have any effect on the risk ratio or percent watershed with high or moderate disturbance. Jess project increases the risk ratio for 0.01 and 0.07 for the Eddy Gulch and Jessups Gulch respectively. The Jess project increases the percent of the watershed with high and moderate disturbance by 1.5 percent for both watersheds. Lovers Canyon increases the risk ratios for South Fork Kelsey and Middle Creek by 0.03 and 0.02 respectively, and the percent disturbed is increased by 3.3 percent for both watersheds. The landslide risks are not increased by the addition of the effects of these projects. None of the projects affect the duration of elevated risk in the watersheds.

Project Area A: Beaver Fire

The only project analyzed as a future or on-going project is the McCollins project for the Beaver Fire area. There are no additional cumulative effects to the landslide risk or duration of elevated risk for the Beaver Fire Area.

Project Area B: Happy Camp Complex

Lovers Canyon project and the Scott Bar Fuels Reduction project are the only projects considered as on-going or future projects for this analysis. The Scott Bar Fuels Reduction has no effect on landslide risk. Lovers Canyon increases the risk ratios for South Fork Kelsey and Middle Creek by 0.03 and 0.02 respectively and the percent disturbed is increased by 3.3 percent for both watersheds. This change is not enough to increase the landslide risk in any of the 7th field watersheds. Neither of these projects have an effect on the duration of elevated risk.

Project Area C: Whites Fire

The Jess project and Sawyers Bar Fuels Reduction project are the only projects considered as on-going or future projects for this analysis. The Sawyers Bar Fuels Reduction project has no effect on landslide risk. Jess project increases the risk ratio for 0.01 and 0.07 for the Eddy Gulch and Jessups Gulch respectively. The Jess project increases the percent of the watershed with high and moderate disturbance by 1.5 percent for both watersheds. This change is not enough to increase the landslide risk in any of the 7th field watersheds. Neither of these projects have an effect on the duration of elevated risk.

Alternative 2

Direct Effects and Indirect Effects

There are about 2,500 acres of salvage harvest proposed on unstable lands as defined by the Forest Plan and considered to be Riparian Reserves. There is about 1,275 acres of roadside hazard tree removal on unstable lands. Fuels treatments will occur on about 385 acres of unstable lands and site preparation and planting on about 400 acres. Some of these treatments on unstable lands overlap the total footprint of treatment on unstable lands for this alternative are about 4,207 acres.

The changes between the draft EIS and the final EIS are not enough to change the landslide risk for any of the watersheds (Table 4 of the Geology Amendment). The analysis using the correctly classified RAVG changed Deep Creek and Rainy Valley Creek from a duration of greater than 80 years to 2-5 years. The new analysis shows that Tompkins Creek, Upper East Fork Elk and Lower East Fork Elk now have a 30 year duration of elevate risk, where it was greater than 80 years in the Geology report (Table 6 of the Geology Amendment).

There are three temporary access road are proposed that will likely be built directly on ultramafic bedrock. These are new temporary access road 10 (accesses unit 22), temporary access road 18 (accesses unit 510) and temporary access road 26 (accesses unit 525). Temporary access road 10 will be on about 0.09 miles or about 0.5 acres of ultramafic bedrock and is more than 0.5 miles from any sensitive receptors. Temporary access road 18 will be on about 0.06 miles or 0.3 acres of ultramafic bedrock and is about 2.5 miles from any sensitive receptors. Temporary access road 26 will be on about 0.2 miles or 0.8 acres of ultramafic bedrock and is about 4.5 miles from sensitive receptors.

Project Area A: Beaver Fire

There are about three acres of salvage harvest proposed on unstable lands as defined by the Forest Plan and considered to be Riparian Reserves. There is about 60 acres of roadside hazard tree removal on unstable lands. Fuels treatments will occur on about 60 acres of unstable lands and site preparation and planting on about 10 acres. Some of these treatments on unstable lands overlap the total footprint of treatment on unstable lands for this alternative are about 75 acres.

Alternative 2 does not change the landslide risk for any watershed in the Beaver Fire area. There is a change in the risk ratio or the percent of watersheds with high or moderate disturbance for five watersheds due to treatments. The average change in risk

ratio is 0.03 and the maximum change was 0.04. All four watersheds with a change in percent high and moderate disturbance have a change of 0.1 percent.

None of the watersheds in the Beaver Fire area have more than 75 percent of the high and moderate vegetation burn severity replanted. The expected duration of elevated risk for watersheds in the fire area with more than 10 percent of the area affected by high and moderate vegetation fire severity is greater than 80 years. This includes all of the watersheds with high landslide risk in the project area (Table 5 of the Geology Amendment). If less than 10 percent of the watershed was burned with high or moderate vegetation burn severity the elevated risk is assumed to be acute and will recover in 2 to5 years (Table 6 of the Geology Amendment).

There are two primary effects of reopening of decommissioned roads, use of temporary roads on existing roadbeds, construction of new temporary roads and the construction of new landings. The first is changes to the hillslope mass balance such as undercutting and increasing the weight in unstable areas (spoil piles) from earthwork. There are no new temporary roads or landings being constructed on toe zones of dormant landslides, active landslides or inner gorges. The slope stability in these areas is the most susceptible to the change in mass balance. Project design feature Watershed-20 restricts excess material from temporary roads, landings and other actions from being stored on active landslides. This minimizes the potential for landslide re-activation due to increased weight. The second is poor drainage on the roads and landings which concentrates water onto the hillslope which can exacerbate existing unstable lands or create new landslides. The cessation of the use of temporary roads per the Wet Weather Operations (Project Design Feature Watershed-1) will minimize any rutting or tire tracks that can concentrate water on the road and hillslope. Project design feature Watershed-22 requires the hydrologic stabilization of all temporary roads which includes control of the drainage on the roadbed. Project design feature Watershed-23 requires new landings to be configured for long-term drainage with the intention to establish natural runoff patterns. The landslide risk will remain above pre-project through the first winter after stabilization. Then they will be back to pre-project levels or below in areas were legacy sites are being addressed on temporary road access. The increase will be the most during implementation of the project and will be reduced after the hydrologic stabilization has occurred at the completion of the project.

There is not likely to be an effect to cave resources protected under the Federal Cave Resource Protection Act. There are no temporary access roads proposed directly on ultramafic rock.

Project Area B: Happy Camp Complex

There are about 2,450 acres of salvage harvest proposed on unstable lands as defined by the Forest Plan and considered to be Riparian Reserves. There is about 1,205 acres of roadside hazard tree removal on unstable lands. Fuels treatments will occur on about 310 acres of unstable lands and site preparation and planting on about 375 acres. Some of these treatments on unstable lands overlap the total footprint of treatment on unstable lands for this alternative are about 4,108 acres.

Alternative 2 does not change the landslide risk for any watershed in the Happy Camp Fire area. There is a change in the risk ratio or the percent watershed high or moderate disturbance for twenty-one watersheds. The average change in risk ratio is 0.03 and the

maximum change was 0.10. The average change in percent watershed with high and moderate disturbance is 0.26 percent and the maximum change is 0.9 percent (Table 5 of the Geology Amendment). The site scale effects of salvage and reforestation on active landslides and toe zones of dormant landslides is the same as for the Beaver fire area.

There are two watersheds with a very high landslide risk that will have a reduced duration of elevated risk. Watersheds with a very high landslide risk have a high potential of landsliding that may affect human life and safety. These watersheds are Lower Grider and Walker Creek. There are four watersheds with a high landslide risk that will have a reduced duration of elevated risk for Alternative 2. These watersheds have a reasonable probability of landsliding that may affect essential infrastructure and safety. They are Upper Grider, Cliff Valley, O'Neil, and Caroline Creeks. There are also six watersheds that have a moderate landslide risk that will have a reduced duration of elevate risk (Table 3-57). In this alternative, these twelve watersheds will have this elevated risk for about 30 years, as opposed to greater than 80 years under the no action alternative. All watersheds that have more than 10 percent high and moderate vegetation fire severity will have a duration of elevated risk of greater than 80 years. If less than 10 percent of the watershed was burned with high or moderate vegetation burn severity the elevated risk is assumed to be acute and will recover in 2 to5 years (Table 6 of the Geology Amendment).

There is one salvage unit underlain by limestone or marble (unit 228). This body was field reviewed for cave potential. No caves were found during field review. However should a cave be present it is not likely to meet the significance criteria outlined by the Federal Cave Resources Protection Act. There is not likely to be an effect to cave resources protected under the Federal Cave Resource Protection Act.

There are three temporary access road are proposed that will likely be built directly on ultramafic bedrock. The areas disturbed are all less than one acre. Dust mitigation is a requirement for all access in the project area (temporary or existing). The temporary access lengths are short so speeds will remain low (less than 15 miles per hour). The dust mitigation combined with the slow speeds means that the potential for naturally occurring asbestos to leave the project area is very low. Equipment is being washed before moving to new areas per the botany project design features intended to reduce weed spread and there are mitigations in place to minimize track out onto paved roads. Despite being exempt from the regulation the project will likely meet the requirements for construction in areas less than one acre.

Project Area C: Whites Fire

There are less than 0.1acres of salvage harvest proposed on unstable lands as defined by the Forest Plan and considered to be Riparian Reserves. There is about 10 acres of roadside hazard tree removal on unstable lands. Fuels treatments will occur on about 20 acres of unstable lands and site preparation and planting on about 10 acres. Some of these treatments on unstable lands overlap the total footprint of treatment on unstable lands for this alternative are about 23 acres.

Alternative 2 does not change the landslide risk for any watershed in the Whites Fire area (modified Table 4 of the Geology Amendment). There is no change in risk ratio and an average change in percent watershed with high and moderate disturbance is 0.15 percent and the maximum change is 0.2 percent. The effect of landslide risk at the site scale is the

same as for the Beaver Fire area. The site scale effects of salvage and reforestation on active landslides and toe zones of dormant landslides is the same as for the Beaver fire area.

None of the watersheds in the Whites Fire area have more than 75 percent of the high and moderate vegetation burn severity replanted. The expected duration of elevated risk for watersheds in the fire area with more than 10 percent of the area affected by high and moderate vegetation fire severity is greater than 80 years (modified Table 7 of the Geology Amendment). If less than 10 percent of the watershed was burned with high or moderate vegetation burn severity the elevated risk is assumed to be acute and will recover in 2 to 5 years (Table 6 of the Geology Amendment).

There is no limestone or marble bedrock in the White Fire area so there is not likely to be an effect to cave resources protected under the Federal Cave Resource Protection Act.

There are no temporary access roads proposed directly on ultramafic rock.

Cumulative Effects

The projects added to the effects of the past actions (the affected environment) and the direct and indirect effects of the alternative are portions of the Jess project, Salmon Reforestation, Scott Bar Underburn, Lovers Canyon, McCollins and Sawyers Bar Fuels Reduction Project that are in the 7th field watersheds analyzed. The Jess project and Lovers Canyon project are the only two future projects that have any effect on the risk ratio or percent watershed with high or moderate disturbance. Jess project increases the risk ratio for 0.01 and 0.07 for the Eddy Gulch and Jessups Gulch respectively. The Jess project increases the percent of the watershed with high and moderate disturbance by 1.5 percent for both watersheds. Lovers Canyon increases the risk ratios for South Fork Kelsey and Middle Creek by 0.03 and 0.02 respectively and the percent disturbed is increased by 3.3 percent for both watersheds. The landslide risks are not increased for any 7th field watershed by the addition of the effects of these projects. None of the projects affect the duration of elevated risk in the watersheds.

Project Area A: Beaver Fire

The only project analyzed as a future or on-going project is the McCollins project for the Beaver Fire area. There are no additional cumulative effects to the landslide risk or duration of elevated risk for the Beaver Fire Area with the addition of the effects of the McCollins project.

Project Area B: Happy Camp Complex

Lovers Canyon project and the Scott Bar Fuels Reduction project are the only projects considered as on-going or future projects for this analysis. Other projects were analyzed in the affected environment (see Geology Resource Report). The Scott Bar Fuels Reduction has no effect on landslide risk. Lovers Canyon increases the risk ratios for South Fork Kelsey and Middle Creek by 0.03 and 0.02 respectively (modified Table 3 in the Geology amendment) and the percent disturbed is increased by 3.3 percent for both watersheds (modified Table 4 in the Geology amendment). The landslide risks are not increased for any 7th field watershed by the addition of the effects of these projects. None of the projects effect the duration of elevated risk in the watersheds.

Project Area C: Whites Fire

Jess project increases the risk ratio for 0.01 and 0.07 for the Eddy Gulch and Jessups Gulch respectively (modified Table 3 in the Geology Amendment). The Jess project increases the percent of the watershed with high and moderate disturbance by 1.5 percent for both watersheds (modified Table 4 in the Geology Amendment). The landslide risks are not increased for any 7th field watershed by the addition of the effects of these projects. None of the projects effect the duration of elevated risk in the watersheds.

Alternative 3

Direct Effects and Indirect Effects

There are about 2,280 acres of salvage harvest proposed on unstable lands as defined by the Forest Plan and considered to be Riparian Reserves. There is about 1,275 acres of roadside hazard tree removal on unstable lands. Fuels treatments will occur on about 385 acres of unstable lands and site preparation and planting on about 400 acres. Some of these treatments on unstable lands overlap the total footprint of treatment on unstable lands for this alternative are about 3,927 acres.

The changes between the draft EIS and the final EIS are not enough to change the landslide risk for any of the watersheds. The analysis using the reclassified RAVG changed Deep Creek and Rainy Valley Creek from a duration of elevated risk of greater than eight years to two to five years. The new analysis shows that Tompkins Creek, Horse Creek, Upper East Fork Elk Creek and Lower East Fork Elk Creek now have a 30 year duration of elevated risk, where it was greater than 80 years in the Geology report. Lower Grider Creek went from greater than 80 year duration of elevated risk in the Geology report to a 30 year duration.

The temporary access roads directly on ultramafic rock are the same as for Alternative 2.

Project Area A: Beaver Fire

There are no acres of salvage harvest proposed on unstable lands as defined by the Forest Plan and considered to be Riparian Reserves. There is about 60 acres of roadside hazard tree removal on unstable lands. Fuels treatments will occur on about 60 acres of unstable lands and site preparation and planting on about 10 acres. Some of these treatments on unstable lands overlap the total footprint of treatment on unstable lands for this alternative are about 73 acres.

The indirect effects to the landslide risk and duration of elevated risk are the same as for Alternative 2. The effects to landslide risk at the site scale are the same as for Alternative 2. The likelihood of effects to cave resources protected under the Federal Cave Resources Protection Act is the same as for Alternative 2. There are no temporary access roads proposed directly on ultramafic rock.

Project Area B: Happy Camp Complex

There are about 2,280 acres of salvage harvest proposed on unstable lands as defined by the Forest Plan and considered to be Riparian Reserves. There is about 1,205 acres of roadside hazard tree removal on unstable lands. Fuels treatments will occur on about 310 acres of unstable lands and site preparation and planting on about 375 acres. Some of these treatments on unstable lands overlap the total footprint of treatment on unstable lands for this alternative are about 3,831 acres. The indirect effects to the landslide risk for the watershed and site scales are the same as for Alternative 2. The duration of

elevated risk will not be reduced in Lower Grider Creek, because the percent of the 7th fields planted drops below 25 percent. All other duration of elevated risks will remain the same as Alternative 2. The effects to landslide risk at the site scale are the same as for Alternative 2. The likelihood of effects to cave resources protected under the Federal Cave Resources Protection Act is the same as for Alternative 2. The temporary access roads on ultramafic rock are the same as for Alternative 2.

Project Area C: Whites Fire

There are less than 0.1 acres of salvage harvest proposed on unstable lands as defined by the Forest Plan and considered to be Riparian Reserves. There is about 10 acres of roadside hazard tree removal on unstable lands. Fuels treatments will occur on about 20 acres of unstable lands and site preparation and planting on about 10 acres. Some of these treatments on unstable lands overlap the total footprint of treatment on unstable lands for this alternative are about 23 acres.

The indirect effects to the landslide risk at the watershed and site scale and duration of elevated risk are the same as for Alternative 2 (Table 5 and Table 6 of the Geology Amendment). The effects to landslide risk at the site scale are the same as for Alternative 2.

The likelihood of effects to cave resources protected under the Federal Cave Resources Protection Act is the same as for Alternative 2. There are no temporary access roads proposed directly on ultramafic rock.

Cumulative Effects for All Fire Areas

The cumulative effects are the same as for Alternative 2.

Alternative 4

Direct Effects and Indirect Effects

There are about 2,360 acres of salvage harvest proposed on unstable lands as defined by the Forest Plan and considered to be Riparian Reserves. There is about 1,260 acres of roadside hazard tree removal on unstable lands. Fuels treatments will occur on about 385 acres of unstable lands and site preparation and planting on about 400 acres. Some of these treatments on unstable lands overlap the total footprint of treatment on unstable lands for this alternative are about 4,067 acres. The original analysis was not clear on the change in effects due to modifications to temporary road access for Alternative 4. There is no temporary road access (new temporary roads, temporary roads in existing roadbeds or re-opening of decommissioned roads) with stream crossings in this alternative. This reduces the site scale effects on debris flow volume described in the effects analysis of Alternative 2. Since temporary road crossings are not proposed for this alternative, there will be no additional volume contributed to debris flows (should they occur) from temporary road crossings. There will be some temporary road access using ridgetop roads and spurs. The probability of these roads contributing to the likelihood of landsliding is negligible.

The changes between the draft EIS and the final EIS are not enough to change the landslide risk for any of the watersheds (Table 5 of the Geology Amendment). The analysis using the reclassified RAVG changed Deep Creek and Rainy Valley Creek from a duration of elevated risk of greater than eight years to two to five years. The new

analysis shows that Cliff Valley Creek, Tompkins Creek, Horse Creek, Upper East Fork Elk Creek and Lower East Fork Elk Creek now have a 30 year duration of elevated risk, where it was greater than 80 years in the Geology report. Upper Elk Creek went from greater than 80 year duration of elevated risk in the Geology report to a 30 year duration (Table 6 of the Geology Amendment).

The temporary access roads directly on ultramafic rock are the same as for Alternative 2.

Project Area A: Beaver Fire

There are about three acres of salvage harvest proposed on unstable lands as defined by the Forest Plan and considered to be Riparian Reserves. There is about 55 acres of roadside hazard tree removal on unstable lands. Fuels treatments will occur on about 60 acres of unstable lands and site preparation and planting on about 10 acres. Some of these treatments on unstable lands overlap the total footprint of treatment on unstable lands for this alternative are about 71 acres. The indirect effects to landslide risk at the watershed and site scale and duration of elevated risk are the same as for Alternative 2.

The likelihood of effects to cave resources protected under the Federal Cave Resources Protection Act is the same as for Alternative 2. There are no temporary access roads proposed directly on ultramafic rock.

Project Area B: Happy Camp Complex

There are about 2,360 acres of salvage harvest proposed on unstable lands as defined by the Forest Plan and considered to be Riparian Reserves. There is about 1,200 acres of roadside hazard tree removal on unstable lands. Fuels treatments will occur on about 375 acres of unstable lands and site preparation and planting on about 310 acres. Some of these treatments on unstable lands overlap the total footprint of treatment on unstable lands for this alternative are about 3,972 acres. The indirect effects to landslide risk are the same as for Alternative 2. There are nine 7th field watersheds that have a reduction in the duration of elevated risk (modified Table 6 of the Geology Amendment). Upper Grider, Lower Grider, and Upper Elk Creeks will have an elevated risk for more than 80 years under this alternative compared to 30 years in Alternative 2. All other watersheds have a duration of elevated risk that is the same as Alternative 2. The effects to landslide risk at the site scale are the same as for Alternative 2.

The likelihood of effects to cave resources protected under the Federal Cave Resources Protection Act is the same as for Alternative 2. The temporary access roads on ultramafic rock are the same as for Alternative 2.

Project Area C: Whites Fire

There are less than 0.1 acres of salvage harvest proposed on unstable lands as defined by the Forest Plan and considered to be Riparian Reserves. There is about 10 acres of roadside hazard tree removal on unstable lands. Fuels treatments will occur on about 20 acres of unstable lands and site preparation and planting on about 10 acres. Some of these treatments on unstable lands overlap the total footprint of treatment on unstable lands for this alternative are about 23 acres. The indirect effects to landslide risk and duration of elevated risk are the same as for Alternative 2. The effects to landslide risk at the site scale are the same as for Alternative 2.

The likelihood of effects to cave resources protected under the Federal Cave Resources Protection Act is the same as for Alternative 2. There are no temporary access roads proposed directly on ultramafic rock.

Cumulative Effects for All Fire Areas

The cumulative effects are the same as for Alternative 2.

Alternative 5

Direct Effects and Indirect Effects

There are about 285 acres of salvage harvest proposed on unstable lands as defined by the Forest Plan and considered to be Riparian Reserves. There is about 1,275 acres of roadside hazard tree removal on unstable lands. Fuels treatments will occur on about 385 acres of unstable lands and site preparation and planting on about 40 acres. Some of these treatments on unstable lands overlap the total footprint of treatment on unstable lands for this alternative are about 1,852 acres.

The changes between the draft EIS and the final EIS are not enough to change the landslide risk for any of the watersheds (Table 5 of the Geology Amendment). The analysis using the reclassified RAVG changed Deep Creek and Rainy Valley Creek from a duration of elevated risk of greater than eight years to two to five years. The new analysis shows that O'Neil Creek, Walker Creek and Caroline Creek now have a 30 year duration of elevated risk, where it was greater than 80 years in the Geology report. Lower East Fork Elk Creek went from greater than 80 year duration of elevated risk in the Geology report to a 30 year duration (Table 6 of the Geology Amendment). There is no proposed temporary access roads construction directly on ultramafic rock in this alternative.

Project Area A: Beaver Fire

There are about three acres of salvage harvest proposed on unstable lands as defined by the Forest Plan and considered to be Riparian Reserves. There is about 60 acres of roadside hazard tree removal on unstable lands. Fuels treatments will occur on about 60 acres of unstable lands and site preparation and planting on about 10 acres. Some of these treatments on unstable lands overlap the total footprint of treatment on unstable lands for this alternative are about 77 acres. The indirect effects for landslide risk are the same as for Alternative 2. The duration of elevated risk is the same as for Alternative 2. The effects to landslide risk at the site scale are the same as for Alternative 2.

The likelihood of effects to cave resources protected under the Federal Cave Resources Protection Act is the same as for Alternative 2. There are no temporary access roads proposed directly on ultramafic rock.

Project Area B: Happy Camp Complex

There are about 285 acres of salvage harvest proposed on unstable lands as defined by the Forest Plan and considered to be Riparian Reserves. There is about 1,205 acres of roadside hazard tree removal on unstable lands. Fuels treatments will occur on about 310 acres of unstable lands and site preparation and planting on about 30 acres. Some of these treatments on unstable lands overlap the total footprint of treatment on unstable lands for this alternative are about 1,753 acres. The indirect effects for landslide risk are the same

as for Alternative 2. Only Middle Creek and Lower East Fork Elk Creek will have a reduced duration of elevated risk of 30 years in this alternative (Table 3-57). The salvage that is underlain by the limestone body described in Alternative 2 is not included in this alternative. The effects to landslide risk at the site scale are the same as for Alternative 2.

There are no salvage activities underlain by limestone or marble and the likelihood of effecting cave resources is unlikely for this alternative. There are no temporary access roads proposed directly on ultramafic rock.

Project Area C: Whites Fire

There are no acres of salvage harvest proposed on unstable lands as defined by the Forest Plan and considered to be Riparian Reserves. There is about 10 acres of roadside hazard tree removal on unstable lands. Fuels treatments will occur on about20 acres of unstable lands and site preparation and planting on about 10 acres. Some of these treatments on unstable lands overlap the total footprint of treatment on unstable lands for this alternative are about 22 acres. The indirect effects for landslide risk are the same as for Alternative 2. The duration of elevated risk is the same as for Alternative 2.

The likelihood of effects to cave resources protected under the Federal Cave Resources Protection Act is the same as for Alternative 2. There are no temporary access roads proposed directly on ultramafic rock.

Cumulative Effects for All Fire Areas

The cumulative effects are the same as for Alternative 2.

Modified Alternative 2

Direct Effects and Indirect Effects

There are about 2,288 acres of salvage harvest proposed on unstable lands as defined by the Forest Plan and considered to be Riparian Reserves. There is about 1,275 acres of roadside hazard tree removal on unstable lands. Fuels treatments will occur on about 395 acres of unstable lands and site preparation and planting on about 395 acres. Some of these treatments on unstable lands overlap the total footprint of treatment on unstable lands for this alternative are about 3,904 acres.

The indirect effects for landslide risk are the same as for Alternative 2. The duration of elevated risk is the same as Alternative 2.

The likelihood of effects to cave resources protected under the Federal Cave Resources Protection Act is the same as for Alternative 2. The temporary access roads directly on ultramafic rock are the same as for Alternative 2.

Project Area A: Beaver Fire

There are about three acres of salvage harvest proposed on unstable lands as defined by the Forest Plan and considered to be Riparian Reserves. There is about 60 acres of roadside hazard tree removal on unstable lands. Fuels treatments will occur on about 60 acres of unstable lands and site preparation and planting on about 10 acres. Some of these treatments on unstable lands overlap the total footprint of treatment on unstable lands for this alternative are about 77 acres. The indirect effects for landslide risk are the same as

for Alternative 2. The duration of elevated risk is the same as for Alternative 2. The effects to landslide risk at the site scale are the same as for Alternative 2.

The likelihood of effects to cave resources protected under the Federal Cave Resources Protection Act is the same as for Alternative 2. There are no temporary access roads proposed directly on ultramafic rock.

Project Area B: Happy Camp Complex

There are about 2,285 acres of salvage harvest proposed on unstable lands as defined by the Forest Plan and considered to be Riparian Reserves. There is about 1,205 acres of roadside hazard tree removal on unstable lands. Fuels treatments will occur on about 310 acres of unstable lands and site preparation and planting on about 375 acres. Some of these treatments on unstable lands overlap the total footprint of treatment on unstable lands for this alternative are about 3,804 acres. The indirect effects for landslide risk are the same as for Alternative 2. The duration of elevated risk is the same as for Alternative 2 except Lower Grider will have a duration of elevated risk of greater than 80 years (Table 3-57).The effects to landslide risk at the site scale are the same as for Alternative 2.

The likelihood of effects to cave resources protected under the Federal Cave Resources Protection Act is the same as for Alternative 2. The temporary access roads on ultramafic rock are the same as for Alternative 2.

Project Area C: Whites Fire

There are less than 0.1 acres of salvage harvest proposed on unstable lands as defined by the Forest Plan and considered to be Riparian Reserves. There is about 10 acres of roadside hazard tree removal on unstable lands. Fuels treatments will occur on about 20 acres of unstable lands and site preparation and planting on about 10 acres. Some of these treatments on unstable lands overlap the total footprint of treatment on unstable lands for this alternative are about 23 acres. The indirect effects for landslide risk are the same as for Alternative 2. The duration of elevated risk is the same as for Alternative 2. The effects to landslide risk at the site scale are the same as for Alternative 2.

The likelihood of effects to cave resources protected under the Federal Cave Resources Protection Act is the same as for Alternative 2. There are no temporary access roads proposed directly on ultramafic rock.

Cumulative Effects for All Fire Areas

The cumulative effects are the same as for Alternative 2.

Modified Alternative 3

Direct Effects and Indirect Effects

There are about 1,973 acres of salvage harvest proposed on unstable lands as defined by the Forest Plan and considered to be Riparian Reserves. There is about 1,147 acres of roadside hazard tree removal on unstable lands. Fuels treatments will occur on about 820 acres of unstable lands and site preparation and planting on about 400 acres. Some of these treatments on unstable lands overlap the total footprint of treatment on unstable lands for this alternative are about 3226 acres.

The indirect effects for landslide risk are the same as for Alternative 2. The duration of elevated risk is the same as Alternative 2.

The likelihood of effects to cave resources protected under the Federal Cave Resources Protection Act is the same as for Alternative 2. The temporary access roads directly on ultramafic rock are the same as for Alternative 2.

Project Area A: Beaver Fire

There are no acres of salvage harvest proposed on unstable lands as defined by the Forest Plan and considered to be Riparian Reserves. There is about 60 acres of roadside hazard tree removal on unstable lands. Fuels treatments will occur on about 60 acres of unstable lands and site preparation and planting on about8 acres. Some of these treatments on unstable lands overlap the total footprint of treatment on unstable lands for this alternative are about 75 acres. The indirect effects for landslide risk are the same as for Alternative 2. The duration of elevated risk is the same as for Alternative 2. The effects to landslide risk at the site scale are the same as for Alternative 2.

The likelihood of effects to cave resources protected under the Federal Cave Resources Protection Act is the same as for Alternative 2. There are no temporary access roads proposed directly on ultramafic rock.

Project Area B: Happy Camp Complex

There are about 1,973 acres of salvage harvest proposed on unstable lands as defined by the Forest Plan and considered to be Riparian Reserves. There is about 1,077 acres of roadside hazard tree removal on unstable lands. Fuels treatments will occur on about 741 acres of unstable lands and site preparation and planting on about 380 acres. Some of these treatments on unstable lands overlap the total footprint of treatment on unstable lands for this alternative are about 3,128 acres. The indirect effects for landslide risk are the same as for Alternative 2. The duration of elevated risk is the same as Alternative 2 except Lower Grider and Tompkins Creek 7th field watersheds will have a duration of elevated risk of more than 80 years instead of 30 years under Alternative 2. The effects to landslide risk at the site scale are the same as for Alternative 2.

The likelihood of effects to cave resources protected under the Federal Cave Resources Protection Act is the same as for Alternative 2. The temporary access roads directly on ultramafic rock are the same as for Alternative 2.

Project Area C: Whites Fire

There is less than 0.1 acres of salvage harvest proposed on unstable lands as defined by the Forest Plan and considered to be Riparian Reserves. There is about 10 acres of roadside hazard tree removal on unstable lands. Fuels treatments will occur on about 20 acres of unstable lands and site preparation and planting on about 10 acres. Some of these treatments on unstable lands overlap the total footprint of treatment on unstable lands for this alternative are about 23 acres. The duration of elevated risk is the same as for Alternative 2. The effects to landslide risk at the site scale are the same as for Alternative 2.

The likelihood of effects to cave resources protected under the Federal Cave Resources Protection Act is the same as for Alternative 2. There are no temporary access roads proposed directly on ultramafic rock.

Cumulative Effects for All Fire Areas

The cumulative effects are the same as for Alternative 2.

Summary of Effects

There is no change in landslide risk compared to current conditions for any watershed in any of the three fire areas. There is no reduction in the duration of elevated risk for any of the watersheds in Beaver or Whites Fire area. There are nine watersheds in the Happy Camp fire area that have changes in duration of elevated risk for at least one alternative (Table 3-57).

Table 3-57: Comparison of Alternatives for 7th field watersheds with effects to duration of elevated risk.

7th field Watershed	Landslide Risk for all alts.	Duration of Elevated Risk Alt. 1	Duration of Elevated Risk Alt. 2	Duration of Elevated Risk Alt. 3	Duration of Elevated Risk Alt. 4	Duration of Elevated Risk Alt. 5	Duration of Elevated Risk Modified Alt. 2	Duration of Elevated Risk Modified Alt. 3
Upper Grider Creek	High	Greater than 80 years	30 years	30 years	Greater than 80 years	Greater than 80 years	30 years	30 years
Cliff Valley	High	Greater than 80 years	30 years	30 years	30 years	Greater than 80 years	30 years	30 years
Lower Grider Creek	Very High	Greater than 80 years	30 years	Greater than 80 years	Greater than 80 years	Greater than 80 years	Greater than 80 years	Greater than 80 years
O'Neil Creek	High	Greater than 80 years	30 years	30 years	30 years	Greater than 80 years	30 years	30 years
Walker Creek	Very High	Greater than 80 years	30 years	30 years	30 years	Greater than 80 years	30 years	30 years
Caroline Creek	High	Greater than 80 years	30 years	30 years	30 years	Greater than 80 years	30 years	30 years
Middle Creek	Moderate	Greater than 80 years	30 years	30 years	30 years	30 years	30 years	30 years
Tompkins Creek	Moderate	Greater than 80 years	30 years	30 years	30 years	Greater than 80 years	30 years	Greater than 80 years
Horse Creek	Moderate	Greater than 80 years	30 years	30 years	30 years	Greater than 80 years	30 years	30 years
Upper East Fork Elk Creek	Moderate	Greater than 80 years	30 years	30 years	30 years	Greater than 80 years	30 years	30 years
Upper Elk Creek	Moderate	Greater than 80 years	30 years	30 years	Greater than 80 years	Greater than 80 years	30 years	30 years
Lower East Fork Elk Creek	Moderate	Greater than 80 years	30 years	30 years	30 years	30 years	30 years	30 years

Table 3-58: Summary of effects to naturally occurring asbestos, cave resources, groundwater, unique geological area and rock material sources.

Alternative	Acres of New Temporary Road on Ultramafic Rock	Likelihood of Affecting Cave Resources	Likelihood of Affecting Groundwater Resources	Likelihood of Affecting Unique Geological Areas	Likelihood of Affecting Rock Material Sources
Alternative 2	1.6	Very Low	No Effect	No Effect	No Effect
Alternative 3	1.6	Very Low	No Effect	No Effect	No Effect
Alternative 4	1.6	Very Low	No Effect	No Effect	No Effect
Alternative 5	0.0	Very Low	No Effect	No Effect	No Effect
Alternative 2 Modified	1.6	Very Low	No Effect	No Effect	No Effect
Alternative 2 Modified	1.6	Very Low	No Effect	No Effect	No Effect
Alternative 3 Modified	1.6	Very Low	No Effect	No Effect	No Effect

Compliance with law, regulation, policy, and the Forest Plan

The project is compliant with the Klamath National Forest Plan (1995, as amended) Standards and Guidelines. A geologic investigation was completed and natural regeneration of vegetation on unstable lands will improve slope stability in portions of the project area but recovery could take between 30 and 80 years.

Air Quality

The purpose of this section is to analyze the effects of the project and its alternatives on air quality including ambient air quality standards.

Methodology

Analysis Indicators and Methodology

The Conformity Rule of the Clean Air Act applies only to Federal actions proposed in the federal non-attainment areas and makes exceptions for activities with emissions considered to be less than "*de minimis*" values. Siskiyou County is currently in attainment for all criteria pollutants including 8-hour ozone, therefore is no Conformity Rule analysis is required. The *de minimis* for nitrogen oxide emissions (a pollutant related to ozone formation) is 100 tons per year. The average emissions of nitrogen oxides are estimated through the use of the First Order Fire Effects Model (FOFEM).The nitrogen oxide analysis was remodeled for comparison purposes between the draft EIS and the final EIS only.

The analysis will include an evaluation of the estimated residence time of smoke from project activities and its impact to the worst days haze to determine compliance with the Regional Haze Rule (40 CFR Part 51). Compliance with the Regional Haze Rule requires that states make reasonable progress towards achieving natural visibility conditions in Class I areas. The reasonable progress means that the worst haze days get less hazy and that visibility does not deteriorate on the best days, when compared with the baseline period of 2000 to 2004 (California Air Resource Board 2009). Federal agencies should not prevent this progress through management activities. Methodology is discussed in detail in the Air Quality resource report, available on the project website.

The total hazardous fuels treatment acres analyzed for the final EIS is the acres of prescribed burn plus 20 percent of the acres of pile burning. Due to caveats in the emissions model the prescribed fire has to be categorized as either underburn or pile burning. The acres include any acre where underburning is prescribed either as the primary treatment (such as underburn blocks) or as a secondary treatment to reduce fuels such as in salvage units and site preparation and plant. Pile burning is also proposed in areas as a primary or secondary fuels reduction treatment in some of the wildland urban interface, fuels management zones, roadside fuels treatments, salvage units and within site preparation and planting units.

The Council on Environmental Quality recommends that Federal agencies disclose in documentation of their NEPA analyses the effects of climate change for actions that are estimated to emit more than 25,000 metric tons of carbon dioxide equivalents annually (Council on Environmental Quality 2014). This is not a threshold for adverse effects but rather a trigger point for when an analysis of greenhouse gas emissions is needed.

Fugitive dust analysis was completed per the request of the Siskiyou County Air Pollution Control District (see response to comments section of final EIS). For the purpose of this analysis fugitive dust is measured as particulate matter as either PM_{10} (particulate matter less than 10 micrometers). The primary source of fugitive dust for the Westside Fire Recovery project is hauling logs on unpaved roads. Siskiyou County is in attainment for PM_{10} so there are no conformity regulations regarding the emissions. The analysis indicator for this analysis is likelihood of conformity. A high likelihood of conformity will occur if the emissions are less than 50 percent of the *de minimis* per year. There is a moderate likelihood of conforming if the emissions are estimated to be more than 50 percent but less than 90 percent of the *de minimis*, and a low likelihood if the emissions are estimated to be more than 90 percent of the *de minimis*.

The emissions factor is taken from the USFS Desk Reference for NEPA Air Quality Analysis (USFS 1995, page 3.2.1-1:10). The analysis assumes five miles is the average haul length and that every haul is a round trip .This is an assumed total 10 miles per log load on unpaved roads.

The tons of fugitive dust can be compared to the general conformity rule *de minimis* contamination. There is no *de minimis* for attainment areas (such as Siskiyou County) but this comparison allows for a quantitative analysis of Clean Air Act compliance and a relative measure of emissions. The *de minimis* for PM_{10} is 100 tons per year.

Spatial and Temporal Context

For this project, the spatial boundary includes the project area, the local communities, and the Marble Mountain Wilderness. Temporally, emissions from mobile sources such as logging trucks and tractors, as well as from prescribed burning, are transient and the impacts are short-lived and the air quality regulations are in terms of one-year emissions. The temporal analyses are on an annual basis and considered short-term. Impacts are considered long-term if they persist for more than a year. The cumulative effects of the mobile source emissions, fugitive dust and smoke emission will be addressed on the 7th field watershed scale.

Affected Environment

The project area is primarily forested federally managed lands with no substantial human-caused emission sources within the area other than emission and fugitive dust from logging and recreation. Other emission contributions will be smoke and haze from seasonal wildland and prescribed fires from both within and outside the county. According to the California Air Resources Board (http://www.arb.ca.gov/app/emsinv/emssumcat.php) the nitrogen oxide emissions are primarily from heavy-duty diesel trucks (such as from the I-5 corridor).

The project is adjacent to the Marble Mountain Wilderness which is designated as a Class I wilderness by the Clean Air Act. The project is adjacent to the Russian Wilderness; however, this is a Class II wilderness and is not subject to the regional haze rule. The worst air quality days are dominated by organic aerosols (particulate matter associated that cause a haze in the air). Organic aerosols peak during the summer months and are strongly correlated with the incidence of wildfires (California Air Resource Board, 2009).

Naturally occurring asbestos is addressed in the Geology report addendum and Chapter 3 of the Final Environmental Impact Statement.

Environmental Consequences

The regulations and guidance for air quality analysis for nitrogen oxide and guidance for greenhouse gas emission disclosure guidance are at the project scale. The analysis of the emissions for the entire project area is described by alternative in the effects section below. For comparison purposes, the emissions are displayed in tables 2 through 4 by fire area in the summary of effects section below.

Alternative 1

Direct Effects and Indirect Effects

Under this alternative no management action will be taken that will emit nitrogen oxides, greenhouse gases, or impact the visibility in the Marble Mountain Wilderness.

Cumulative Effects

There are no direct or indirect effects for this alternative and therefore no cumulative effects.

Alternative 2

Direct Effects and Indirect Effects

There will be about 8 tons of nitrogen oxide emissions per year from prescribed fire and 26 tons per year from mobile sources for a total of 34 tons per year. This is less than the *de minimis* allowed to meet the Conformity Rule.

There will be about 45,130 metric tons of carbon dioxide equivalents from prescribed fire and 1026 metric tons of carbon dioxide equivalents from mobile sources. This is a total of 46,155 metric tons of carbon dioxide equivalents per year from this project.

There will be about 220 tons per year of fugitive dust that will be mitigated by project design features requiring dust mitigation on non-paved roadways. The mitigation will reduce the fugitive dust emissions to about 44 tons per year for the entire project area.

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

The nitrogen oxide emissions from prescribed fire will be 0.4 per year for the Beaver Fire area. The emissions from heavy equipment (including logging trucks) will be about 5 tons per year and there are no emissions from helicopters. The total nitrogen oxide emitted from the Beaver Fire area treatments will be 5.4 per year.

There will be no effect to any Class I wildernesses due to their absence in the Beaver Fire area.

Greenhouse gas emission will be about 2,128 metric tons of carbon dioxide equivalents per year from prescribed burning. There will be about 168 metric tons of carbon dioxide equivalents per year from heavy equipment used for treatments (including log trucks) and no emissions associated with helicopters for the Beaver Fire area. This is a total of 2,296 metric tons of carbon dioxide equivalent per year from the Beaver Fire area.

There would be about 13 tons per year of fugitive dust created if no mitigations were applied. The project design features requiring dust suppression on log hauling routes (Chapter 2 of the final EIS) will reduce those emissions by as much as 80 percent. This will reduce the emissions to about 2 tons per year.

Cumulative Effects

Cumulative effects are described in the Air Quality Resources report for nitrogen oxide and greenhouse gas emissions. For fugitive dust, Siskiyou County is in attainment for PM_{10} and will remain in attainment with the implementation of this project in conjunction with the future and on-going projects. It is assumed that all Forest and private lands projects have a high likelihood of conforming because of the common mitigation of watering or otherwise mitigating fugitive dust on unpaved roads. So cumulatively the project will have a high likelihood of conforming should conformity be required.

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

The nitrogen oxide emissions from prescribed fire will be 2.8 per year for the Happy Camp Fire area. The emissions from heavy equipment (including logging trucks) will be about 15 tons per year and about 0.9 tons per year from helicopter use. The total nitrogen oxide emitted from the Happy Camp Fire area treatments will be about 19 per year.

Prescribed fire in the Happy Camp fire area may be noticeable in the Marble Mountain Wilderness which is a Clean Air Act Class I Wilderness. The prescribed fire and related smoke that will affect visibility in the wilderness will occur over a few days any given year. The likelihood of making the worst haze days worse is low. The worst haze days occur during wildfires – when implementing prescribed fire is very unlikely. If prescribed fire should overlap with the worst haze days the haze from the wildfire would overshadow the prescribed fire haze. The project will not have any permanent effect on haze in the Class I wilderness. The likelihood that prescribed burning smoke will affect the best days over an entire year is very low. The likelihood of preventing the progress of the Regional Haze rule is very low.

Greenhouse gas emission will be about 15,906 metric tons of carbon dioxide equivalent per year from prescribed burning. There will be about 504 metric tons of carbon dioxide equivalent per year from heavy equipment used for treatments (including log trucks).

There will be about 168 tons per year of carbon dioxide equivalents from helicopter use. This is a total of 16,578 metric tons of carbon dioxide equivalent per year from the Happy Camp Fire area.

There would be about 174 tons per year of fugitive dust created if no mitigations were applied. The project design features requiring dust suppression on log hauling routes (Chapter 2 of the final EIS) will reduce those emissions by as much as 80 percent or to about 35 tons per year.

Cumulative Effects

Cumulative effects are the same as for Beaver Fire area.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

The nitrogen oxide emissions from prescribed fire will be 4.8 per year for the Whites Fire area. The emissions from heavy equipment (including logging trucks) will be about 5 tons per year and about 0.1 tons per year from helicopter use. The total nitrogen oxide emitted from the Whites Fire area treatments will be about 10 tons per year.

The effects to Class I wildernesses and Inventoried Roadless Areas the same as described in the Happy Camp Complex analysis above.

Greenhouse gas emission will be about 27,095 metric tons of carbon dioxide equivalent per year from prescribed burning. There will be about 168 metric tons of carbon dioxide equivalents per year from heavy equipment used for treatments (including log trucks). There will be about 18 tons per year of carbon dioxide equivalents from helicopter use. This is a total of 27,281 metric tons of carbon dioxide equivalent per year from the Whites Fire area.

There would be about 33 tons per year of fugitive dust created if no mitigations were applied. The project design features requiring dust suppression on log hauling routes (Chapter 2 of the final EIS) will reduce those emissions by as much as 80 percent (to about 7 tons per year).

Cumulative Effects

Cumulative effects the same as for Beaver Fire area.

Alternative 3

Direct Effects and Indirect Effects

There will be about 8 tons of nitrogen oxide emissions per year from prescribed fire and 26 tons per year from mobile sources for a total of 34 tons per year. This is less than the *de minimis* allowed to meet the Conformity Rule.

There will be about 44,680 metric tons of carbon dioxide equivalents from prescribed fire and 1026 metric tons of carbon dioxide equivalents from mobile sources. This is a total of 45,706 metric tons of carbon dioxide equivalents per year from this project.

There will be about 220 tons per year of fugitive dust that will be mitigated by project design features requiring dust mitigation on non-paved roadways. The mitigation will reduce the fugitive dust emissions to about 44 tons per year for the entire project area.

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

The nitrogen oxide emissions from prescribed fire will be 0.3 per year for the Beaver Fire area. The emissions from heavy equipment (including logging trucks) will be about 5 tons per year and there are no emissions from helicopters. The total nitrogen oxide emitted from the Beaver Fire area treatments will be 5.3 per year.

There will be no effect to any Class I wildernesses due to their absence in the Beaver Fire area.

Greenhouse gas emission will be about 1,938 metric tons of carbon dioxide equivalents per year from prescribed burning. There will be about 168 metric tons of carbon dioxide equivalents per year from heavy equipment used for treatments (including log trucks) and no emissions associated with helicopters for the Beaver Fire area. This is a total of 2,106 metric tons of carbon dioxide equivalent per year from the Beaver Fire area.

Fugitive dust emissions will be the same as for Alternative 2.

Cumulative Effects

Cumulative effects are the same as for Alternative 2.

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

The nitrogen oxide emissions from prescribed fire will be 2.8 per year for the Happy Camp Fire area. The emissions from heavy equipment (including logging trucks) will be about 15 tons per year and about 0.9 tons per year from helicopter use. The total nitrogen oxide emitted from the Happy Camp Fire area treatments will be about 19 per year.

The effects to Class I wildernesses are the same as for Alternative 2.

Greenhouse gas emission will be about 15,680 metric tons of carbon dioxide equivalent per year from prescribed burning. There will be about 504 metric tons of carbon dioxide equivalents per year from heavy equipment used for treatments (including log trucks). There will be about 168 tons per year of carbon dioxide equivalents from helicopter use. This is a total of 16,352 metric tons of carbon dioxide equivalent per year from the Happy Camp Fire area.

Fugitive dust emissions will be the same as for Alternative 2.

Cumulative Effects

Cumulative effects are the same as for Alternative 2.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

The nitrogen oxide emissions from prescribed fire will be 4.8 per year for the Whites Fire area. The emissions from heavy equipment (including logging trucks) will be about 5 tons per year and about 0.1 tons per year from helicopter use. The total nitrogen oxide emitted from the Whites Fire area treatments will be about 10 tons per year.

The effects to Class I wildernesses and Inventoried Roadless Areas the same as described in the Happy Camp Complex analysis section of Alternative 2 above.

Greenhouse gas emission will be about 27,062 metric tons of carbon dioxide equivalent per year from prescribed burning. There will be about 168 metric tons of carbon dioxide equivalents per year from heavy equipment used for treatments (including log trucks). There will be about 18 tons per year of carbon dioxide equivalents from helicopter use. This is a total of 27,248 metric tons of carbon dioxide equivalent per year from the Whites Fire area.

Fugitive dust emissions will be the same as for Alternative 2.

Cumulative Effects

Cumulative effects are the same as for Alternative 2.

Alternative 4

Direct Effects and Indirect Effects

There will be about 8 tons of nitrogen oxide emissions per year from prescribed fire and 26 tons per year from mobile sources for a total of 34 tons per year. This is less than the *de minimis* allowed to meet the Conformity Rule.

There will be about 44,391 metric tons of carbon dioxide equivalents from prescribed fire and 845 metric tons of carbon dioxide equivalents from mobile sources. This is a total of 45,231 metric tons of carbon dioxide equivalents per year from this project.

There will be about 220 tons per year of fugitive dust that will be mitigated by project design features requiring dust mitigation on non-paved roadways. The mitigation will reduce the fugitive dust emissions to about 44 tons per year for the entire project area.

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

The nitrogen oxide emissions from prescribed fire will be 0.4 per year for the Beaver Fire area. The emissions from heavy equipment (including logging trucks) will be about 5 tons per year and there are no emissions from helicopters. The total nitrogen oxide emitted from the Beaver Fire area treatments will be 5.4 per year.

There will be no effect to any inventoried roadless areas or Class I wildernesses due to their absence in the Beaver Fire area.

Greenhouse gas emission will be about 2,108 metric tons of carbon dioxide equivalents per year from prescribed burning. There will be about 168 metric tons of carbon dioxide equivalents per year from heavy equipment used for treatments (including log trucks) and no emissions associated with helicopters for the Beaver Fire area. This is a total of 2,276 metric tons of carbon dioxide equivalent per year from the Beaver Fire area.

Fugitive dust emissions will be the same as for Alternative 2.

Cumulative Effects

Cumulative effects the same as for Alternative 2.

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

The nitrogen oxide emissions from prescribed fire will be 2.8 per year for the Happy Camp Fire area. The emissions from heavy equipment (including logging trucks) will be about 15 tons per year and about 0.9 tons per year from helicopter use. The total nitrogen oxide emitted from the Happy Camp Fire area treatments will be about 19 per year.

The effects to Class I wildernesses are the same as for Alternative 2.

Greenhouse gas emission will be about 15,188 metric tons of carbon dioxide equivalent per year from prescribed burning. There will be about 504 metric tons of carbon dioxide equivalents per year from heavy equipment used for treatments (including log trucks). There will be about 168 tons per year of carbon dioxide equivalents from helicopter use. This is a total of 15,860 metric tons of carbon dioxide equivalent per year from the Happy Camp Fire area.

Fugitive dust emissions will be the same as for Alternative 2.

Cumulative Effects

Cumulative effects are the same as for Alternative 2.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

The nitrogen oxide emissions from prescribed fire will be 4.8 per year for the Whites Fire area. The emissions from heavy equipment (including logging trucks) will be about 5 tons per year and about 0.1 tons per year from helicopter use. The total nitrogen oxide emitted from the Whites Fire area treatments will be about 10 tons per year.

The effects to Class I wildernesses and Inventoried Roadless Areas the same as described in the Happy Camp Complex analysis section of Alternative 2 above.

Greenhouse gas emission will be about 27,095 metric tons of carbon dioxide equivalent per year from prescribed burning. There will be about 168 metric tons of carbon dioxide equivalents per year from heavy equipment used for treatments (including log trucks). There will be about 18 tons per year of carbon dioxide equivalents from helicopter use. This is a total of 27,281 metric tons of carbon dioxide equivalent per year from the Whites Fire area.

Fugitive dust emissions will be the same as for Alternative 2.

Cumulative Effects

Cumulative effects are the same as for Alternative 2.

Alternative 5

Direct Effects and Indirect Effects

There will be about 7 tons of nitrogen oxide emissions per year from prescribed fire and 8 tons per year from mobile sources for a total of 15 tons per year. This is less than the *de minimis* allowed to meet the Conformity Rule.

There will be about 38,982 metric tons of carbon dioxide equivalents from prescribed fire and 308 metric tons of carbon dioxide equivalents from mobile sources. This is a total of 39,290 metric tons of carbon dioxide equivalents per year from this project.

There will be about 60 tons per year of fugitive dust that will be mitigated by project design features requiring dust mitigation on non-paved roadways. The mitigation will reduce the fugitive dust emissions to about 12 tons per year for the entire project area.

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

The nitrogen oxide emissions from prescribed fire will be 0.4 per year for the Beaver Fire area. The emissions from heavy equipment (including logging trucks) will be about 1.5 tons per year and there are no emissions from helicopters. The total nitrogen oxide emitted from the Beaver Fire area treatments will be 1.9 per year.

There will be no effect to any Class I wildernesses due to their absence in the Beaver Fire area.

Greenhouse gas emission will be about 2,108 metric tons of carbon dioxide equivalents per year from prescribed burning. There will be about 50 metric tons of carbon dioxide equivalents per year from heavy equipment used for treatments (including log trucks) and no emissions associated with helicopters for the Beaver Fire area. This is a total of 2,158 metric tons of carbon dioxide equivalent per year from the Beaver Fire area.

There would be about 4 tons per year of fugitive dust created if no mitigations were applied. The project design features requiring dust suppression on log hauling routes (Chapter 2 of the final EIS) will reduce those emissions by as much as 80 percent. This will reduce the emissions to about 1 tons per year.

Cumulative Effects

Cumulative effects are the same as Alternative 2.

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

The nitrogen oxide emissions from prescribed fire will be 1.8 per year for the Happy Camp Fire area. The emissions from heavy equipment (including logging trucks) will be about 4 tons per year and about 0.9 tons per year from helicopter use. The total nitrogen oxide emitted from the Happy Camp Fire area treatments will be about 6.7 per year.

The effects to Class I wildernesses are the same as for Alternative 2.

Greenhouse gas emission will be about 10,492 metric tons of carbon dioxide equivalents per year from prescribed burning. There will be about 151 metric tons of carbon dioxide equivalents per year from heavy equipment used for treatments (including log trucks). There will be about 51 tons per year of carbon dioxide equivalents from helicopter use. This is a total of 10,694 metric tons of carbon dioxide equivalent per year from the Happy Camp Fire area.

There would be about 52 tons per year of fugitive dust created if no mitigations were applied. The project design features requiring dust suppression on log hauling routes (Chapter 2 of the final EIS) will reduce those emissions by as much as 80 percent. This will reduce the emissions to about 10 tons per year.

Cumulative Effects

Cumulative effects are the same as for Alternative 2.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

The nitrogen oxide emissions from prescribed fire will be 4.8 per year for the Whites Fire area. The emissions from heavy equipment (including logging trucks) will be about 1.5 tons per year and about 0.1 tons per year from helicopter use. The total nitrogen oxide emitted from the Whites Fire area treatments will be about 6.4 tons per year.

The effects to Class I wildernesses and Inventoried Roadless Areas the same as described in the Happy Camp Complex analysis section of Alternative 2 above.

Greenhouse gas emission will be about 26,382 metric tons of carbon dioxide equivalent per year from prescribed burning. There will be about 50 metric tons of carbon dioxide equivalents per year from heavy equipment used for treatments (including log trucks). There will be about 6 tons per year of carbon dioxide equivalents from helicopter use. This is a total of 26,438 metric tons of carbon dioxide equivalent per year from the Whites Fire area.

There would be about 4 tons per year of fugitive dust created if no mitigations were applied. The project design features requiring dust suppression on log hauling routes (Chapter 2 of the final EIS) will reduce those emissions by as much as 80 percent. This will reduce the emissions to about 1 ton per year.

Cumulative Effects

Cumulative effects are the same as for Alternative 2.

Alternative 2 Modified

There will be about 8 tons of nitrogen oxide emissions per year from prescribed fire and 26 tons per year from mobile sources for a total of 34 tons per year. This is less than the *de minimis* allowed to meet the Conformity Rule.

There will be about 45,163 metric tons of carbon dioxide equivalents from prescribed fire and 1026 metric tons of carbon dioxide equivalents from mobile sources. This is a total of 46,196 metric tons of carbon dioxide equivalents per year from this project.

There will be about 44 tons per year of fugitive dust that will be mitigated by project design features requiring dust mitigation on non-paved roadways. The mitigation will reduce the fugitive dust emissions to about 12 tons per year for the entire project area.

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

There will be about 0.4 tons per year of nitrogen oxide emission from prescribed burning. There will be about 5 tons per year of nitrogen oxide emissions from mobile sources. This is a total of 5.4 tons per year of nitrogen oxide emissions.

The Beaver fire area is not adjacent to a Class I Wilderness or Inventoried Roadless Areas. The activities in this area will not affect the Regional Haze Rule or roadless character.

There will be 2,175 metric tons of carbon dioxide equivalents from prescribed burning and 168 metric tons from mobile sources for a total of 2,343 metric tons of carbon dioxide equivalents for the Beaver fire area.

The effects to fugitive dust are the same as for Alternative 2.

Cumulative Effects

Cumulative effects are the same as for Alternative 2.

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

There will be about 2.8 tons per year of nitrogen oxide emission from prescribed burning. There will be about 16 tons per year of nitrogen oxide emissions from mobile sources. This is a total of 18.8 tons per year of nitrogen oxide emissions.

The effects to Class I wildernesses are the same as for Alternative 2.

There will be 15,906 metric tons of carbon dioxide equivalents from prescribed burning and 672 metric tons from mobile sources for a total of 16,572 metric tons of carbon dioxide equivalents for the Happy Camp fire area.

The effects to fugitive dust are the same as for Alternative 2.

Cumulative Effects

Cumulative effects are the same as for Alternative 2.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

There will be about 4.8 tons per year of nitrogen oxide emission from prescribed burning. There will be about 5 tons per year of nitrogen oxide emissions from mobile sources. This is a total of 9.8 tons per year of nitrogen oxide emissions.

The effects to Class I wildernesses and Inventoried Roadless Areas the same as described in the Happy Camp Complex analysis section of Alternative 2 above.

There will be 27,095 metric tons of carbon dioxide equivalents from prescribed burning and 186 metric tons from mobile sources for a total of 27,281 metric tons of carbon dioxide equivalents for the Whites fire area.

The effects to fugitive dust are the same as for Alternative 2.

Cumulative Effects

Cumulative effects are the same as for Alternative 2.

Alternative 3 Modified

There will be about 8.4 tons of nitrogen oxide emissions per year from prescribed fire and 26 tons per year from mobile sources for a total of 34.4 tons per year. This is less than the *de minimis* allowed to meet the Conformity Rule.

There will be about 46,984 metric tons of carbon dioxide equivalents from prescribed fire and 1026 metric tons of carbon dioxide equivalents from mobile sources. This is a total of 48,010 metric tons of carbon dioxide equivalents per year from this project.

There will be about 44 tons per year of fugitive dust that will be mitigated by project design features requiring dust mitigation on non-paved roadways. The mitigation will reduce the fugitive dust emissions to about 12 tons per year for the entire project area.

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

There will be about 0.6 tons per year of nitrogen oxide emission from prescribed burning. There will be about 5 tons per year of nitrogen oxide emissions from mobile sources. This is a total of 5.6 tons per year of nitrogen oxide emissions.

The Beaver fire area is not adjacent to a Class I Wilderness or Inventoried Roadless Areas. The activities in this area will not affect the Regional Haze Rule or roadless character.

There will be 3,578 metric tons of carbon dioxide equivalents from prescribed burning and 168 metric tons from mobile sources for a total of 3,746 metric tons of carbon dioxide equivalents for the Beaver fire area.

The effects to fugitive dust are the same as for Alternative 2.

Cumulative Effects

Cumulative effects are the same as for Alternative 2.

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

There will be about 2.8 tons per year of nitrogen oxide emission from prescribed burning. There will be about 16 tons per year of nitrogen oxide emissions from mobile sources. This is a total of 18.8 tons per year of nitrogen oxide emissions.

The effects to Class I wildernesses are the same as for Alternative 2.

There will be 15,974 metric tons of carbon dioxide equivalents from prescribed burning and 672 metric tons from mobile sources for a total of 16,646 metric tons of carbon dioxide equivalents for the Happy Camp fire area.

The effects to fugitive dust are the same as for Alternative 2.

Cumulative Effects

Cumulative effects are the same as for Alternative 2.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

There will be about 4.8 tons per year of nitrogen oxide emission from prescribed burning. There will be about 5 tons per year of nitrogen oxide emissions from mobile sources. This is a total of 9.8 tons per year of nitrogen oxide emissions.

The effects to Class I wildernesses and Inventoried Roadless Areas the same as described in the Happy Camp Complex analysis above.

There will be 27,431 metric tons of carbon dioxide equivalents from prescribed burning and 186 metric tons from mobile sources for a total of 27,617 metric tons of carbon dioxide equivalents for the Whites fire area.

The effects to fugitive dust are the same as for Alternative 2.

Cumulative Effects

Cumulative effects are the same as for Alternative 2.

Summary of Effects

Table 3-59: Summary of Effects for the Beaver Fire Area.

Indicator	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Mod Alt. 2	Mod Alt. 3
Nitrogen Oxide Emissions (tons/year)	0	5.4	5.3	5.4	1.9	5.4	5.6
Carbon Dioxide Equivalent Emissions (metric tons/year)	0	2,296	2,106	2,276	2,158	2,343	3,746
Fugitive Dust (tons/year)	0	2	2	2	1	2	2

Table 3-60: Summary of Effects for the Happy Camp Fire Area.

Indicator	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Mod Alt. 2	Mod Alt 3
Nitrogen Oxide Emissions (tons/year)	0	19	19	19	6.7	18.8	18.8
Carbon Dioxide Equivalent Emissions (metric tons/year)	0	16,578	16,352	15,860	10,694	16,572	16,646
Fugitive Dust (tons/year)	0	35	35	35	10	35	35

Table 3-61: Summary of Effects for the Whites Fire Area.

Indicator	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Mod Alt. 2	Mod Alt 3
Nitrogen Oxide Emissions (tons/year)	0	10	10	10	6.4	9.8	9.8
Carbon Dioxide Equivalent Emissions (metric tons/year)	0	27,281	27,248	27,095	26,438	27,281	27,617
Fugitive Dust (tons/year)	0	7	7	7	2	7	7

Table 3-62: Summary of Effects for the entire project area.

Indicator	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Mod Alt. 2	Mod Alt 3
Nitrogen Oxide Emissions (tons/year)	0	34	34	34	15	34	34
Carbon Dioxide Equivalent Emissions (metric tons/year)	0	46,155	45,706	45,231	39,290	46,196	48,010
Fugitive Dust (tons/year)	0	44	44	44	12	44	44

Compliance with law, regulation, policy, and the Forest Plan

All alternatives are compliant with the Clean Air Act and the Conformity Rule. The project will not prevent the progress of the State of California's Regional Haze Plan as required by the Regional Haze Rule, and will be consistent with the Forest Plan as displayed on the Forest Plan consistency checklist, available on the project website.

Heritage Resources

The purpose of this section is to outline the process for determining effects of the Westside Fire Recovery Project on properties included in or eligible for the National Register of Historic Places (NRHP). Effects analysis is required under Section 106 of the National Historic Preservation Act of 1966 (NHPA), as amended and is accomplished by the Klamath National Forest (Forest) under the *Programmatic Agreement Among*

U.S.D.A. Forest Service, Pacific Southwest Region (Region 5), California State Historic Preservation Officer, Nevada State Historic Preservation Officer, Advisory Council on Historic Preservation Regarding the Processes for Compliance with Section 106 of the National Historic Preservation Act for Management of Historic Properties by the National Forests of the Pacific Southwest Region (Region 5 PA). However, the Forest has determined that the effects of the project cannot be fully assessed prior to the issuance of the Record of Decision, and therefore the Forest proposed phased identification and evaluation pursuant to 36 C.F.R. § 800.4(b)(2) in a programmatic agreement prepared in accordance with 36 C.F.R. § 800.14(b)(3). This agreement, the *Programmatic Agreement Among the U.S.D.A. Forest Service, Klamath National Forest; the California State Historic Preservation Officer; and the Advisory Council on Historic Preservation Regarding the Westside Fire Recovery Program, Siskiyou County, California (WFR Programmatic Agreement)*, is being developed in consultation with tribes, and requires identification and evaluation of historic properties and cultural resources prior to implementing any project activities. Project activities will be implemented in phases, as a program of undertakings. The Section 106 process will be completed for each undertaking in accordance with the forthcoming WFR Programmatic Agreement's stipulations, in order to take into account the effect of the undertakings on historic properties and cultural resources.

An *historic property* is a prehistoric or historic-era district, site, building, structure, or object, included in or eligible for inclusion on the National Register including associated artifacts, remains, features, settings, and records that are over 50 years of age. The term also includes properties of traditional religious and cultural importance to an Indian tribe, so long as that property also meets the criteria for listing in the National Register. These properties may include Traditional Cultural Properties, which are tangible locations of traditional religious or cultural importance or Scared Sites, which are locations identified by tribal authorities to the agency that are specific, discrete, and narrowly delineated, e.g., locations where spiritual practices take place or sacred viewsheds. Tribal Sacred Sites may not always meet the criteria of an historic property. In these cases, agencies are directed to avoid adverse effects to the site's physical integrity under Executive Order 13007.

A *cultural resource* is an object or definite location of human activity, occupation, or use identifiable through field survey, historical documentation, or oral evidence. Cultural resources are prehistoric, historic, archaeological, or architectural sites, structures, places, or objects and traditional cultural properties. Cultural resources include the entire spectrum of resources for which the Heritage Program is responsible from artifacts to cultural landscapes without regard to eligibility for listing on the National Register of Historic Places (FSM 2360.5). Cultural resources, such as traditional-use areas may be managed as an historic property when these areas are identified by tribal authorities to the agency during the planning process.

The Forest acknowledges that tribal resources encompass the full spectrum of cultural and natural resources. This section only analyzes the effects of the Westside Fire Recovery Project on cultural resources as defined above. The effects of the project on natural resources are analyzed by various specialists in other sections of Chapter 3, e.g. Botany, Fisheries, Wildlife, etc.

Detailed descriptions of the project alternatives are found in Chapter 2.

Methodology

As stated above, the National Historic Preservation Act of 1966, as amended "requires federal agencies to take into account the effects of their undertakings on historic properties." This is accomplished through a four-step process following 36 CFR Part 800, the implementing regulations for Section 106 of the NHPA, or through alternative procedures set forth in programmatic agreements.

The Region 5 PA provides definitions of terms, roles and responsibilities, general program guidance, exemptions from review and a "screened" review process for routine forest undertakings, which serve as the framework for the forthcoming WFR Programmatic Agreement. The forthcoming WFR Programmatic Agreement covers all activities proposed under the Westside Fire Recovery Project, and are collectively referred to as the "program". Because implementation of the program will occur in phases (hazard tree removal, timber harvest, fuels reduction, etc.), with each phase consisting of several undertakings (e.g. individual timber sales), the effects on historic properties and cultural resources will be analyzed for each undertaking according to the WFR Programmatic Agreement stipulations. The forthcoming WFR Programmatic Agreement includes a program specific survey protocol and a process for resolving any adverse effects, if it is determined that adverse effects may occur. It expands the Standard Resource Protection Measures and expedited ineligible determinations allowed under the Regional PA. The forthcoming WFR Programmatic Agreement also provides for robust tribal input and involvement in the identification of significant tribal cultural resources and the evaluation and assessment of effects to these resources.

There are two key parameters for analyzing effects to historic properties. The first parameter is defining an Area of Potential Effect. 36 CFR 800.16(d) defines the Area of Potential Effect, which is essentially the area within which project activities are expected to occur that may affect historic properties or cultural resources. By delineating the area within which effects are anticipated to occur, the scope of analysis is established. The second parameter is determining whether historic properties or cultural resources are present or identified within the Area of Potential Effect. Identification is a three-step process of pre-field research, consultation and field surveys.

Once the Area of Potential Effect (APE) is defined and historic properties and cultural resources within the APE identified, analyses are conducted to determine if the proposed project will directly or indirectly cause changes in the character or use of the historic properties and/or cultural resources. If no historic properties or cultural resources are present, there will be no adverse effects. If historic properties and/or cultural resources are present and any potential adverse effects can be mitigated through project design features or Standard Resource Protection Measures, historic properties and/or cultural resources will not be adversely affected. If historic properties and/or cultural resources are present, and potential adverse effects cannot be mitigated through management or Standard Resource Protection Measures, the Forest will prepare a Historic Property Treatment Plan, in consultation with the State Historic Preservation Office (SHPO) and tribes as appropriate that will stipulate the actions the Forest will take to resolve the effects and ensure those actions are implemented.

Analysis Indicators

The analysis process includes establishing indicators to measure effects. Indicators for analyzing project effects on historic properties and cultural resources are (a) the number of *at risk* historic properties and cultural resources; and (b) the degree (level) to which the integrity of historic values of these properties/resources may be diminished by the project activities.

At-risk historic properties and cultural resources are those that are significant and retain integrity, and have been identified as being susceptible to adverse effects by specific undertaking activities. The degree to which an *at-risk* property or resource's integrity is diminished by project activities is classified by relative degree within four categories – negligible, minor, moderate, or major. If the project activities would change one or more of the character-defining features and diminish the integrity of the resource to the extent that it would no longer be eligible for listing on the NRHP, the effects would be adverse (the degree of change would be moderate to major). Adverse effects must be resolved in consultation with the SHPO and tribes as applicable under the stipulations in the forthcoming WFR Programmatic Agreement.

Direct and indirect effects, as well as the effects of reasonably foreseeable future actions (cumulative effects), that may diminish the integrity of historic properties and cultural resources identified in the area of potential effects are analyzed.

Spatial and Temporal Context

Spatial boundaries for the analysis of effects are the Area of Potential Effect as defined by the National Historic Preservation Act and its implementing regulations (36 CFR Part 800). The Area of Potential Effect for this project includes areas where treatment activities are proposed and areas used in support of treatment activities. Temporal boundaries for the short term are based on the effect being anticipated to occur during or within one to eight years of implementation. Long-term effects will occur after the eight years following implementation.

Affected Environment

The affected environment for the Westside Fire Recovery (WFR) Project mainly consists of steep, rugged mountains, incised by numerous rivers and creeks. The isolating effects of this landscape have resulted in a diversity of natural resources that have been sought and used by humans for thousands of years. Evidence of past use is spread across the project area but is concentrated into those areas people used most intensively, such as terraces, benches, areas along rivers and their tributaries, and areas where resources such as plants, animals, or minerals are exploited relatively easily. A record of human presence is found across the landscape in the material remains left behind which comprise a record of irreplaceable and non-renewable resources related to past human life and land use. This record includes historic properties as well as locations of cultural importance to local Native American groups.

Although few archaeological investigations into the prehistory of the project area have been conducted, Pilot Ridge, the foundational study for the interior North Coast Ranges revealed evidence of 8,000 years of human occupation and highlighted a forager subsistence- settlement pattern that required frequent moves of entire social units to locate resources. Archaeological site distributions shifted over time, in response to

climatically induced vegetation shifts, and produced generalized artifact assemblages (Hildebrandt and Hays 2007).

The WFR Project lies within the ancestral territories of groups from the Shastean Complex, specifically the Salmon, Scott and Klamath River Shasta, as well as the Karuk Tribe. Like most tribes in California, the Shastean and Karuk people were engaged in seasonal subsistence rounds. The people would foray out from permanent village sites throughout the year as resources became available for harvesting and processing. When resources had been procured, individuals and families would return to the village sites and store the supplies for future use. The project area has numerous culturally significant plant stands (e.g. tanoaks, bear grass, hazel, huckleberry) within and adjacent to natural openings, plantations and meadow areas. Important species were often managed and enhanced by tribes through the use of fire.

Native groups in this area, like in much of California, were severely impacted when gold was discovered. Native people were crowded off their fishing and hunting grounds by Euro-American miners and subsequent settlers, and villages decimated by this disruption and European diseases. However, native cultures survive and native peoples are actively preserving their traditional knowledge and lifeways.

Euro-Americans entered into Siskiyou County in 1827, with regular forays into the area by the early 1840s. With the 1851-1852 gold strikes, the gentler-slopes/lower-elevations of the Klamath Mountain watersheds steadily became transformed into an intensively exploited and densely populated landscape. By the 1870s, large-scale hydraulic mining of the region's placer deposits began. From the 1870s into the early twentieth century, systems of high ditches, head boxes, iron-pipe penstocks, "giant" nozzles, huge sluice systems, and the other accoutrements of "hydraulicking" transformed many of the project-area's stream bottoms into a landscape of vast, linear 'washing pits' (the mined out areas of ancient alluvium) located within, adjacent, and parallel to stream courses. The project area encompasses portions of several historic mining districts.

Livestock operations arose in support of miners and later expanded as fluctuating mining populations stabilized and communities became more settled. With the creation of the National Forest Preserves in 1905, most of the project area became part of the Klamath National Forest. By the 1950s the timber industry assumed a prominent role in the use of the landscape. During its prominence, until the passage of environmental laws in the late 1960s and early 1970s, this industry extracted large volumes of timber from the Forest, the effects of which are still visible across the landscape. Recreation in the form of hunting, fishing, rafting, hiking, and camping has been and continues to be a key component of the land use within the project area.

Project Area A: Beaver Fire

There are eight recorded historic properties within the Beaver Fire Area of Potential Effect; seven are historic and one contains components of both historic and precontact time periods. There are approximately 2,600 acres that will be surveyed prior to project implementation. The Beaver Fire project area is entirely within the ancestral territory of Shastean people. At the time of publication, no Traditional Cultural Properties or Sacred Sites had been identified within this Area of Potential Effect. Once the Section 106 process is completed for an undertaking in this project area, an Archaeological Survey

Report will be prepared to document survey results, analysis of project effects and resolution of adverse effects, if needed.

Project Area B: Happy Camp Complex

There are forty-three recorded historic properties within the Happy Camp Complex Area of Potential Effect; thirty-seven are historic, four precontact, and two contain components of both historic and precontact periods. There are at least 4,300 acres that will be surveyed prior to project implementation. Approximately one third of the Happy Camp Complex project area is within the ancestral territory of the Karuk Tribe, approximately one third is within the ancestral territory of Shastean groups and about one third represents an area of overlap of the two group's ancestral territories. At the time of publication, no Traditional Cultural Properties or Sacred Sites had been identified within this Area of Potential Effect. The Karuk did bring forward a concern about an as yet unevaluated property of religious and cultural significance to the Tribe, however the Forest and the Tribe acknowledge that it is not necessary to fully identify and evaluate its eligibility under the stipulations of the forthcoming WFR Programmatic Agreement in order to project if during project implementation. Once the Section 106 process is completed for an undertaking in this project area, an Archaeological Survey Report will be prepared to document survey results, analysis of project effects and resolution of adverse effects, if needed.

Project Area C: Whites Fire

There are thirty-four recorded historic properties within the Whites Fire Area of Potential Effect; all of which date to the historic period. There are approximately 790 acres that will be surveyed prior to project implementation. Nearly three-quarters of the Whites Fire project area is within the ancestral territory of Shastean people and approximately one quarter is within Karuk ancestral territory. At the time of publication, no Traditional Cultural Properties or Sacred Sites had been identified within the Area of Potential Effect. Once the Section 106 process is completed for an undertaking in this project area, an Archaeological Survey Report will be prepared to document survey results, analysis of project effects and resolution of adverse effects, if needed.

Environmental Consequences

Using the analysis indicators outlined above, each alternative is considered based on the proposed management actions and the relative level of potential effects to historic properties and cultural resources. If an action alters in any way the characteristics that qualify the property or resource for inclusion on the National Register of Historic Places (NRHP), it is considered to have an effect. An effect can be direct or indirect, beneficial or adverse. Effects are "adverse" when the alterations diminish one or more of the seven elements of a historic property or cultural resource's integrity (location, design, setting, materials, workmanship, feeling, or association). The degree (level) to which the integrity is diminished by the proposed actions are classed into four categories that are based upon relative intensity – negligible, minor, moderate, major. A "no adverse effect" occurs when the project has an effect on the property or resource but is not harmful to the characteristics that qualify the resource for inclusion on the NRHP. A finding of "no adverse effect" may also occur if the effects of the proposed project can be reasonably predicted and project design features or Standard Resource Protection Measures can be used to avoid or minimize potential adverse effects to historic properties or cultural

resources. Standard Resource Protection Measures are provided in the Region 5 PA, Appendix E; additional project-specific Standard Resources Protection Measures are provided in the forthcoming WFR Programmatic Agreement.

Under the National Historic Preservation Act, Section 304 and the Archaeological Resources Protection Act of 1979, Section 9a, the disclosure of information revealing the location or character of historic or archaeological resources is prohibited when this information would open the resources or their settings to a substantial risk of harm, theft, or destruction. Therefore, discussion of the effects of this project is generalized into two types of historic properties and cultural resources rather than individual properties or resources. Project design features have been developed to protect these resources while not disclosing specific locations.

Alternative 1

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

Historic Properties

There would be no direct effects to historic properties because no management action would be implemented. However, there would also be no actions taken in the project area to reduce fire-weakened trees from within and around historic properties. Tree mortality, such as that resulting from wildfires, often puts historic properties at risk. When trees are left to fall naturally, these trees may damage or destroy site features or displace the same when uprooting (e.g. rock walls, house pits). The effects of tree fall are often compounded by erosion, which can bury or displace cultural deposits; increased fuel loading that increases fire intensity and the potential for artifact damage, destruction or permanent alteration; and accelerated decay as previously unexposed surfaces become exposed. Tree fall may also affect linear resources through erosion, and blowouts where culverts are plugged creating negative effects to morphological features. Therefore, a possible indirect adverse effect resulting from Alternative 1 is the continued risk of damage to sites from tree fall and the resultant fuel loading, erosion and decay. At particular risk are large scale historic mining sites (tens to hundreds of acres) consisting primarily of earthen and rock features (e.g. hydraulic headwalls, ditches, raceways, waste-rock piles, processed sediment deposits, roads, etc.).

Additionally, there would be no actions taken in the APE to reduce fuel loads within and around historic properties, which increases the potential of high intensity wildfire; wildfires can adversely affect historic properties. High temperatures and prolonged exposure to heat may affect artifacts and the ability to acquire relevant data (such as obsidian hydration readings) that would affect the information potential and hence NRHP potential of any given site. Fire is especially destructive to historic resources made of wood and some metals and would essentially destroy these materials, likely rendering a site ineligible for the NRHP. Therefore, a possible indirect adverse effect resulting from Alternative 1 is the continued risk of damage to sites from wildfire. The indirect, short-term effects to archaeological resources would be negligible but indirect, long-term effects would be moderate to major (adverse).

Cultural Resources

Depending on the particular cultural resource, no action may result in no effect or adverse effects of varying degrees. If no management actions are implemented, there would be no

direct effects. However, haphazard tree fall may limit access to traditionally used cultural resources. For example, if tribal people are unable to access traditionally used plant stands, subsistence opportunities may be reduced, as well as opportunities to manage these plant stands, and practice religious and cultural traditions. Traditional-use areas and plants will become degraded, resulting in the alteration of culturally important places which could impact the ability to sustain traditions and cultures. Tree fall may also change site-specific characteristics that influence growing conditions or habitat for some culturally significant plant species; or change fuel loading that may alter habitat if the area burns again.

Furthermore, no action would be taken in the project area to reduce fuel loads within and around cultural resources. Fire-adapted plant species (those that respond positively to fire) would not be enhanced without the use of low intensity prescribed fire in the project area; this indirect adverse effect would also result in the long-term degradation or loss of these species and a gradual loss of important plant gathering areas. The results of natural tree fall and the absence of fuels treatments are indirect adverse effects; these effects are moderate to major in both the short and long term.

Cumulative Effects

Historic Properties

Cumulative effects to historic properties would result not from tree fall, which like historic properties is location specific; rather they would result from the no action alternative in combination with actions in the reasonably foreseeable future that result in higher fuel loads within the larger landscape where the historic properties are located. Through time, as fuels loads increase around historic properties, high intensity fire would likely destroy structures and features of historic sites that would result in the loss of potential NRHP eligible districts. Combining taking no action in the project area with other wildfires that have burned or are likely to burn in the surrounding areas, would result in loss of data at precontact sites and would contribute to their deterioration. This has the potential to result in ineligibility for the NRHP. Emergency fire suppression activities may also have minor to major effects on historic properties as the level of suppression activities needed for larger and more intensive fires has greater potential for adversely effecting sites. The cumulative effects to historic properties under Alternative 1, the no action alternative, in combination with the no actions in the reasonably foreseeable future that would will be moderate to major (adverse.)

Cultural Resources

No actions are planned for the foreseeable future that will improve access to specific areas or increase opportunities for managing stands and practicing religious and cultural traditions within the Area of Potential Effects. In addition, effects from high intensity wildfires would accelerate over time, resulting in the loss of culturally significant gathering areas and plants, and could result in the loss of important settings and viewsheds, rendering them unsuitable for use in spiritual practices. The cumulative effects to cultural resources under Alternative 1, the no action alternative, in combination with the actions in the reasonable foreseeable future will be moderate to major (adverse.)

Project Area B: Happy Camp Complex

The effects of taking no action for the Happy Camp Complex are the same as summarized for the Beaver Fire area.

Project Area C: Whites Fire

The effects of taking no action for the Whites Fire area are the same as summarized for the Beaver Fire area.

Alternative 2

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

Salvage Harvest and Roadside Hazard Tree Removal:

Historic Properties

There would be no direct or indirect adverse effects to historic properties as the result of salvage harvest and roadside hazard tree removal because historic properties will be avoided by project activities, unless avoidance would inhibit the ability to achieve project objectives as identified in the purpose and need. In such cases, project activities may need to be conducted within site boundaries. If it is determined that project activities within sites are necessary, such activities will only be conducted in accordance with the project design features and the Standard Resource Protection Measures outlined in either the Region 5 PA or the forthcoming WFR Programmatic Agreement. For example, harvest activities within sites will be allowed when implemented from existing roads, as will the use of specific types of existing landing (e.g. located within the debris field of large hydraulic mines).

However, even when using Standard Resource Protection Measures and project design features to reduce the risk of adversely affecting historic sites, the potential for direct effects still exists if there is subsurface material present (when operating within the site boundaries). While a site locality is recorded to the archaeologist's best ability, the possibility of unrecorded material can still exist, especially if the site has not been evaluated. Limiting ground disturbance as much as possible within these sites can prevent potential subsurface artifacts, if present, from exposure, displacement, or damage.

Salvage harvest and roadside hazard tree removal from within and adjacent to historic properties benefits historic properties by reducing the hazards of natural tree fall. By salvaging trees rather than letting them fall naturally, there is more control over where a tree falls, which reduces the risk of damage and/or destruction of site features or displacement of the same when trees uproot. The removal of dead and dying trees from within and adjacent to historic properties results in direct and indirect beneficial effects; these effects are moderate to major in both the short and long term. However, when trees are removed from within historic properties, there is a risk of adverse effects due to equipment operating in the site boundaries. When trees are removed from within site boundaries, resource protection measures will be applied, which may result in negligible to minor effects over the short and long term. If protection measures will not sufficiently mitigate moderate to major adverse effects of harvesting trees within a site, then the process for resolving adverse effects will be followed as outlined in the forthcoming WFR Programmatic Agreement.

Cultural Resources

Depending on the particular cultural resource, salvage harvest and hazard tree removal may result in effects that vary in degree and may be beneficial or adverse. As with historic properties, removal of dead and dying trees from within and adjacent to cultural resources through harvest can benefit the resources by reducing the hazards of natural

tree fall by controlling where and how they fall. Trees may be removed in such a way as to influence site-specific growing conditions or habitat for culturally significant plant species; or change fuel loading that may benefit the habitat if the area burns again. Roadside salvage of hazard trees will allow continued and safer access to traditionally used cultural resources, providing opportunities for subsistence activities as well as practicing religious and cultural traditions. The results are direct and indirect beneficial effects; these effects are moderate to major in both the short and long term.

Direct or indirect adverse effects will be avoided or mitigated through the use of tribal monitors, tribal project design features and/or protection measures, and/or other methods developed through consultation. If it is determined that adverse effects cannot be avoided or mitigated through these means, then the process for resolution as specified in the forthcoming WFR Programmatic Agreement will be followed.

Fuels Reduction:
Historic Properties

There would be no direct effects to historic properties as the result of fuels reduction because actions would not be, for the most part, implemented within the boundaries of these sites. Prescribed fire will not occur within site boundaries, and other types of fuel reduction, if occurring in site boundaries will be conducted under the provisions of the Region 5 PA using Standard Resource Protection Measures. For example, brush in and around historic properties would be removed by hand, piled outside of the site boundaries and then burned.

The use of Standard Resource Protection Measures to reduce or mitigate adverse effects to historic properties may however foster conditions that result in indirect effects. By avoiding or not treating within site boundaries, a higher fuel load is left within the site compared to surrounding areas. Intense fire may damage or destroy combustible artifacts or permanently alter material susceptible to heat or flame within a site. Not only do “leave” areas increase the risk that future fires will burn with higher intensity within a site’s boundary, they direct the public’s attention to these areas which may result in increased looting and vandalism. These indirect effects to historic properties are minor in the short term but moderate to major in the long term (adverse). If adverse effects cannot be avoided or mitigated, the resolution process as specified in the forthcoming WFR Programmatic Agreement will be followed.

Cultural Resources

As with salvage harvest and hazard tree removal, project fuels treatments may result in effects to cultural resources that vary in degree and may be beneficial or adverse depending on the particular cultural resource. There will be direct beneficial effects to cultural resources when project fuels reduction occurs within or adjacent to cultural resources that respond well to low intensity prescribed fire or the removal of fuels by other means (e.g. hand, mechanical). For example, fire may reduce unwanted vegetation and stimulate the growth of useful species. As stated by the Karuk in consultation and conveyed by other tribes, “well managed fire provides gathering and food resources, provides forage for elk and cuts down on harmful bugs that damage resources important to people and animal, and provide a more productive and varied ecosystem.” Fuels reduction may occur within cultural resources identified by the tribes. To prevent adverse effects, tribal project design features or standard resource protection measures may be

developed, or tribes may request to have tribal monitors present when the fuels reduction activities are implemented within identified cultural resources. If it is determined that adverse effects cannot be avoided or mitigated through these means, then the process for resolution as specified in the forthcoming WFR Programmatic Agreement will be followed.

Site Preparation and Planting:
Historic Properties and Cultural Resources

Mechanical site preparation and planting activities create significant ground disturbance, which would result in direct adverse effects to historic properties and cultural resources, if allowed to occur within their boundaries. As such, Standard Resource Protection Measures and project design features will be used to prevent these activities from occurring within the boundaries of historic properties and any identified cultural resources. There will be no direct or indirect adverse effects as the result of site preparation and planting, in either the short or the long term to historic properties or identified cultural resources.

Cumulative Effects
Historic Properties
The cumulative effects from salvage harvest and hazard tree removal under this project, in combination with salvage harvest and hazard tree removal considered under projects in the foreseeable future will have a cumulative beneficial effects on historic properties as natural tree fall and fuel loads are reduced adjacent to and within some historic properties. Reducing fuels under this project, in combination with similar types of other projects already implemented or implemented in the reasonably foreseeable future will result in a cumulatively beneficial effect to historic properties, except in cases where properties are avoided and no treatments are implemented; in these cases there will be moderate to major cumulative effects (adverse). The adverse cumulative effects result from the increased number of historic properties that become islands of higher fuels loads where fires burn more intensely and become visual islands that attract looters and vandals. There are no cumulative effects from site prep and planting as these activities will not occur within the boundaries of historic properties.
Cultural Resources

The cumulative effects from salvage harvest and hazard tree removal under this project, in combination with salvage harvest and hazard tree removal considered under projects in the foreseeable future, will have a cumulative beneficial effects on cultural resources. As natural tree fall and fuel loads are reduced, continued and safer access to traditionally used cultural resources, opportunities for subsistence activities as well as practicing religious and cultural traditions are provided. The cumulative effects of fuels reduction to cultural resources under the proposed actions and actions in the reasonable foreseeable future will be cumulative beneficial effect to those identified cultural resources that were treated. During consultation, all tribes conveyed the benefits to their resources that result from reducing fuels. There will be no cumulative effects as a result of site prep and planting, as these activities will not occur within identified cultural resources.

Project Area B: Happy Camp Complex
Direct Effects and Indirect Effects

The effects of salvage/roadside hazard and fuels treatments in the Happy Camp Complex fire area in Alternative 2 are the same as described for the Beaver Fire area.

Site Prep and Plant:
Cultural Resources

Planting, but not site prep, may have an adverse effect on Karuk cultural resources within Karuk aboriginal territory in the Happy Camp Complex, if plantations are established in areas inconsistent with the historic forest character, and if fire is not allowed within the plantations. The Karuk have stated during consultation that they believe fire suppression and past general patterns and practices of establishing conifer plantations has increased the probability of large, uncharacteristic fires and has resulted in a homogenized forest structure. Furthermore, they have stated in consultation and in the Draft Karuk Tribe Department of Natural Resources Eco-Cultural Resources Management Plan that this forest structure is not reflective of pre-contact forests that were more diverse and perpetuated subsistence food resources, medicines, and materials critical to maintaining the integrity of Karuk Culture. As captured in consultation with the Karuk, the direct and indirect effects of planting to Karuk cultural resources are minor in the short term, but both are major in the long term and all are adverse. Adverse effects to Karuk cultural resources from all project activities are being mitigated through the forthcoming WFR Programmatic Agreement, Stipulation II. If adverse effects cannot be mitigated through these means, then the process for resolution as specified in the forthcoming WFR Programmatic Agreement will be followed.

Cumulative Effects

The cumulative effects of salvage/roadside hazard and fuels treatments in the Happy Camp Complex fire area in Alternative 2 are the same as described for the Beaver Fire area. The effects on Karuk cultural resources within Karuk ancestral territory have changed to reflect input from the Karuk during consultation on the establishment of conifer plantations. Even if the plantations considered under this project are limited, the cumulative effect of these plantations in combination with recent planting and planting considered under projects in the foreseeable future, the cumulative effects may be adverse on individual cultural resources. Adverse effects to Karuk cultural resources from all project activities are being mitigated through the forthcoming WFR Programmatic Agreement, Stipulation II. If adverse effects cannot be mitigated through these means, then the process for resolution as specified in the WFR Programmatic Agreement will be followed.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

The effects of salvage/roadside hazard and fuels treatments in the Whites Fire area in Alternative 2 are the same as described for the Beaver Fire area.

Site Preparation and Planting:
Cultural Resources

The effects of site prep and planting are the same for cultural resources in the Whites Fire area as described in Alternative 2 for the Happy Camp Complex area.

Cumulative Effects

The cumulative effects of salvage/roadside hazard and fuels treatments in the Whites Fire area in Alternative 2 are the same as described for the Beaver Fire area. The cumulative effects on Karuk cultural resources within Karuk aboriginal territory in the White's Fire

area in Alternative 2 are the same as described in Alternative 2 for the Happy Camp Complex area.

Alternatives 3, 4, 5, Modified Alternative 2, and Modified Alternative 3

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

The direct and indirect effects of alternatives 3, 4, 5, modified Alternative 2, and modified Alternative 3 are essentially the same as the effects described under Alternative 2 for the Beaver Fire area.

Cumulative Effects

The cumulative effects of alternatives 3, 4, 5, modified Alternative 2, and modified Alternative 3 are essentially the same as the effects described under Alternative 2 for the Beaver Fire area.

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

The direct and indirect effects of alternatives 3, 4, 5, modified Alternative 2, and modified Alternative 3 are essentially the same as the effects described under Alternative 2 for the Happy Camp Complex area.

Cumulative Effects

The cumulative effects of alternatives 3, 4, 5, modified Alternative 2, and modified Alternative 3 are essentially the same as the effects described under Alternative 2 for the Happy Camp Complex area.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

The direct and indirect effects of alternatives 3, 4, 5, modified Alternative 2, and modified Alternative 3 are essentially the same as the effects described under Alternative 2 for the Whites Fire area.

Cumulative Effects

The cumulative effects of alternatives 3, 4, 5, modified Alternative 2, and modified Alternative 3 are essentially the same as the effects described under Alternative 2 for the Whites Fire area.

Karuk Alternative

Project Area A: Beaver Fire

Direct Effects, Indirect Effects, and Cumulative Effects

The Karuk alternative did not propose any activities for the Beaver Fire area; therefore, the direct and indirect effects of the Karuk alternative are essentially the same as the effects described under Alternative 1, the no action alternative.

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

Historic Properties

The direct and indirect effects of the Karuk alternative are essentially the same for salvage harvest, roadside hazard tree removal, and site prep and planting as the effects

described under Alternative 2 for the Happy Camp Complex area. However, the amount of fuels reduction proposed under the Karuk alternative is substantial, and therefore, increases the scale of potential adverse effects on historic properties as described in Alternative 2 for the Happy Camp Complex, If adverse effects cannot be avoided or mitigated, then the process for resolution as specified in the forthcoming WFR Programmatic Agreement will be followed.

Cultural Resources

The direct and indirect effects of the Karuk alternative are essentially the same for salvage harvest and roadside hazard tree removal as the effects described under Alternative 2 for the Happy Camp Complex area. There would be no direct or indirect effects from site prep and planting, as none of these activities are proposed in the Karuk alternative. However, the amount of fuels reduction in the Karuk alternative is substantial, which would result in beneficial effects to Karuk cultural resources in Karuk aboriginal territory on the landscape level, in both the short and long term.

Cumulative Effects

The cumulative effects of salvage harvest and roadside hazard in the Happy Camp Complex fire area in the Karuk alternative are the same as described for the Beaver Fire area. No site prep and planting are proposed in the Karuk alternative, so there would be no cumulative effects. Cumulative effects from fuels reduction under this project, in combination with fuels reduction considered under projects in the foreseeable future, would have a beneficial effect on Karuk cultural resources on the landscape level. However, the number of "leave" areas resulting if historic properties are avoided under this project in combination with future projects, increases the risk of high intensity fire to more properties, and increases the risk of looting and vandalism to the same.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

The direct and indirect effects of the Karuk alternative are essentially the same as the effects described under the Karuk alternative for the Happy Camp Complex area.

Cumulative Effects

The cumulative effects of the Karuk alternative are essentially the same as the effects described under the Karuk alternative for the Happy Camp Complex area.

Comparison of Effects

Under Alternative 1, there will be no direct effects to historic properties or cultural resources because no management action would be implemented. However, there would also be no actions taken in the project area to reduce fire-weakened trees or reduce fuel loads from within and around historic properties or cultural resources. The indirect, short-term effects to historic properties would be negligible but indirect, long-term effects would be moderate to major (adverse). The indirect short and long-term effects to cultural resources would be moderate to major (adverse).

Under Alternatives 2, 3, 4, 5, modified Alternative 2, and modified Alternative 3, there will be no direct adverse effects from project activities in the short or long term to historic properties; there will be direct beneficial effects (moderate to major) as the result of salvage harvest and roadside hazard tree removal. There may be indirect adverse

effects if historic properties are avoided, these effects are minor in the short term but moderate to major in the long term. Indirect beneficial effects(moderate) result in both the short and long term as the likelihood of damage and destruction to historic properties is decreased through project activities.

Under Alternatives 2, 3, 4, 5, modified Alternative 2, and modified Alternative 3, there will be *direct beneficial effects* to cultural resources that are moderate to major in both the short and long term; *direct or indirect adverse effects* will be avoided or mitigated through the use of tribal monitors, tribal project design features and/or protection measures, and/or other methods developed through consultation. If it is determined that adverse effects cannot be avoided or mitigated through these means, then the process for resolution as specified in the WFR Programmatic Agreement will be followed.

Under the Karuk alternative, in the Beaver Fire area, there will be no direct effects *to historic properties or cultural resources because no management action would be implemented. However, there will also be no actions taken in the project area to reduce fire-weakened trees or reduce fuel loads. As a result, there would be* negligible indirect effects *to historic properties in the short-term, but* adverse indirect effects *in the long-term that will be moderate to major. There would be* adverse indirect effects *to cultural resources in the short and long-term that will be moderate to major short and long-term.*

Under the Karuk alternative, in the Happy Camp Complex and White's Fire areas, there will be no *direct adverse effects* from project activities in the short or long term to historic properties; there will be *direct beneficial effects* (moderate to major) in the short and long-term as the result of salvage harvest and roadside hazard tree removal. There may be *indirect adverse effects* if historic properties are avoided, these effects are minor in the short term but moderate to major in the long term. *Indirect beneficial effects* result in both the short and long term as the likelihood of damage and destruction to historic properties is decreased through project activities.

Under the Karuk alternative, in the Happy Camp Complex and White's Fire areas, there will be *direct beneficial effects* to cultural resources that are moderate to major in both the short and long term. *Direct or indirect adverse effects* will be avoided or mitigated through the use of tribal monitors, tribal project design features and/or protection measures, and/or other methods developed through consultation. If it is determined that adverse effects cannot be avoided or mitigated through these means, then the process for resolution as specified in the forthcoming WFR Programmatic Agreement will be followed.

The *cumulative effects* to historic properties and cultural resources under Alternative 1, the no action alternative, in combination with the no actions in the reasonably foreseeable future will be moderate to major (*adverse*.)

Under Alternatives 2, 3, 4, 5, modified Alternative 2, and modified Alternative 3, *beneficial cumulative effects* (moderate to major) will result to historic properties as natural tree fall and fuel loads are reduced, except in cases where properties are avoided and no fuels treatments are implemented; in these cases there will be *adverse cumulative effects* (moderate to major). There will be *beneficial cumulative effects* on cultural resources as the result of these alternatives.

Under the Karuk alternative*, beneficial cumulative effects* (moderate to major) will result to historic properties, except in cases where properties are avoided and no fuels treatments are implemented; in these cases there will be *adverse cumulative effects* (moderate to major). There will be *beneficial cumulative effects* on cultural resources as the result of this alternative.

Compliance with law, regulation, policy, and the Forest Plan

All action alternatives adhere to applicable heritage resource laws, regulation, policy, and the Forest Plan. Documentation of the effects of each alternative in this report meets legal compliance. The Forest Plan consistency checklist, displayed on the project website, identifies the Forest Plan Standards and Guidelines that apply to this project and related information about compliance with the Forest Plan.

The Native American Graves Protection Act of 1990; Executive Order 13007, entitled Indian Sacred Sites; and Executive Order 13175, entitled Consultation and Cooperation with Indian Tribal Governments, among others, provide direction on the protection of tribal cultural resources in federal land management decisions. Both federally recognized and non-federally recognized tribes were contacted early in project planning and were engaged throughout the planning process, in accordance with the National Historic Preservation Act, NEPA and other laws, regulations, and policy. Tribal Engagement is summarized in chapter 1, *Public Involvement*. Consultation was conducted with the Karuk Tribe, Quartz Valley Indian Reservation, the Confederated Tribes of the Siletz, and the Confederated Tribes of the Grand Ronde. The Forest conferred with the Shasta Indian Nation and the Shasta Nation, Inc.

Written and verbal comments received during tribal consultation were considered when refining the proposed action and while developing project alternatives; many tribal concerns were incorporated in these alternatives. Consultation with the tribes regarding the proposed project is on-going.

Social and Economic Environment

The purpose of this section is to analyze the effects of the Westside Fire Recovery project on rural social and economic health, and identify any disproportionately high and adverse human health or environmental effects to minorities and disadvantaged groups in Siskiyou County. Safety is an important value to people in Siskiyou County; therefore, one purpose of this analysis is to gain a better understanding of how safety relates to the purpose and need of this project and its proposed actions. In particular, how safety of local residents, the recreating public, and forest workers such as firefighters and planting contractors are affected by the treatments being proposed. Social and economic analysis and effects cannot effectively be displayed by fire area (Beaver, Happy Camp and Whites) because most of the data and information are measurable and understandable only at the county level.

Methodology

Social

Information from federal data sources is used to compare the social status of Siskiyou County to the State of California and the United States to provide background information for effects of the project on minorities and disadvantaged groups. The

Economic Profile System – Human Dimensions Toolbox which compiles statistics from federal data sources is used as the source of information for this analysis.

Economic

Economic effects are analyzed using information from a customized version of an input-output model that summarizes inter-industry production and consumption for each state and county in the United States (IMPLAN). Since the data sources and methods used by IMPLAN are approximations of reality that sometimes contain substantial departures relative to actual conditions in the state or county, a customized model was developed (SCFSM) in 2012. This model customizes the standard Siskiyou County IMPLAN model to provide a more reliable representation of Siskiyou County's forest sector. It was developed primarily to support defensible analysis of the economic impacts of national forest projects in Siskiyou County and is used in the analysis of the Westside Fire Recovery project. More information on both the SCFSM and IMPLAN models is provided in the body of, and appendix to, the Socio-economic resource report.

Analysis Indicators

Social Environment

Social analysis is based on the quality of life of people affected by this project. Quality of life depends partly on the ability of people to sustain themselves and their families which is analyzed in the economic portions of this document. The indicators used for the social analysis include lifestyles, values, beliefs, and health and safety of individuals and communities. For this project, three measures are used for evaluating the effects of the project on quality of life for Siskiyou County residents:

- The value of using the resources of the Forest, and project area in particular, for the benefit of county residents (Siskiyou County Land and Resource Management Plan 1994). This will be analyzed using the estimated volume of timber products the alternatives will produce.
- Changes to the "fire-safe character of communities" in the project area. This will be analyzed using the acres of fuels treatments in each alternative. It is assumed that fuels treatments have the indirect effect of creating more fire-safe communities.
- Safety for Forest workers, firefighters and the public. This is estimated by the number of acres on which standing dead trees are removed by salvage harvest and by the number of miles and acres of roadside hazard trees removed (for those who use roads in and through the project area). Also see the discussion about resistance to control regarding fire suppression tactics in the Fire and Fuels section of this Chapter 3.

Additional assumptions made in this analysis include that it is probable that any portion of the project area will be accessed by the public, firefighters or Forest workers. Hazard trees can directly harm a person or property but can also pose an indirect hazard such as blocking access to or from portions of the Forest or to major escape routes during storms or future wildfires.

Economic Environment

The Forest Plan includes a Forest-wide goal to promote the economic stability of local communities (Forest Plan page 4-9). Economic analysis indicators for this report are:

1. total economic outputs;
2. labor income (wages and proprietor's income);

3. number of jobs created;
4. revenue generated based on the estimated volume from timber sale units; and
5. project revenue estimated to be returned to Siskiyou County.

Spatial and Temporal Context

Siskiyou County is used as the spatial analysis area for social effects and for fiscal effects (timber receipts) because the project area is entirely within the county. The model used to analyze other economic effects takes into account impacts within a four-county area including Siskiyou, Shasta and Trinity counties in California and Jackson County in Oregon because the project's direct economic effects through the veneer manufacturing, logging, log hauling and forestry support services are realized throughout this larger area. The three fire-related project areas are used as the spatial analysis area for effects to safety because treatments proposed to improve safety are entirely within these project areas.

This analysis considers one to eight years as the short-term time period for effects analysis on safety and other social and economic indicators. This temporal bounding approximates when treatments will be completed and most fire-killed trees are likely to fall, and when treatments will be completed and products from implementation will have entered the wood products market. More than ten years is the long-term time period for effects analysis on safety and other social and economic effects.

Affected Environment

Social Environment

In terms of safety, the following conditions describe the affected environment:

- Trees killed or severely burned by wildfire (i.e. snags) are often unstable and at risk for falling or snapping off, especially during winter snow, rain, and high wind events.
- Infrastructure, including utility lines, roadways, bridges, trailheads, campgrounds, and fire lookouts within the project area, are surrounded by fire-killed and damaged trees and preexisting danger trees that pose a hazard to the public and Forest workers. As a result of the 2014 fires, infrastructure, including utility lines, roads, bridges, trailheads, campgrounds, and fire lookouts within the project area are surrounded by fire-killed and damaged trees and preexisting danger trees that pose a hazard to the public and Forest workers and restrict access. About 650 miles of roadways are affected.
- Dead and dying trees within proposed salvage harvest areas present a safety hazard to firefighters (should the area burn again) or others who may recreate or work in these areas.
- A high probability of future high-intensity wildfires (due to heavy fuel loading from existing fire-killed timber) threatens structures and presents a safety hazard to nearby residents and firefighters (should the area burn again). Progressively increasing fuel loads (where potential flame lengths exceed four feet) provides conditions in which fires are resistant to suppression tactics.

The closest communities to this project are the communities of Happy Camp, Seiad Valley, Yreka, Fort Jones, Etna, Klamath River, Scott Bar, Hamburg, and Sawyers Bar. Social effects of the project, including safety concerns, will be most noticeable in these communities and the surrounding rural areas of the county.

The Siskiyou County population consists of Caucasian, African American, American Indian, Hispanic, Asian, Native Hawaiian or Pacific Islander, and other races. The

American Indian population is a greater percentage of the population in Siskiyou County than in the State of California; therefore, potential impacts of management actions on the American Indian population will be disclosed. The American Indian tribes and resources important to the tribes are described in the cultural resources section of this chapter. A larger percentage of the population of Siskiyou County is unemployed or below the poverty line than in the state of California; the impacts of the project on low-income populations in Siskiyou County will also be disclosed.

Lifestyles, attitudes, beliefs and values of Siskiyou County residents are similar to those of rural residents in other counties in the western United States. Many local residents depend on the environment to support them, and they want forest products to be used for the benefit of the county. Conditions related to safety have changed in the last few years due to high intensity wildfires that have left many acres of the Forest in an unsafe condition and are of particular concern to communities within and adjacent to the project area boundaries.

Economic Environment

Labor income in Siskiyou County has held relatively constant since 1970; non-labor income has been on a steady rise.

From 1970 to 2011, employment grew from 14,085 to 20,224 jobs, a 44 percent increase from 1970. Since 1990, the annual unemployment rate ranged from a low of 7.5 percent in 2000 to a high of 16.6 percent in 2010. Siskiyou County unemployment rates tend to be higher than the rest of the United States.

In 1998, timber represented more than seven percent of total employment of Siskiyou County but by 2011, timber represented five percent of total employment, mirroring the trend in the United States as a whole. Jobs in the timber sector in the county decreased to 410 jobs in 2011. “Although National Forests account for more than 60 percent of the county’s land base, the share of the county’s timber harvest off federal lands has decreased from roughly 50 percent to less than 20 percent since the northern spotted owl was listed as threatened in 1990. Since 1990, the number of wood products manufacturing facilities in the county has declined by half” (Dennis 2012).

Siskiyou County has limited sawmilling (i.e., lumber production) capacity compared to the other counties in the four-county region. The main log-processing facilities in Siskiyou County are veneer mills. Siskiyou County’s veneer mills typically purchase relatively low-value logs and may produce relatively high-value wood products compared to sawmills. More information on the economic environment is provided in the body of, and appendix to, the Socio-economic resource report.

Environmental Consequences

Alternative 1

Direct Effects and Indirect Effects

Social and Economic

Under this alternative no project treatment activities are proposed. The social effects of this alternative will be a continuation of the current distribution of jobs among racial and ethnic groups. Alternative 1 will not contribute to timber employment jobs and the

county's economic situation will not be improved. The effects of this alternative on traditional-use areas are disclosed in the cultural resource section of this chapter and the effects on cultural plant collecting areas are disclosed in the botany section. Although there are some effects on these populations, there will be no disproportionately high and adverse human health or environmental effects on American Indians or the poor.

The lifestyles, values and beliefs of the people in Siskiyou County will not be changed and the request that resources of the Forest be used to benefit local residents will not be fulfilled. The concern regarding the fire-safe character of the communities will not be addressed because no project-related fuels treatments will be implemented.

The effect on safety of implementing Alternative 1 will be that no burned acres will be treated and no miles of roadside hazard trees will be removed in this project at this time. If roadside hazard trees are to be treated to remove safety hazards, this will take place in the future and be dependent on future budget allocations. This delay will increase the likelihood that forest workers, firefighters, or public users of Forest land will be injured by a fire-killed or hazard tree as time goes on and the trees deteriorate and fall down. Because no roadside hazard trees will be removed in this project at this time, safe travel on roads within the fire area will be hindered year after year due to new trees falling into the roads or roads may need to be closed for various periods of time to assure public safety which will affect public access to the Forest. Fallen trees in the road may also delay the response of firefighting personnel to new wildland fires in and around the project area. Safety for Siskiyou County as a whole will decrease since the project area represents about 10 percent of the Siskiyou County land base.

Without treatment, hazards would not be abated around critical infrastructure.

- Salvage treatments would not be accomplished. Without salvage harvest, snags would continue to decay, break, and fall. This would increase surface fuel loading, which will increase the severity and intensity of future fires. Increased fire intensities and dead and decaying standing trees would inhibit the effective control of future fires and/or put fire suppression crews at increased risk. (See fuels and vegetation sections in this chapter.)
- Reforestation of burned forested areas would not be accomplished with this or any other project, since planting crews cannot safely operate in areas of dead and decaying standing trees. It is a violation of Office of Safety and Health Administration codes to plant or treat hazardous fuels under, or adjacent to, snags. Since there would also be fewer funds available from timber contract receipts, the opportunity to restore forested habitat through site preparation and reforestation work would be lost.
- In the short term, Forest workers such as firefighters, planters, researchers, and surveyors would either risk working in conditions that may subject them to injury or death from fallen snags or would not work in the areas because the areas would be deemed unsafe for work. In the long term, jack-strawed conditions from fallen snags would impede effective travel through areas of high to moderate severity burns, which would put workers at increased risk or eliminate their ability to work in the areas.
- In the short and long term, no treatment of hazard trees along roadways and nearby infrastructure would increase safety risks to forest workers and the public. The number of fallen snags along roadways would be innumerable –far too many to be addressed by fire crews and through permitted public fuelwood removal. To mitigate safety risks to the public, Forest Orders may be needed temporarily to close road access to portions of the Forest, which would impact public access (see the Recreation section of this chapter).

- In the long term, increased fire intensities and the continued existence of dead and decaying standing trees would inhibit the effective control of future fires and/or put fire suppression crews at increased risk. See the Fire and Fuels section of this chapter for details.

Cumulative Effects

Ongoing and reasonably foreseeable future actions in the project area are listed in appendix C. Some current and reasonably foreseeable future projects, including projects with hazard tree and fuels treatments, will improve safety conditions for the public and forest workers. Alternative 1 would not add to cumulative effects of other present and/or reasonably foreseeable future projects that are planned to improve safety across the landscape. Additionally, because of access issues resulting from fallen snags along roadways, difficulties may preclude future projects from either continuing or being planned due to the high density of snags within or adjacent to the project area. Using fire as a management tool in both the planned (prescribed fire) and unplanned setting may not meet desired resource objectives due to future fuel loading potential as well as the hazard, cost and time needed to remove decaying hazard trees from planned control lines. This will be a limiting factor in future prescribed fire activities.

For cumulative social and economic effects of indicators other than safety, all current and reasonably foreseeable similar actions within Siskiyou County over the next eight years were considered; for this analysis, it is assumed that actions in the four-county area will be similar to those in Siskiyou County. Future foreseeable actions on National Forest System land within Siskiyou County are available on the Forest Service Schedule of Proposed Actions website: http://www.fs.fed.us/sopa/. These projects include the Salmon Salvage, Two Bit, Jess, Hotelling Roadside Hazard, Crawford, McCollins Late Successional Reserve, Eastend, Craggy, and Lover's Canyon projects on the west side of the Forest, Big Pony, Ruffed Grouse, Butte Mountain, Little Deer, Landlord, Pumice, Six Shooter, and Harlan projects on the eastside of the Forest, and the Harris project on the Shasta Trinity National Forest. A list of planned Timber Harvest Plans for California can be found at:
http://calfire.ca.gov/resource_mgt/resource_mgt_forestpractice_thpreviewprocess.php.

Since it is difficult if not impossible to obtain detailed information on the amount of harvest expected or the economic value of such harvest, it is assumed that timber harvest on private lands will continue at a rate similar to the past. There are also a number of salvage projects on private land covered by exemptions from requiring a timber harvest plan.

Implementation of Alternative 1 will neither support nor add to the demand for timber industry jobs and its related industries employment. Adding the social and economic effects of these projects to the effects of Alternative 1 will not result in substantial social or economic cumulative effects.

Alternative 2

Direct Effects and Indirect Effects

Social

The social effects of this alternative will include more jobs available for Siskiyou county residents from the 1,236 additional jobs provided and a continuation of the current

distribution of jobs among racial and ethnic groups. The effects of this alternative on traditional-use areas are disclosed in the cultural resource section of this chapter and the effects on cultural plant collecting areas are disclosed in the botany section. Although there are some effects on these populations, there will be no disproportionately high and adverse human health or environmental effects on American Indians or the poor.

The lifestyles, values and beliefs of the people in Siskiyou County include some fulfillment of the desire that resources of the Forest be used to benefit local residents. The concern regarding the fire-safe character of the communities will be addressed through fuels treatments on ridges and near communities.

Treatments that will improve safety conditions within the project area include: roadside hazard treatments, hazardous fuels treatments, and salvage harvest treatments.

Hazard trees along almost 650 miles of roads and other infrastructure, including campgrounds, fire lookouts, trailheads, and bridges would be treated. Since roadside hazard tree treatments are buffered to 250 feet on either side of the road, these treatments incorporate bridges, campgrounds, fire lookouts, and trailheads. Treatments will abate hazard trees along roadways and other infrastructure, improving safety conditions for the public and forest workers. Hazard tree treatments along roadways are critical for providing safe and effective access for the public and forest workers. Treatments are also proposed along utility corridors where needed to protect infrastructure and improve conditions for fire suppression tactics. The removal of fire-killed trees and other hazard trees from around local communities, key infrastructure, and roads would also provide fire managers with improved options for effectively managing potential future wildfires.

Salvage harvest on 7,940 acres within 11,700 acres of salvage units would reduce safety hazards, promoting improved safety conditions for public and forest workers, including but not limited to firefighters, planters, and surveyors. Safety conditions and suppression effectiveness for firefighters are improved by removing fire-killed trees before they fall and become “jack-strawed.” Removing fire-killed trees helps make foot travel feasible and removes fuel build-up.

Hazardous fuels treatments within fuel management zones (i.e. fuel breaks) and the wildland urban interface treatments also improve safety conditions for firefighters and improve suppression tactics around local communities, improving the safety conditions of local residents. Although fire plays an important role in the ecosystem, reducing these fuel loads minimizes the intensity and severity of future fires, thus improving the likelihood of firefighting success.

Proposed treatments decrease the likelihood that forest workers, firefighters, or public users of Forest land will be injured by a fire-killed or hazard tree as time goes on and the trees deteriorate and fall down. Safety for Siskiyou County as a whole will increase since the project area represents about 10 percent of the Siskiyou County land base.

Economic

Economic effects of Alternative 2 include an economic output of $210,206,000, labor income value of $53,107,000, and employment increased by 1,236 jobs. Timber revenues from implementing this alternative are estimated at $11,892,000 and returns to Siskiyou County at $2,973,000 based on 25 percent of timber revenue receipts. Wholesale veneer value is estimated as $98,700,000, logging costs at $33,140,000 and hauling cost at

$10,515,000. Required costs to restore the project landscape through site preparation, planting and fuels reduction are estimated as $36,460,000. If all the timber revenue is used to support restoration, this revenue would provide about 33% of the funding required for the fire recovery. The rest of the costs would need to be provided through appropriated funds or other sources.

Cumulative Effects

As noted above, implementation of Alternative 2 will have measureable social and economic effects on Siskiyou County; adding the social and economic effects of the ongoing and reasonable foreseeable future projects identified in Alternative 1 to the effects of Alternative 2 will result in noticeable social and economic cumulative effects, especially in the timber sector. Since this sector is such a small part of the economy of Siskiyou County, overall cumulative effects to the county are not expected to be substantial. In terms of safety, projects will) improve safety conditions for the public and forest workers, especially those with hazard tree and fuels treatments. Treatments proposed in this project would supplement other present and/or reasonably foreseeable future projects that are planned to improve safety across the landscape. Roadside hazard treatments proposed in this project would provide access to other future projects within or adjacent to the project area, providing access for treatments. Using fire as a management tool in both the planned (prescribed fire) and unplanned settings would meet desired resource objectives due to lower future fuel loading potential and fewer hazards, providing conditions to improve the likelihood of suppression effectiveness. See the Fire and Fuels section of this chapter for details.

Alternative 3

Direct Effects and Indirect Effects

Social

Social effects will be similar to those of Alternative 2 except that (1) safety will be affected by 6,590 acres of salvage logging within 9,600 acres of salvage units; and (2) 1,067 jobs are expected to be created. Effects of this alternative to improving safety will be similar to Alternative 2 except that 5,800 acres will have large fuels removed through salvage harvest.

Economic

Economic effects of Alternative 3 include an economic output of $185,381,000, labor income value of $46,523,000, and employment increased by 1,067 jobs. Timber revenues from implementing this alternative are estimated at $9,851,000 and returns to Siskiyou County at $2,463,000 based on 25 percent of timber revenue receipts. Wholesale veneer value is estimated as $87,000,000, logging costs at $29,807,000 and hauling cost at $9,260,000. Required costs to restore the project landscape through site preparation, planting and fuels reduction are estimated as $29,310,000. If all the timber revenue is used to support restoration, this revenue would provide about 34% of the funding required for the fire recovery. The rest of the costs would need to be provided through appropriated funds or other sources.

Cumulative Effects

As noted above, implementation of Alternative 3 will have measureable social and economic effects on Siskiyou County; adding the social and economic effects of the ongoing and reasonable foreseeable future projects identified in Alternative 1 to the effects of Alternative 3 will result in noticeable social and economic cumulative effects, especially in the timber sector. Since this sector is such a small part of the economy of Siskiyou County, overall cumulative effects to the county are not expected to be substantial.

Alternative 4

Direct Effects and Indirect Effects

Social

Social effects will be similar to those of Alternative 2 except (1) safety will be affected by 6,910 acres being salvage logged within 10,200 acres of salvage units; and (2) 1,074 jobs are expected to be created. Effects of this alternative to improving safety will be similar to Alternative 2 except that 5,900 acres will have large fuels removed through salvage harvest.

Economic

Economic effects of Alternative 4 include an economic output of $189,564,000, labor income value of $47,338,000, and employment increased by 1,074 jobs. Timber revenues from implementing this alternative are estimated at $9,586,000 and returns to Siskiyou County at $2,396,000 based on 25 percent of timber revenue receipts. Wholesale veneer value is estimated as $88,900,000, logging costs at $30,940,000 and hauling cost at $9,463,000. Required costs to restore the project landscape through site preparation, planting and fuels reduction are estimated as $29,500,000. If all the timber revenue is used to support restoration, this revenue would provide about 32% of the funding required for the fire recovery. The rest of the costs would need to be provided through appropriated funds or other sources.

Cumulative Effects

As noted above, implementation of Alternative 4 will have measureable social and economic effects on Siskiyou County; adding the social and economic effects of the ongoing and reasonable foreseeable future projects identified in Alternative 1 to the effects of Alternative 4 will result in noticeable social and economic cumulative effects, especially in the timber sector. Since this sector is such a small part of the economy of Siskiyou County, overall cumulative effects to the county are not expected to be substantial.

Alternative 5

Direct Effects and Indirect Effects

Social

Social effects will be similar to those of Alternative 2 except that (1) safety will be affected by 2,360 acres being salvage logged within 3,400 acres of salvage units and an additional 1,200 acres adjacent to private property will have fuels reduced; and (2) 549 jobs are expected to be created.

Economic

Economic effects of Alternative 5 include an economic output of $83,752,000, labor income value of $21,932,000, and employment increased by 549 jobs. Timber revenues from implementing this alternative are estimated at $6,334,000 and returns to Siskiyou County at $1,583,000 based on 25 percent of timber revenue receipts. Wholesale veneer value is estimated as $39,500,000, logging costs at $11,712,000 and hauling cost at $4,214,000. Required costs to restore the project landscape through site preparation, planting and fuels reduction are estimated as $25,802,000. If all the timber revenue is used to support restoration, this revenue would provide about 24% of the funding required for the fire recovery. The rest of the costs would need to be provided through appropriated funds or other sources.

Cumulative Effects

As noted above, implementation of Alternative 5 will have reduced social and economic effects on Siskiyou County compared to Alternative 2; adding the social and economic effects of the ongoing and reasonable foreseeable future projects identified in Alternative 1 to the effects of Alternative 5 will result in minor social and economic cumulative effects. Since this sector is such a small part of the economy of Siskiyou County, overall cumulative effects to the county are not expected to be substantial.

Alternative 2 Modified

Direct Effects and Indirect Effects

Social

Social effects will be similar to those of Alternative 2 except that (1) safety will be affected by 7,070 acres of salvage logging within 9,720 acres of salvage units; and (2) 1,076 jobs are expected to be created. Effects of this alternative to improving safety will be similar to Alternative 2 except that 6,010 acres will have large fuels removed through salvage harvest.

Economic

Economic effects of Alternative 2 Modified include an economic output of $178,788,000, labor income value of $45,474,000, and employment increased by 1,076 jobs. Timber revenues from implementing this alternative are estimated at $10,820,000 and returns to Siskiyou County at $2,705,000 based on 25 percent of timber revenue receipts. Assuming all timber from the project is manufactured into veneers, wholesale veneer value is estimated as $84,510,000, logging costs at $27,166,000 and hauling cost at $9,000,000. Required costs to restore the project landscape through site preparation, planting and fuels reduction are estimated as $26,985,000. If all the timber revenue is used to support restoration, this revenue would provide about 40% of the funding required for the fire recovery. The rest of the costs would need to be provided through appropriated funds or other sources.

Cumulative Effects

As noted above, implementation of Alternative 2 will have measureable social and economic effects on Siskiyou County; adding the social and economic effects of the ongoing and reasonable foreseeable future projects identified in Alternative 1 to the

effects of Alternative 2 Modified will result in noticeable social and economic cumulative effects, especially in the timber sector. Since this sector is such a small part of the economy of Siskiyou County, overall cumulative effects to the county are not expected to be substantial.

Alternative 3 Modified

Direct Effects and Indirect Effects

Social

Social effects will be similar to those of Alternative 2 except that (1) safety will be affected by 5,760 acres of salvage logging within 6,890 acres of salvage units; and (2) 900 jobs are expected to be created. Effects of this alternative to improving safety will be similar to Alternative 2 except that 5,760 acres will have large fuels removed through salvage harvest.

Economic

Economic effects of Alternative 3 Modified include an economic output of $153,153,000, labor income value of $38,419,000, and employment increased by 887 jobs. Timber revenues from implementing this alternative are estimated at $10,133,000 and returns to Siskiyou County at $2,533,000 based on 25 percent of timber revenue receipts. Assuming all timber from the project is manufactured into veneers, wholesale veneer value is estimated as $73,342,000, logging costs at $23,360,000 and hauling cost at $7,811,000. Required costs to restore the project landscape through site preparation, planting and fuels reduction are estimated as $27,487,000. If all the timber revenue is used to support restoration, this revenue would provide about 37% of the funding required for the fire recovery. The rest of the costs would need to be provided through appropriated funds or other sources.

Cumulative Effects

As noted above, implementation of Alternative 3 Modified will have some social and economic effects on Siskiyou County; adding the social and economic effects of the ongoing and reasonable foreseeable future projects identified in Alternative 1 to the effects of Alternative 3 Modified will result in social and economic cumulative effects, including some in the timber sector. However, overall cumulative effects to the county are not expected to be substantial.

Comparison of Effects

The project's economic effects on Siskiyou County and the four-county region will be largest under the Alternative 2, about 12 percent smaller under Alternatives 3 and 4, 14 percent smaller under Alternative 2 Modified, 25 percent smaller under Alternative 3 Modified, and about 50 percent smaller under Alternative 5. The relative contributions of timber harvesting and landscape restoration to the project's economic effects are given by their relative monetary values.

Table 3-63 displays a comparison of the social and economic effects of alternatives.

Table 3-63: Comparison of Social and Economic Effects of Alternatives

Indicator	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 2 Mod.	Alt. 3 Mod.
Economic Output	$0	$210,206,000	$185,381,000	$189,564,000	$83,752,000	$178,788,000	$153,153,000
Labor Income	$0	$53,107,000	$46,523,000	$47,338,000	$21,932,000	$45,474,000	$38,419,000
Employment (Jobs)	0	1,236	1,067	1,074	549	1076	887
Timber Sale Revenue	$0	$11,892,000	$9,851,000	$9,586,000	$6,334,000	$10,820,000	$10,133,000
Meets local social value for use of resources (potential revenue to county)	$0	$2,973,000	$2,463,000	$2,396,000	$1,583,000	$2,705,000	$2,533,000
Fuels Management Zone Acres	0	4,810	4,810	4,810	6,020	4,890	4,930
Roadside Fuels Treatment Acres	0	4,420	4,420	4,420	4,420	4,420	5,710
Wildland Urban Interface Treatment Acres	0	2,220	2,220	2,220	2,220	2,220	2,630
Salvage Harvest Treatment Acres	0	7,940	6,590	6,910	2,360	7,070	5,760
Maximum Roadside Hazard Treatment Acres	0	20,500	20,500	19,580	20,500	20,500	14,320

All action alternatives will address priority treatment areas for safety. Consequently, effects to safety are only incrementally different among action alternatives, differing only by the acres of salvage harvest treatments proposed.

Compliance with law, regulation, policy and the Forest Plan

Actions are consistent with the Forest Plan. Forest Plan management goals and standards and guidelines related to safety include providing:

- an economical, safe, and environmentally sensitive transportation system for the Forest. Emphasize the maintenance and restoration of existing roads over the construction of new roads where appropriate (Forest Plan, page 4-8);
- administrative sites and facilities that effectively and safely serve the public and accommodate the workforce. Provide facilities with barrier-free access (Forest Plan, page 4-8); and

- an economical, safe, and environmentally sensitive transportation system for the Forest. Emphasize the maintenance and restoration of existing roads over the construction of new roads where appropriate. Provide administrative sites and facilities that effectively and safely serve the public and accommodate the workforce. Provide facilities with barrier-free access. (Forest Plan, page 4-37).

Forest Plan management direction related to other social and economic indicators is to:

- assist rural, forest-dependent communities with efforts to enhance their economic stability and social vitality (Forest Plan, page 4-65);
- work with local community leaders and individuals to provide opportunities for the development of natural resource-based enterprises (Forest Plan, page 4-65); and
- consider rural development options and opportunities in resource decisions that may assist rural communities in achieving long-term economic development stability and quality of life (Forest Plan, page 4-66).

All alternatives will be consistent with law, regulation, and policy, including Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (1994), USDA Departmental Regulation 5600-002 on Environmental Justice, and the Forest Plan in relation to the social and economic environment as displayed in the Forest Plan consistency checklist.

Scenery

Methodology

This evaluation applies current National Forest Landscape Management methodology in conjunction with existing Forest Plan direction. It relies on geospatial information system (GIS) analysis, field studies of similar types of projects, as well as field observations from sensitive viewpoints, computer modeling to determine visibility of project activities, and consideration of public preferences for scenic quality. This evaluation relies on the following assumptions:

- ASSUMPTION 1: Wildfires are a natural ecological process that commonly occurs on the Forest, and as such their effects to scenery are perceived as natural. Associated fire suppression activities (i.e. fire breaks) could be perceived as management activities.
- ASSUMPTION 2: Project activities proposed in Modification and/or Maximum Modification Visual Quality Objective areas would typically meet their assigned visual quality objectives. Frequently activities in these visual quality objective areas are not visible from any high or moderate sensitivity viewpoints, or if they are, at middle-ground or background distances.
- ASSUMPTION 3: The North Fork Salmon River road (1C01) was used as a proxy for visibility from the North Fork Salmon River. State Highway 96 was used as a proxy for visibility from the Klamath River. The Scott River road (7F01) was used as a proxy for visibility from the Scott River. Differences in elevation, adjacent vegetation, topographic screening, slope position, and horizontal alignments were factors considered in determining visibility and effects from the river perspective.
- ASSUMPTION 4: Because of a highly accelerated timeline to complete project analysis, winter weather conditions limiting access, and a multitude of potential viewpoints to consider for scenery effects, a computer model was used to determine visibility of project activities from sensitive viewpoints. The visibility analysis has been updated with field verification.
- ASSUMPTION 5: Sensitive viewpoints which are linear in nature, such as trails, roads, or rivers did not utilize the computer model. The visibility assessment was based on previous

experience, on-the-ground knowledge, and map reviews. The visibility analysis has been updated with field verification.

- ASSUMPTION 6: Analysis was based upon professional judgment and experience of a landscape architect with 25 years of Forest Service scenery evaluation experience. Based on professional judgment, it is estimated that the project has an 85-90 percent probability of successfully meeting or exceeding Visual Quality Objectives as predicted. See the "Visual Resource Management" section in 2013 Forest Plan Monitoring Report for more information.

The general process for a scenery evaluation follows:

6. Determine high or moderate sensitivity viewpoints located within or adjacent to the project area from which the project may be visible.
7. Extensive/intensive office review of project descriptions and maps; assessing project activity locations (orientation, slope position, distance from viewer, etc.), logging systems, combined with on-the-ground knowledge of topography and vegetation.
8. Seven field reviews were conducted of project area, focusing on project activities located in Retention and Partial Retention Visual Quality Objective areas.
9. Individual project activities were evaluated for their visibility from high or moderate sensitivity routes. Noticeable changes from project activities to existing landforms and vegetation are evaluated in terms of form, line, color, and texture contrasts. Utilizing professional expertise, the overall visual dominance and degree of noticeable contrast to the existing scenic character is then compared against the Visual Quality Objectives which define levels of acceptable visual change. A judgement call of "meet," "not meet," or "exceed" the assigned visual quality objective is then made.
10. To minimize scenery effects, project design features were developed; these are in Chapter 2 of this Final Environmental Impact Statement. Recreation and scenery project design features were designed to minimize or mitigate the effects of all action alternatives on recreation and scenery resources.
11. Cumulative effects to scenery were evaluated within a larger context than the individual project activities themselves, considering the potentially affected viewsheds as a whole.

Analysis Indicators

Analysis indicators used to determine the effects of alternatives on scenery include:

Scenic Character

The overall visual impression or image that gives a geographical area its identity. Scenic character is a qualitative description of the combination of vegetative patterns, landforms, water characteristics, and cultural features. The existing scenic character description provides a basis for comparing changes from alternatives and desired scenic character.

Visual Quality Objectives

Define levels of acceptable visual change, and are identified in the Forest Plan. The visual quality objectives for the project area are defined below and listed by management area below:

- Retention visual quality objective - management activities are not visually evident to the casual Forest visitor.
- Partial Retention visual quality objective – management activities may be noticeable, but are subordinate to the characteristic landscape.
- Modification visual quality objective - management activities appear altered and dominate yet reflect nearby natural features.
- Maximum Modification visual quality objective - management activities appear strongly altered and dominate but appear as natural occurrences when viewed at distances greater than 5 miles.

Spatial and Temporal Context

The spatial scale for analysis of effects to scenery includes the viewsheds from the Forest Plan-identified sensitive viewing locations. The temporal scale is defined as three years for short-term effects, at which time projects are required to meet their assigned visual quality objectives (except Maximum Modification which is immediate). These timeframes are required by Forest Plan Standards and Guidelines. Long-term effects are defined as ten years or longer.

Affected Environment

Scenic Quality of or within National Forests is valued for the aesthetic enjoyment and physiological benefits it offers. “Viewing Natural Features” and “Viewing Wildlife” are the second and third respectively, most popular recreation activities of visitors to the Klamath National Forest (USDA 2012). Scenic quality within the project areas is important to the people who live and work in the area and to Forest visitors. Both of these groups travel through the areas, enjoying views from State, County, and Forest roads, and while recreating on National Forest lands, trails, rivers, or roads. The scenery of these areas contributes an important part to the Forest’s scenic resources.

Other recreational use in the project area consists of dispersed-type recreation such as hiking, equestrian, camping, hunting, and woodcutting (see the Recreation section of this chapter and the Recreation resource report). Scenery is an important component that affects recreation use, setting, and the recreation experience.

Viewsheds of the Project Areas

Table 3-65 displays a list of all the potential viewpoints located in/or near the three project areas that project activities could be visible from. A total of 62 potentially affected viewpoints were identified for the three project areas: Beaver Fire (9 viewpoints), Happy Camp Complex Fire (34 viewpoints), and Whites Fire (19 viewpoints). The scenery assessment of project activities uses these viewpoints. The distance zone listed identifies the closest project activity from the viewpoint. A high visual sensitivity means the visitors have a high level of interest in the scenery. Viewpoints that have a moderate visual sensitivity are usually secondary County or Forest roads with moderate use.

Existing Scenic Character

Scenic Character is the overall visual impression or image that gives a geographical area its identity. The overall scenic character consists of steep, rugged mountainous terrain which is bisected by major rivers and tributary creeks. These creeks are flanked by mid-

elevation, steep terrain with numerous side drainages. The mountains are overlain with largely continuous, mixed conifer forest canopies. There are breaks in the forest canopy from previous wildfires, rock outcrops, meadows, roads, and older harvest activities are evident. In the background, more open higher elevation ridges and peaks provide a visual backdrop.

Vegetation is diverse in both pattern and species, with the Douglas-fir/white fir mixed conifer forest being most dominant. Conifer species include ponderosa pine, sugar pine, incense cedar, and white fir. Also, common is the Douglas-fir/tanoak community where Douglas-fir dominates the overstory with hardwoods found in the understory such as canyon live oak, black oak, white oak, pacific madrone, and big leaf maple. The hardwoods are slowly being overtopped by the conifers and declining in numbers. Some forested areas are extremely dense, where wildfires have been artificially suppressed for at least 50 years. This density of vegetation not only obstructs in-canopy views to the forest floor, but provides ladder fuels thereby increasing the risk of extreme wildfire events. Streams display extremely high water clarity. Air quality is high, with coastal moisture occasionally adding clouds and haze to the typical clear views under blue skies.

The scenic character of the project areas was substantially affected by the 2014 fire season, as described in Chapter 1 of this draft EIS. The fires burned with high severity in many areas, creating standing dead trees, blackened tree boles and brush skeletons, bare soil, and dying trees with brown needles. The fire opened up views into the forest, exposing hillsides, bare soil, and rock outcrops. In many places the once green forest now looks like blackened toothpicks, while ocassionally some green trees survived the fire.

Existing Scenic Integrity

Scenic integrity is the relative degree of natural appearance displayed by a landscape. In the three project areas, current scenic integrity as viewed from inventoried sensitive viewpoints is as follows: 1) Some limited evidence of existing roads, fire breaks, plantations, and past and on-going logging units. 2) Vegetation and/or topography screen most of these management activities except when in the immediate vicinity of the activity or from distant viewpoints. Cumulatively, across the project areas as a whole, the alterations are minor, and generally a near-natural appearance dominates. Therefore the project areas have Moderate Scenic Integrity and meet a Partial Retention visual quality objective as defined in the Forest Plan.

Desired Scenic Character

The ideal, socially valued Scenic Character of the Westside project area would display a more attractive, forested condition. These conditions would include increased vegetative and spatial variety throughout a largely continuous but more open and irregular forest canopy, with more frequent small, irregular openings and edges. There would be a widepread presence of large trees as individuals and clumps, features such as outcrops, rocks and barrens, meadows, irregular patches of native shrubs, forbs and grasses in openings and forest floor understories, scattered standing snags, scattered irregular fire-killed canopy openings containing clumps of standing dead trees over a green surface of conifer seedlings. This more open forest canopy would support attractive views through the forest canopy as well as to more distant mountainous landscapes.

Management Direction

Management direction for Scenery comes from the Forest Plan primarily under Standards and Guidelines for the Visual Resource Management Program and Retention and Partial Retention visual quality objective Management Areas 11 and 15 respectively. However a visual quality objective is identified in the Forest Plan for *all* National Forest lands; hence each Management Area lists the appropriate visual quality objective in a Standard and Guideline under the "Visual Resource Management" subheading. Table 2 displays visual quality objectives of Management Areas in which activities are proposed in this project.

For the Klamath Wild and Scenic Designated Recreational River (Management Area 13), a Retention visual quality objective supersedes the Partial Retention visual quality objective because Highway 96 is an eligible State Scenic Highway.

For General Forest lands (Management Area 17), a Modification or Maximum Modification visual quality objective is utilized. The location of these visual quality objectives was determined using criteria from the Visual Resource Management System. A majority of General Forest lands have a Modification visual quality objective.

Table 3-64: Desired Visual Quality Objective by Management Area (per Forest Plan)

		Visual Quality Objective (Vqo)*				
Forest Plan Management Area		Preservation	Retention	Partial Retention	Modification	Maximum Modification
Ma-5	Special Habitat			X		
Ma-7	Special Interest Area		X[1]			
Ma-10	Riparian Reserves			X		
Ma-11	Retention Visual Quality Objective		X			
Ma-12	Designated And Recommended Scenic Rivers		X			
Ma-13	Designated And Recommended Recreational Rivers		X[2]	X		
Ma-15	Partial Retention Visual Quality Objective			X		
Ma-17	General Forest				X	X

* Visual quality objective(s) are specifically identified by a Standard and Guideline for each Management Area.

[1] Per Forest Plan "Manage these areas to meet the intent of the Forest visual quality objective map. As a minimum, manage the lands within the areas to meet a Retention visual quality objective."

[2] Retention visual quality objective designated elsewhere in Forest Plan for State Scenic Highways may supersede Partial Retention visual quality objective.

Table 3-65: Identified potential viewpoints, sensitivity level, and distance zone by project area.

Potential Viewpoint(s)	Visual Sensitivity Level	Distance Zone
Beaver Fire		
State Highway 96 (State of Jefferson Scenic Byway)	High	Foreground
Klamath Wild and Scenic River	High	Foreground
Klamath River community	High	Foreground
Gottville River Access	High	Foreground
Brown Bear River Access	High	Foreground
Beaver Creek Road (8J01/11)	Moderate	Foreground

Potential Viewpoint(s)	Visual Sensitivity Level	Distance Zone
Beaver Creek Campground	Moderate	Foreground
Pipeline Gap/Deer Camp Road* (40S01)	Moderate	Foreground
Buckhorn Bally Lookout*	Moderate	Foreground
Happy Camp Complex		
State Highway 96 (State of Jefferson Scenic Byway)	High	Foreground
Klamath Wild and Scenic River	High	Foreground
Klamath River community	High	Foreground
Hamburg	High	Foreground
Seiad	High	Foreground
Happy Camp	High	Foreground
O'Neil Creek Campground	High	Foreground
Sarah Totten Campground	High	Foreground
Curly Jack Campground	High	Foreground
Lake Mountain Lookout*	High	Foreground
Gordon's Ferry River Access	High	Foreground
Indian Creek River Access	High	Foreground
Scott River road (7F01)	High	Foreground
Scott Wild and Scenic River	High	Foreground
Johnson Bar River Access	High	Foreground
Scott Bar	High	Foreground
Sugar Pine Trail	High	Foreground
Townsend Gulch River Access	High	Foreground
Gold Flat River Access	High	Foreground
Tompkins River Access	High	Foreground
Lake Mountain Trail	Moderate	Foreground
Scott Bar Lookout*	Moderate	Middleground
Box Camp Trailhead	Moderate	Middleground
Paradise Trailhead	Moderate	Middleground
Grider Creek road (46N66, 46N24X)	High	Foreground
Grider Creek Campground	High	Foreground
Grider Creek (Recommended Wild and Scenic River)	High	Foreground
Pacific Crest Trail	High	Middleground
Cold Springs Trailhead	High	Foreground
Tyler Meadows Trailhead	High	Foreground
Elk Creek road (7C001)	Moderate	Foreground
Elk Creek (Recommended Wild and Scenic River)	Moderate	Foreground
Bear Creek Trailhead road (16N05, 15N06)	Moderate	Foreground
Bear Creek Trailhead	High	Foreground
Whites Fire		
Sawyers Bar Road (FH102)	Moderate	Foreground
Sawyers Bar	High	Foreground
South Russian Creek (recommended Wild and Scenic River)	Moderate	Foreground
Timber Camp Trailhead	Moderate	Foreground
Timber Camp Trailhead road (36N58, 36N15)	Moderate	Foreground
Pacific Crest Trail	Moderate	Middleground
Hogan Lake Trail	Moderate	Middleground
Snoozer Trail	Moderate	Foreground
Tanner Peak Trail	Moderate	Foreground
Mule Bridge Road (41N36)	Moderate	Foreground

Potential Viewpoint(s)	Visual Sensitivity Level	Distance Zone
North Fork Salmon Wild and Scenic River	Moderate	Foreground
Music Creek Trailhead	Moderate	Foreground
South Russian Creek Trailhead	Moderate	Foreground
Idlewild Campground	Moderate	Foreground
Mule Bridge Trailhead	Moderate	Foreground
Eddy Gulch Lookout*	Moderate	Middleground
Eddy Gulch Lookout road (39)	Moderate	Foreground
East Whites Gulch Trail*	Moderate	Foreground
South Russian Creek Trail*	Moderate	Foreground

* Viewpoints identified as a sensitive viewpoint post-Forest Plan and as such were not utilized in the development of Forest Plan visual quality objectives. Post-Forest Plan viewpoints are not required to meet S and G 11-1, but should be considered during project planning.

Environmental Consequences

Alternative 1

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

Alternative 1 would result in direct short- and long-term adverse effects to scenic character. In the short term, evidence of the fire with standing dead trees, blackened tree boles and brush, bare soil, and dying trees with brown needles or leaves would continue to be quite noticeable. Along many viewpoints, most screening vegetation has lost all needles or leaves, opening up views into the forest of bare soils, streams, and rock outcrops. Trees with burnt roots would start falling down. In two to three years, some brushes and grasses would return to the burn areas providing some green color, texture, and ground cover.

Decay and wind disturbance would lead to the smaller diameter, fire-killed trees falling down within the first ten years, with the majority of all trees falling down within the next 20 years (Russell et al. 2006). Standing trees would provide visual clues of the past fires for decades. As dead trees fall, the scenic character of areas once-forested would change becoming much more open. Extremely high fuel loads would develop creating a landscape that is susceptible to a high intensity, high severity fire. In many areas these conditions would likely create a long term vegetation change away from a conifer-dominated vegetation type towards a shrub-dominated ecosystem.

Without both harvest and replanting treatments within the project areas, current conditions would likely result in increased growth of brush. The competing brush, combined with a limited seed source would inhibit the natural regeneration of conifer species that dominated the landscape prior to the fires. The desired scenic character of a forested canopy with large tree character, as well as increased species diversity would be adversely affected. Without management treatments, achievement of the desired condition for scenery would be set back 50 plus years or more.

Visual Quality Objectives establish acceptable levels of alteration for management activities. For Alternative 1, there would be no effects to the Visual Quality Objectives because no project activities will be implemented.

Cumulative Effects

Several other private land parcels within the project area have been or are proposed for salvage logging. Removal of all dead trees would create texture contrasts with adjacent forested lands. If trees are removed up to and along straight property boundaries, these line contrasts would likely be noticeable from some sensitive viewpoints.

Other ongoing and future foreseeable actions on the Forest include projects with vegetation treatments such as commercial thinning, pre-commercial thinning, and mastication. Most projects also include a fuels treatment component such as underburning, thinning of small diameter understory trees or brush, piling, and pile burning. All of these projects would affect scenery, creating both short- and long-term beneficial effects to scenic character. Densely forested areas would be opened up (thinned); this more open forest canopy would support attractive views through the forest canopy as well as to more distant mountainous landscapes. Fuels treatments would increase the resiliency of the areas to high intensity wildfires and help to perpetuate ecologically established scenery. These projects would create noticeable visual contrasts in the short term and likely be visible from some sensitive viewpoints. In two-three years after project completion, “greening up” these activities would appear near-natural. Adding the effects of these projects to the effects of Alternative 1 on scenic character would have minor cumulative effects.

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

The direct and indirect effects are the same as for the Beaver Fire area.

Cumulative Effects

The cumulative effects are the same as for the Beaver Fire area.

Project Area C: White Fire

Direct Effects and Indirect Effects

The direct and indirect effects are the same as for the Beaver Fire area.

Cumulative Effects

The cumulative effects are the same as for the Beaver Fire area.

Alternatives 2, 3, 4 and 5

Because of minor differences between alternatives, the analysis description for all four alternatives has been combined into one section. The four action alternatives propose hazardous fuels treatments, salvage harvest, roadside hazard treatments, and reforestation (site preparation, planting, and release). See the Scenery report amendment for details on the acres affected by fire area and for each alternative.

Direct Effects and Indirect Effects

Visibility Analysis

The analysis indicated most viewpoints would have visibility of two project treatments or more; three viewpoints would not have visibility of any activities.

Salvage Harvest

The removal of dead and dying trees would create large openings with line and texture contrasts with adjacent burned or forested areas. Individual larger snags and clumps with no treatment would be retained for wildlife resources. These would provide some texture to the units when viewed from sensitive viewpoints. Logging systems can further influence the noticeable visual contrasts by the disturbances they create. Helicopter creates the least visual contrasts; skyline creates linear contrasts from log skidding and cable corridors; and ground-based creates more color contrasts from soil disturbance by equipment and log skidding. The actual acres of harvest that will occur within individual salvage harvest units is reduced with the inclusion of riparian reserves. These no cut areas will benefit scenery resources by visually breaking up units and reducing their size/scale and by adding texture. The assessment of effects to scenery considers these inclusions.

Roadside Hazard Treatments

The removal of both merchantable and non-merchantable hazard trees along system roads and through treatment units, would “open up” travel corridors in those areas where a higher number of trees are removed. In other areas where only individual or isolated trees are removed, there would be little change or effect to overall scenic character. Ground disturbance, tree stumps, and trees felled and left would be noticeable in the short term. A recovery time of three years would allow seasonal leaf and needle cast, weathering (graying) of tree stumps and chips, and resprouting of vegetation or “greening up” to soften these effects.

Hazardous Fuels Treatments

These treatments would occur along strategic ridgelines, roads, or control lines. Trees would be removed (12 inches in diameter at breast height or less) and other understory vegetation by mechanical, machine, or hand work. Slash would be piled and burned, lop and scattered, or chipped. Remaining trees would be pruned up to seven feet. The short-term visual impacts from felling and piling dead trees and then burning would create color and texture soil contrasts. Removing understory vegetation and tree pruning would open views into the forest and of the forest floor. Fuels breaks along visible ridgelines would create longer-term linear contrasts. A recovery time of three years would allow seasonal leaf and needle cast, weathering (graying) of tree stumps and chips, and resprouting of vegetation or “greening up” to soften these effects.

Prescribed Fire

The short term visual impacts from underburning would create brown vegetation, red tree crowns, blackened duff layer, and scorched trunks. Scraping control lines to mineral soil would create linear disturbances. Recovery times of three years would allow revegetation or “greening up” of many of the burn effects. At that point, any residual effects from the underburn would appear as a natural occurrence, consistent with the many wildfires that have occurred throughout the Forest. Underburning would create long term positive effects such as the creation of more open stands where forest visitors can look into stands, larger trees and wildlife can be observed by travelers, greater species diversity, and increased resiliency of the stand to wildfire. This activity would easily meet all assigned visual quality objectives and help meet (Standard and Guideline 11-4) to perpetuate the Forest’s ecologically established landscape character.

Site Preparation, Planting and Release (Reforestation)

Planting in areas previously stocked (pre-fire) with conifers, combined with rocky or unplantable sites, and tree survival rates, would provide spatial variability across the project areas. This would speed up recovery of burned areas to a mostly forested condition with some openings and appear natural in the long term. This would be consistent with the Desired Scenic Character to a forested condition.

Visual Quality Objectives

Table 3-66: Preliminary Results of Meeting or Not Meeting visual quality objective by Alternative by Treatment Type.

All Alternatives and Treatment Type	Does Treatment Type Meet visual quality objective? (Yes or No)			
	Retention	Partial Retention	Modification	Maximum Modification
Fuels Treatments	Y	Y	Y	Y
Salvage Harvest	N*39	Y/N*	Y	Y
Roadside Hazard	N*	Y/N*	Y	Y
Prepare Site and Plant	Y	Y	Y	Y

Minor localized short-term direct adverse effects to visual quality objectives from management treatments would occur during project implementation with the presence of equipment, smoke, stumps, exposed soils, and cut and/or piled vegetation.

Retention visual quality objective areas

Salvage harvest and roadside hazard treatments in Retention visual quality objective areas would likely not meet the Retention visual quality objective – where management activities are not visually evident to the casual Forest visitor. However an exception is allowed under Forest Plan Standards and Guideline 11-7 which states "In the case of recovery activities after extreme catastrophic events such as intense wildland fires, time periods to achieve the visual quality objectives stated in Forest-wide and Management Area Standards and Guidelines may be extended. This would be necessary where previously unnoticed scenery alterations are exposed to view due to loss of vegetative screening, or during timber salvage activities where recovery of forest vegetation is determined to be of greater importance than achievement of visual quality objectives within the time periods established."

Partial Retention visual quality objective areas

Salvage harvest and roadside hazard treatments in the foreground distance zone along hiking trails would likely not meet the Partial Retention visual quality objective in three years – where management activities may be noticeable, but are subordinate to the characteristic landscape. The presence of high stumps and tree marking paint (if used) would be noticeable to hikers for 10 years or more. This includes units bisected by both the Lake Mountain and Bear Creek trails.

Although this appears inconsistent with Forest Plan Standards and Guidelines numbers MA15-1, MA15-5, and MA15-10, an exception is allowed under Forest Plan Standards and Guideline 11-7 which states "In the case of recovery activities after extreme catastrophic events such as intense wildland fires, time periods to achieve the visual quality objectives stated in Forest-wide and Management Area Standards and Guidelines may be extended. This would be necessary where previously unnoticed scenery alterations are exposed to view due to loss of vegetative screening, or during timber

[39] *= Not meeting a visual quality objective in the three year timeframe is inconsistent with Forest Plan Standards and Guidelines numbers MA12-7 and MA13-6. However, an exception is allowed under Forest Plan Standards and Guidelines number 11-7 which states "In the case of recovery activities after extreme catastrophic events such as intense wildland fires, time periods to achieve the visual quality objectives stated in Forest-wide and Management Area Standards and Guidelines may be extended. This would be necessary where previously unnoticed scenery alterations are exposed to view due to loss of vegetative screening, or during timber salvage activities where recovery of forest vegetation is determined to be of greater importance than achievement of visual quality objectives within the time periods established."

salvage activities where recovery of forest vegetation is determined to be of greater importance than achievement of visual quality objectives within the time periods established."

All other project activities (including salvage units not located in foreground distance zones along hiking trails) would likely meet their assigned visual quality objective of Partial Retention in three years. A recovery time of three years would allow seasonal leaf and needle cast, weathering (graying) of tree stumps and chips, and resprouting of vegetation or "greening up" to soften these effects. Thus project activities would appear near-natural to Forest visitors.

Thus in the long-term these project activities (salvage harvest and roadside hazard treatments in the foreground distance zone along hiking trails) and all other project activities would appear near-natural to Forest visitors and meet a Partial Retention visual quality objective. Forest Plan direction would be met.

Modification and Maximum Modification visual quality objective areas

All activities would meet their assigned visual quality objectives within Forest Plan timelines. These activities are located either in middleground or background distance zones from sensitive viewpoints and appear as a natural occurrence or not visible.

However cumulative scenic quality effects are evaluated in a larger context than the individual project activities themselves - the potentially affected viewsheds as a whole. The scenery analysis area includes the multitude of viewsheds throughout the project areas. When viewed from multiple viewpoints, proposed management activities in all viewsheds would be appear visually subordinate to the characteristic landscape. All viewsheds would be natural or near-natural appearing and meet or exceed a Partial Retentionvisual quality objective.

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

Highway 96 State of Jefferson Scenic Byway: Additional field review indicates that project activities (fuels treatments, roadside hazard) visible from Highway 96 State of Jefferson Scenic Byway would not be noticeable and meet a Retention visual quality objective. Roadside hazard treatments occur primarily along County Road 8G004 located on the south side of the Klamath River 100-150 feet from Highway 96. The highway's curvilinear nature, travel speed of 55 MPH, and vegetative screening would likely limit the duration of view to a few seconds. A recovery time of three years would allow seasonal leaf and needle cast, weathering (graying) of tree stumps and chips, and resprouting of vegetation or "greening up" to soften these effects. Therefore travelers probably would not notice these treatments and the viewshed would not be adversely effected.

Klamath Wild and Scenic River: These same roadside hazard treatments (mentioned above), would likely be noticeable to floaters and fishermen in some locations because of their closer proximity to the disturbances and slower rate of travel. Existing riverside vegetation would screen some effects. Project treatments would still be noticeable in some locations; up to six areas totaling 3.5 miles and likely not meet a Retention visual

quality objective in the three year timeframe. Continued "greening up" for five – ten years would allow additional resprouting and growth of vegetation to hide these effects.

All Other Viewsheds Listed in Table 3-67 not discussed above: There would be no adverse effects to all other viewsheds (listed below) from project treatments. All assigned visual quality objectives would be met. Treatments would either be not visible, not noticeable in Retention visual quality objective areas, or noticeable in Partial Retention/Modification/Maximum Modification visual quality objective areas. The disturbances associated with various project activities such as soil disturbance, stumps, burnt vegetation, etc. would recover in three years' time with seasonal leaf and needle cast, weathering (graying) of tree stumps and chips, and resprouting of vegetation or "greening up. Hence all activities would appear near natural and easily meet their assigned visual quality objectives.

In summary, the Klamath Wild and Scenic River would not meet its assigned visual quality objective within the three year timeframe and visual quality objectives would be met for the other eight viewsheds.

Table 3-67: Visibility of Project Treatments From Sensitive Viewpoints for Beaver Fire Areas.

Potential Viewpoint(s)	Visual Sensitivity Level	Project Area	Fuels Treatments	Salvage Harvest	Roadside Hazard Treatments	Site Preparation and Planting
		Is the project area or activity potentially visible from the scenic viewpoint40?				
Beaver Fire						
State Highway 96 (State of Jefferson Scenic Byway)	High	Y	Y	N	Y	N
Klamath Wild and Scenic River	High	Y	Y	N	Y	N
Klamath River community	High	Y	Y	N	N	N
Gottville River Access	High	Y	Y	N	N	N
Brown Bear River Access	High	N	N	N	N	N
Beaver Creek Road (8J01/11)	Moderate	Y	Y	N	Y	Y
Beaver Creek Campground	Moderate	Y	Y	N	N	Y
Pipeline Gap/Deer Camp Road* (40S01)	Moderate	Y	Y	Y	Y	Y
Buckhorn Bally Lookout*	Moderate	Y	Y	Y	Y	Y

Cumulative Effects

[40] Based upon a combination of computer modeling, map review, on-the ground knowledge, and field verification.

Several other private land parcels within the project area have been or are proposed for salvage logging. Removal of all dead trees would create texture contrasts with adjacent forested lands. If trees are removed up to and along straight property boundaries, these line contrasts would likely be noticeable from some sensitive viewpoints.

Other ongoing and future foreseeable actions on the Forest include projects with vegetation treatments such as commercial thinning, pre-commercial thinning, and mastication. Most projects also include a fuels treatment component such as underburning, thinning of small diameter understory trees or brush, piling, and pile burning. All of these projects would affect scenery, creating both short- and long-term beneficial effects to scenic character. Densely forested areas would be opened up (thinned); this more open forest canopy would support attractive views through the forest canopy as well as to more distant mountainous landscapes. Fuels treatments would increase the resiliency of the areas to high intensity wildfires and help to perpetuate ecologically established scenery. These projects would create noticeable visual contrasts in the short term and likely be visible from some sensitive viewpoints. In two-three years after project completion, "greening up" these activities would appear near-natural. Adding the effects of these projects to the effects of Alternative 1 on scenic character would have minor cumulative effects.The cumulative effects of grazing does not affect the overall visual quality objectives because cattle are a temporary and seasonal use and rangeland improvements are minimal and are typically limited to fencing.

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

Klamath Wild and Scenic River: Roadside hazard, fuels treatments, and salvage harvest units are proposed within the river corridor. These activities would likely be noticeable to floaters and fishermen in three to four locations (estimated 2 miles) because of their wider field of view and slower rate of travel (than Highway 96). Riverside vegetation would screen some effects. Project treatments would likely not meet a Retention visual quality objective in the three year timeframe. Continued "greening up" for five – ten years would allow additional resprouting and growth of vegetation to hide these effects.

Grider Creek Campground: Salvage harvest units (numbers 61 and 62-1) are proposed for Alternatives 2, 3, and 4 within close proximity of the campground and are prominently located on adjacent hillsides. Roadside hazard treatments are proposed along the access road (number46N24X) and the campground loop road (Alternatives 2-5). Green trees provide substantial screening throughout most of the campground, but project treatments would be noticeable to campers in the northern loop (horse corral) area and likely not meet a Retention visual quality objective in the three year timeframe. Continued "greening up" for five – ten years would allow additional resprouting and growth of vegetation to hide these effects.

Grider Creek (recommended Wild & Scenic River): Portions of salvage harvest units (numbers 61 and 62-1) and roadside hazard treatments are proposed for Alternatives 2, 3, and 4 within the river corridor near Grider Creek Campground. The PCT is also located in this area of the river corridor. Project treatments would be highly noticeable to hikers only when in the immediate vicinity of these two units, and likely not meet a Retention visual quality objective in the three year timeframe. Continued "greening up" for five –

ten years would allow additional resprouting and growth of vegetation to hide these effects.

Although several salvage harvest units located in the Grider Creek recommended Wild and Scenic river corridor were removed for Alternative 5, this was overlooked in the Draft analysis. However, the inclusion of roadside hazard treatments (7 acres) in Grider Creek for Alternative 5 would still have noticeable effects (only when in the immediate vicinity) and likely not meet the Retention visual quality objective within three years. Continued "greening up" for five – ten years would allow additional resprouting and growth of vegetation to hide these effects. Therefore the viewshed of Grider Creek would be adversely affected for all four alternatives.

Pacific Crest Trail (between north boundary of Marble Mountain Wilderness and Forest road 45N72X): Two mapping discrepancies were discovered during field reviews for the project and are displayed in Figures 7 and 8 of the Recreation amendment.

Using the revised trail alignment data shown on Figure 7 in the Recreation Amendment, for Alternatives 2-4 the PCT bisects a roadside hazard treatment at the Cold Spring Trailhead, then skirts harvest unit number224 for approximately 50 feet (Alternatives 2-4). The trail continues and eventually bisects a roadside hazard treatment (45N78). Three years of "greening up" would soften effects, but high stumps would still be noticeable for two hundred feet along the trail and likely would not meet a Retention visual quality objective in the three year timeframe for Alternatives 2-5. Continued "greening up" for five – ten years would allow additional resprouting and growth of vegetation to hide these effects.

Using the revised trail alignment data shown on Figure 88 in the Recreation Amendment, for Alternatives 2-4, the PCT would skirt unit 228-3 - not bisect this unit as shown on earlier project maps. Dead trees along the trail provide some partial screening of the unit located uphill, but it would still be noticeable to PCT hikers (for approximately 1/8 mile) and likely not meet a Retention visual quality objective in the three year timeframe. Three years of "greening up" would soften effects, but high stumps would still be noticeable and likely would not meet a Retention visual quality objective in the three year timeframe for Alternatives 2-5. Continued "greening up" for five – ten years would allow additional resprouting and growth of vegetation to hide stumps and reduce texture contrasts. This unit is not proposed in Alternative 5, hence there will be no effect.

The trail continues north and eventually bisects a roadside hazard treatment (45N72X). Three years of "greening up" would soften effects, but high stumps would still be noticeable for a hundred feet and likely would not meet a Retention visual quality objective in the three year timeframe for Alternatives 2-5. Continued "greening up" for five – ten years would allow additional resprouting and growth of vegetation to hide these effects.

Tyler Meadows Trailhead: Numerous salvage harvest units (number520, 521, 522, 524, 525, 525-1, 525-2, 528-1) and temporary roads on existing roadbeds are proposed for Alternatives 2, 3, and 4 in the Faulkstein Camp/Tyler Meadows area along forest road 45N77 which accesses the Tyler Meadows Trailhead. Roadside hazard treatments are proposed for Alternatives 2-5. Units would be visible for approximately 3 miles in close proximity to the road and large in scale. When combining roadside hazard treatments with Forest visitors being able to look down from road on these treatments (when they

are most visible), the Retention visual quality objective would not be met in the three year timeframe. Continued "greening up" for five – ten years would allow additional resprouting and growth of vegetation to hide these effects. These units are not proposed in Alternative 5, hence there will be no effect.

Grider Creek road (46N66, 46N24X): Roadside hazard treatments and salvage harvest unit 62 are proposed adjacent to the road; Harvest units 61 and 62-1 are prominently located on adjacent hillsides. These activities would be highly visible for approximately 1 mile to PCT hikers and forest visitors traveling these roads. It is unlikely these treatments would meet a Retention visual quality objective in the three year timeframe. Continued "greening up" for five – ten years would allow additional resprouting and growth of vegetation to hide these these effects.

Cold Spring Trailhead: Roadside hazard treatments are proposed for Alternatives 2-5 along access road 45N78A, the trailhead, and the PCT; salvage harvest unit number224 (Alternatives 2-4) and site prep/plant unit P323 (Alternatives 2-5) are proposed immediately adjacent to the PCT. The disturbances (i.e. soils, high stumps) from these treatments would be highly visible to Forest visitors and PCT hikers. Three years of "greening up" would soften effects, but likely would not meet a Retention visual quality objective in the three year timeframe for Alternatives 2-5. Continued "greening up" for five – ten years would allow additional resprouting and growth of vegetation to hide these effects.

Scott Wild and Scenic River: Roadside hazard, fuels treatments, and portions of several salvage harvest units are proposed within the river corridor. All of these treatments occur along or above County Road 7F01. The Scott River parallels the county road and is vertically separated by an estimated thirty to several hundred feet. Screening vegetation along the road and river would further limit visibility. It is unlikely that kayakers and rafters would notice any of these treatments. Hence activities would easily meet the Partial Retention visual quality objective for river segments Sc01 and Sc03, and a Retention visual quality objective for river Segment Sc02. There would be no adverse effect to the river's viewshed.

Scott River Road (County Roadnumber7F01): Numerous roadside hazard and fuel treatments, and a few harvest units and site prep/plant units are proposed along the road. The road's highly curvilinear nature, topographic and vegetative screening and steep adjacent topography severely limit the duration of view of disturbances to a few seconds. A recovery time of three years would allow seasonal leaf and needle cast, weathering (graying) of tree stumps and chips, and resprouting of vegetation or "greening up" to soften these effects. Hence activities would easily meet the Partial Retention visual quality objective (Kelsey Creek to McCarthy Creek, Scott Bar to Highway 96), and a Retention visual quality objective (McCarthy Creek to Scott Bar). There would be no adverse effect for travelers to the road's viewshed.

Bear Creek Trailhead: Roadside hazard treatments are proposed along access road 15N06. The trail utilizes a portion (approximately ¼ mile) of the access road. This treatment (i.e. high stumps) would be highly visible to Forest visitors and hikers and likely not meet a Partial Retention visual quality objective in three years. Continued "greening up" for five – ten years would allow additional resprouting and growth of vegetation to hide these effects.

Lake Mountain Trail: As the trail bisects salvage harvest unit numbers 508-1, 508-4-1, 508-5, roadside hazard for road 45N65, Fuels treatment unit F071, disturbances (i.e. stumps) would be highly visible to hikers for approximately ¾ mile) and likely not meet a Partial Retention visual quality objective in three years. Continued "greening up" for five – ten years would allow additional resprouting and growth of vegetation to hide these effects.

Other Viewsheds Listed in Table 3-68 not discussed above: There would be no adverse effects to all other viewsheds from project treatments. All assigned visual quality objectives would be met. Treatments would either be not visible, not noticeable in Retention visual quality objective areas, or noticeable in Partial Retention/ Modification/Maximum Modification visual quality objective areas. The disturbances associated with various project activities such as soil disturbance, stumps, burnt vegetation, etc. would recover in three years' time with seasonal leaf and needle cast, weathering (graying) of tree stumps and chips, and resprouting of vegetation or "greening up. Hence all activities would appear near natural and easily meet their assigned visual quality objectives.

In summary, the nine viewsheds discussed above would not meet their assigned visual quality objectives within the three year timeframe and visual quality objectives would be met for the other 25 viewsheds.

Table 3-68: Visibility of Project Treatments From Sensitive Viewpoints for the Happy Camp Complex area.

Potential Viewpoint(s)	Visual Sensitivity Level	Project Area	Fuels Treatments	Salvage Harvest	Roadside Hazard Treatments	Site Preparation and Planting
		Is the project area or activity potentially visible from the scenic viewpoint[41]?				
Happy Camp Complex						
State Highway 96 (State of Jefferson Scenic Byway)	High	Y	Y	Y	Y	N
Klamath Wild and Scenic River	High	Y	Y	Y	Y	N
Hamburg	High	Y	N	Y	N	N
Seiad	High	Y	Y	Y	N	Y
Happy Camp	High	Y	Y	N	Y	Y
O'Neil Creek Campground	High	Y	Y	N	Y	N
Sara Totten Campground	High	Y	Y	Y	N	N
Curly Jack Campground	High	Y	Y	N	N	N
Lake Mountain Lookout*	High	Y	Y	Y	Y	Y

[41] Based upon a combination of computer modeling, map review, on-the ground knowledge, and field verification.

Potential Viewpoint(s)	Visual Sensitivity Level	Project Area	Fuels Treatments	Salvage Harvest	Roadside Hazard Treatments	Site Preparation and Planting
Gordon's Ferry River Access	High	Y	Y	Y	Y	Y
Indian Creek River Access	High	Y	Y	N	Y	Y
Scott River road (7F01)	High	Y	Y	Y	Y	N
Scott Wild and Scenic River	High	Y	Y	Y	N	N
Johnson Bar River Access	High	Y	Y	Y	Y	N
Scott Bar	High	Y	Y	N	N	N
Sugar Pine River Access	High	Y	Y	N	Y	N
Townsend Gulch River Access	High	Y	Y	N	N	N
Gold Flat River Access	High	Y	Y	N	Y	N
Tompkins Creek River Access	High	Y	Y	N	Y	N
Lake Mountain Trail	Moderate	Y	N	Y	N	N
Scott Bar Lookout*	Moderate	Y	Y	Y	Y	Y
Box Camp Trailhead	Moderate	Y	Y	N	Y	Y
Grider Creek road (46N66, 46N24X)	High	Y	Y	Y	Y	N
Grider Creek Campground	High	Y	Y	Y	Y	N
Grider Creek (Wild and Scenic River)	High	Y	N	Y	N	N
Pacific Crest Trail	High	Y	Y	Y	Y	Y
Cold Spring Trailhead	High	Y	N	Y	Y	Y
Tyler Meadows Trailhead	High	Y	Y	Y	N	Y
Elk Creek road (7C001)	Moderate	Y	Y	N	N	N
Elk Creek (Wild and Scenic River)	Moderate	Y	Y	N	N	N
Bear Creek Trailhead road (16N05, 15N06)	Moderate	Y	N	N	Y	N
Bear Creek Trailhead	High	Y	N	N	Y	N

Cumulative Effects

The cumulative effects are the same as described for the Beaver Fire area with one addition. There is an ongoing action of removing hazard trees in the Grider Creek Campground. The purpose of this project is safety to the public within an

administration/recreation site after the 2014 wildfire went through the campground. Proposed treatments include cut, buck, limb, and move 20 hazardous trees. The cumulative effect of this action is an adverse effect to both the campground and Grider Creek (recommended Wild and Scenic River). Because the stumps will be in close proximity to visitors, it is likely the Retention visual quality objective would not be met in the three year timeframe. Continued "greening up" for five – ten years would allow additional resprouting and growth of vegetation to hide these effects.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

North Fork Road (FH102): Roadside hazard and fuels treatments are proposed in the Retention (first ½ mile of road within project area) and Partial Retention visual quality objective areas (rest of road in project area) along this road. The roadside hazard treatments occur along adjacent roads which are not visible from the North Fork Road. It is unlikely the fuels treatments would be noticeable to travelers because of the road's steep and winding nature and therefore meet their assigned visual quality objectives. Several harvest units are proposed along (number410, 411) or with close proximity (number409, 423, 426) of the road and are all within Partial Retention visual quality objective areas. The removal of trees would introduce some form and texture contrasts, but within three years of "greening up" these treatments would be subordinate to the characteristic landscape and easily meet a Partial Retention visual quality objective from the viewshed.

North Fork Salmon Wild and Scenic River: Roadside hazard, fuels, salvage harvest (number409, 410, 411), and site prep/plant are proposed within the river corridor with a Partial Retention visual quality objective. It is likely all or portions of each of these treatments will be visible from the river. The removal of trees would introduce some form, color, and texture contrasts, but within three years of "greening up" these treatments would be subordinate to the characteristic landscape and easily meet a Partial Retention visual quality objective from the river viewshed.

Snoozer, East Whites and Tanner Peak Trails: The Snoozer trail bisects an underburn for 2-1/2 miles; East Whites trail borders an underburn for 2 miles, Tanner Peak trail passes thru several hundred feet of a fuels treatment; all three are in a Partial Retention visual quality objective area. Within three years of "greening up" these treatments would easily meet a Partial Retention visual quality objective from these viewsheds.

All Other Viewsheds Listed in Table 6 not discussed above: There would be no adverse effects to all other viewsheds from project treatments. All assigned visual quality objectives would be met. Treatments would either be not visible, not noticeable in Retention visual quality objective areas, or noticeable in Partial Retention/ Modification/Maximum Modification visual quality objective areas. The disturbances associated with various project activities such as soil disturbance, stumps, burnt vegetation, etc. would recover in three years' time with seasonal leaf and needle cast, weathering (graying) of tree stumps and chips, and resprouting of vegetation or "greening up. Hence all activities would appear near natural and easily meet their assigned visual quality objectives.

In summary all viewsheds listed below would meet their assigned visual quality objectives within three year timeframe.

Table 3-69: Visibility of Project Treatments from Sensitive Viewpoints for the Whites Fire area.

Potential Viewpoint(s)	Visual Sensitivity Level	Project Area	Fuels Treatments	Salvage Harvest	Roadside Hazard Treatments	Site Preparation and Planting
		Is the project area or activity potentially visible from the scenic viewpoint[42]?				
Whites Fire						
North Fork Road (FH102)	Moderate	Y	Y	Y	Y	Y
Sawyers Bar	High	Y	Y	Y	N	Y
South Russian Creek (recommended Wild and Scenic River)	Moderate	N	N	N	N	N
Timber Camp Trailhead	Moderate	Y	Y	N	Y	N
Timber Camp Trailhead road (39N58, 39N15)	Moderate	Y	Y	Y	Y	Y
Pacific Crest Trail	Moderate	Y	Y	N	N	N
Hogan Lake Trail	Moderate	N	N	N	N	N
Tanners Peak Trail*	Moderate	Y	N	Y	Y	Y
Snoozer Trail*	Moderate	Y	N	N	N	N
Mule Bridge Road (40N47)	Moderate	Y	Y	N	Y	N
North Fork Salmon Wild and Scenic River	Moderate	Y	Y	Y	Y	N
Music Creek Trailhead	Moderate	Y	N	N	N	Y
South Russian Creek Trailhead	Moderate	Y	N	N	Y	Y
Idlewild Campground	Moderate	Y	Y	N	N	N
Mule Bridge Trailhead	Moderate	Y	Y	N	N	N
Eddy Gulch Lookout*	Moderate	Y	Y	Y	Y	Y
Eddy Gulch Lookout road (39)	Moderate	Y	Y	Y	Y	Y
East Whites Trail*	Moderate	Y	Y	N	N	N
South Russian Creek Trail*	Moderate	N	N	N	N	N

[42] Based upon a combination of computer modeling, map review, on-the ground knowledge, and field verification.

Cumulative Effects

The cumulative effects are the same as described for the Beaver Fire area.

Alternative 2 Modified

Project Area A: Beaver Fire Area

Direct Effects and Indirect Effects

The effects of Modified Alternative 2 are the same as described for Alternative 2, 3, 4, and 5.

Cumulative Effects

The effects are the same as described in Alternative 2, 3, 4 and 5.

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

Between Draft and Final, seven new Project Design Features (Recreation and Scenery 6-12), see Chapter 2 of final EIS for complete listing) were developed in response to Public comments to reduce negative effects to viewsheds at several locations, including along the PCT, and at the Cold Springs Trailhead. Although these project design features would greatly reduce effects, because of the close proximity (20-50 feet) of treatments to hikers, it is likely that these disturbances would be still noticeable after three years and not meet their compatible visual quality objective of Retention. Continued “greening up” for five – ten years would allow additional resprouting and growth of vegetation to hide these effects.

The use of these same project design features at both Bear Creek and Lake Mountain trails are intended to reduce negative effects (i.e. high stumps) to acceptable levels within three years from “greening up”; the low and angle-cut stumps would be noticeable but subordinate to the characteristic landscape. The viewsheds for both trails would meet their Partial Retention visual quality objectives.

In summary, seven viewsheds would not meet their assigned visual quality objectives within the three year timeframe. Visual quality objectives would be met for the other 27 viewsheds.

Cumulative Effects

The effects are the same as described in Alternatives 2, 3, 4 and 5.

Project Area C: Whites Fire Area

Direct Effects and Indirect Effects

The effects of Modified Alternative 2 are the same as described for Alternative 2, 3, 4, and 5.

Cumulative Effects

The effects are the same as described in Alternatives 2, 3, 4 and 5.

Alternative 3 Modified

Project Area A: Beaver Fire Area

Direct Effects and Indirect Effects

The effects of Modified Alternative 3 are the same as described for Alternative 2, 3, 4, and 5.

Cumulative Effects

The effects are the same as described in Alternative 2, 3, 4 and 5.

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

The size of riparian reserves that occur within individual salvage harvest units has been further increased (than in other alternatives) in Modified Alternative 3 with the inclusion of "additional snag retention areas" and "field and corporate riparian reserve" data. These expanded no cut areas will benefit scenery resources by visually breaking up units and reducing their size and by adding texture. Although considered for all viewpoints, the application of their use notably changes the scenery effects for two viewpoints discussed below.

Grider Creek Campground: Salvage harvest units (numbers 61 and 62-1) are proposed for Modified Alternative 3 within close proximity of the campground and are located on adjacent hillsides. The inclusion of snag retention areas and field and corporate riparian reserves, has significantly reduced the harvestable acres in unit number62-1 and resultant effects. Unit number61 also has these inclusions which reduce effects; the lower third of the unit has been dropped moving the boundary further away from the campground. Green trees provide substantial screening of these units throughout most of the campground. It is likely these units would not be noticeable to campers and meet a Retention visual quality objective in the three year timeframe. Roadside hazard treatments are proposed along the access road (number46N24X) but have been removed from the campground loop road (number46N24XA). It is likely these units will meet a Retention visual quality objective in the three year timeframe.

Grider Creek (recommended Wild & Scenic River): Portions of salvage harvest units (numbers 61 and 62-1) are proposed for Modified Alternative 3 within the river corridor near Grider Creek Campground. The PCT is also located in this area of the river corridor. As noted above, the snag inclusion areas would break up the units. Additional visual screening would be present from moving the lower unit boundary uphill away from the PCT. Combining these two factors with three years of greening up, it is likely these units would meet a Retention visual quality objective in the three year timeframe.

In summary, five viewsheds would not meet their assigned visual quality objectives within the three year timeframe. Visual quality objectives would be met for the other 29 viewsheds.

Cumulative Effects

The effects are the same as described in Alternatives 2, 3, 4 and 5.

Project Area C: Whites Fire Area

Direct Effects and Indirect Effects

The effects of Modified Alternative 3 are the same as described for Alternative 2, 3, 4, and 5.

Cumulative Effects

The effects are the same as described in Alternatives 2, 3, 4 and 5

Compliance with law, regulation, policy, and the Forest Plan

This project would help achieve the Forest Plan desired conditions to perpetuate ecologically established scenery. Reforestation would speed up recovery to a forested condition and fuels reduction treatments would reduce the likelihood of high intensity wildfires. The project would meet Forest Plan Visual Quality Objectives in the long term.

In the short term, noticeable visual disturbances from salvage harvest and roadside hazard treatments in Retention visual quality objective areas and some Partial Retention visual quality objective areas would likely not meet their assigned Visual Quality Objectives. Although this appears inconsistent with some Forest Plan Standards and Guidelines, an exception is allowed under Forest Plan Standards and Guideline 11-7 which states ”In the case of recovery activities after extreme catastrophic events such as intense wildland fires, time periods to achieve the visual quality objectives stated in Forest-wide and Management Area Standards and Guidelines may be extended. This would be necessary where previously unnoticed scenery alterations are exposed to view due to loss of vegetative screening, or during timber salvage activities where recovery of forest vegetation is determined to be of greater importance than achievement of visual quality objectives within the time periods established.” These disturbances would “green up” over time (10 years) and meet the Retention or Partial Retention visual quality objective. Integration of scenery project design features insures this project is consistent with Forest Plan scenery desired conditions and direction.

Recreation

The purpose of the section is to identify recreation use and opportunities in the project area and examine the effects of the project alternatives on these uses and opportunities.

Methodology

A recreation assessment of project activities was conducted using field and office review, professional expertise, and on-the-ground knowledge.

Analysis Indicators

Analysis indicators used to determine the effects of alternatives on recreation include:

1. Recreation Use - Will overall use increase or decrease as a result of the action?
2. Recreation Opportunities - How will the project affect existing and or new recreational opportunities?

Spatial and Temporal Context

The geographic extent for analysis of the effects for recreation is the general vicinity of the recreation feature. This unit of spatial analysis is used for determining direct, indirect, and cumulative effects. A short-term timeframe of three years allows the activities

associated with this project to be mostly completed. A long-term temporal bound of 10 years allows completed activities associated with this project to be established.

Affected Environment

Recreational use in the project areas is low and consists primarily of dispersed recreation opportunities. "Dispersed recreation is outdoor recreation that involves relatively low density use and occurs over broad expanses of land and water. Eighty percent of the Forest's recreational use is dispersed recreation. Most dispersed activity occurs during the summer and fall months. All dispersed areas are currently managed at low standard levels" (Forest Plan, page 3-11). Dispersed recreation opportunities include primitive camping, fishing, hunting, equestrian use, hiking, swimming/water play, whitewater rafting/kayaking, woodcutting, and viewing scenery.

Camping occurs at both developed campgrounds and primative dispersed campsites within the Wildernesses or along roads throughout the project areas. See Table 3-70 below for a listing of these features.

Hunting is the most popular primary activity for Forest visitors (USDA Forest Service 2012), with large numbers of people visiting the Forest primarily to hunt deer or other big game (elk, bear). During hunting seasons, developed campground occupancy increases, many primative campsites are occupied, and All-terrain Vehicles use Forest roads in the project areas.

Hiking occurs on numerous Wilderness trails, the Pacific Crest Trail and other trails. The 2014 fires burned two bridges and some trail signs. Trail treads were also damaged from burned tree roots, soil erosion from increased runoff, and increased sedimentation of water diversion features.

The replacement of fire damaged or destroyed trail bridges and signs along the Pacific Crest Trail are not part of the Proposed Action for this project. A Categorical Exclusion for trail maintenance will be used and additional funding obtained for replacements. Hazard trees associated with trails within the project areas will be addressed separately from this project as part of routine trail maintenance. Trail-side hazard trees will be prioritized and treated based on risk level including probability of tree failure and probability of a target. Selective treatment of hazard trees along trails allows for protection of scenery and the recreation setting.

Fishing occurs on rivers and high elevation lakes. Drift boats float the Klamath River for steelhead and salmon. Trout fishing occurs at high elevation lakes in the Wildernesses.

Whitewater rafting/kayaking and swimming water play occur primarily on the Klamath and Scott Rivers and to a lesser degree on the North Fork Salmon River. Use occurs from outfitter-guided trips as well as private parties. Some of these users camp at nearby river accesses, dispersed sites along the river or developed campgrounds.

Woodcutting is a popular recreation activity on the Forest; Douglas-fir, incense cedar, white oak, black oak, and madrone are preferred woodcutting species.

Scenery is an important component that affects recreation use, setting, and the recreation experience. Viewing scenery from within or outside project area boundaries occurs while driving along roadways such as the State of Jefferson Scenic Byway, floating or fishing rivers such as the Klamath or Scott Wild and Scenic Rivers, hiking on the Pacific Crest

Trail or other Wilderness trails, or overlooking the area from viewpoints such as fire lookouts.

For the Beaver Fire, there are five recreation features within the project area (one developed campground and four features related to dispersed recreation). For the Happy Camp Complex Fire, there are 24 recreation features within the project area (five developed campgrounds and 19 features related to dispersed recreation). For the Whites Fire, there are 13 recreation features within the project area (one developed campground and 12 features related to dispersed recreation). See Table 3-70 for more information.

Table 3-70: Summary of Potentially Affected Recreation Features located within Beaver Fire, Happy Camp Complex Fire, and Whites Fire Project Areas

Recreational Feature	Feature Description
Beaver Fire	
Klamath River	Designated National Wild and Scenic River
Gottville River Access	Klamath River access
Highway 96 State of Jefferson Scenic Byway	National Forest Scenic Byway
Beaver Creek Campground	Developed Campground
Dispersed Campsites (1)[43]	51D010 shown on Motor Vehicle Use Map
Happy Camp Complex Fire	
Klamath River	Designated National Wild and Scenic River
Indian Creek River Access	Klamath River access
Scott River	Designated National Wild and Scenic River
Johnson Bar River Access	Scott River access
Townsend Gulch River Access	Scott River access
Gold Flat River Access	Scott River access
Sugar Pine River Access	Scott River access
Tompkins Creek River Access	Scott River access
Bridge Flat Campground	Scott River access
Elk Creek	Recommended National Wild and Scenic River
Grider Creek	Recommended National Wild and Scenic River
Pacific Crest Trail	National Scenic Trail
Cold Spring Trailhead	Pacific Crest Trail access/Marble Mountain Wilderness access
Tyler Meadows Trailhead	Pacific Crest Trail access/Marble Mountain Wilderness access
Kelsey Creek Trail	National Recreation Trail
Bear Creek Trailhead	Kelsey Creek Trail access
Highway 96 State of Jefferson Scenic Byway	National Forest Scenic Byway
Sarah Totten Campground	Developed Campground
ONeil Creek Campground	Developed Campground (closed for 8+ years)
Grider Creek Campground	Developed Campground (currently closed by Forest Order until 05/15/15)
Curly Jack Campground	Developed Campground
Dispersed Campsites (34)[44]	As shown on Motor Vehicle Use Map

[43] Total number of dispersed campsites shown is taken from 2012 Motor Vehicle Use map and does not include campsites in Wilderness or immediately adjacent to forest roads.

Recreational Feature	Feature Description
Lake Mountain Trail	Forest Trail
Lake Mountain Lookout	Fire Lookout
Whites Fire	
North Fork Salmon River	Designated National Wild and Scenic River
South Russian Creek	Recommended National Wild and Scenic River
Pacific Crest Trail	National Scenic Trail
Mule Bridge Trailhead	Dispersed Campsites, Marble Mountain Wilderness access
Tanners Peak Trail	Forest Trail
Snoozer Trail	Forest Trail
Timber Camp Trailhead	Russian Wilderness access
South Russian Trailhead	Russian Wilderness access
East Whites Trail	Forest Trail
Music Creek Trailhead	Russian Wilderness access
Idlewild Campground	Developed Campground (currently closed by Forest Order until 05/15/15)
Robinson Flat	Dispersed campsites
Dispersed Campsites (2)[45]	54D001, 54D011 shown on Motor Vehicle Use Map

Environmental Consequences

Alternative 1

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

Recreation Use

Under this alternative no project treatment activities are proposed. The roadways would be untreated and fire-killed tree hazards would pose threats to recreationist. Fallen snags along of the roadways would substantially impact access for recreational uses such as dispersed camping, scenic driving, and hunting. As fire-killed trees continue to decay and fall, public and worker safety would be threatened and the likelihood of potential injuries or death to individuals would increase. Forest Orders to restrict public access might be needed to mitigate risks to the recreating public.

With the exception of temporary closures by Forest Order, there is no reason to expect recreation use to measurably increase or decrease as a result of this alternative. Temporary closures of campgrounds, roads, rivers, or trails or portions of the burn area would displace users to other available areas within or outside of the burn affected area.

Fire-killed trees from the recent fires would greatly increase firewood availability for permitted collection; the permitted public would be most likely to collect fallen fire-killed trees and/or newly created (fire-killed) snags adjacent to roads. Firewood cutting use would likely increase in burned areas in the short term. Since re-sprouting of hardwood trees and brush in burned areas would attract deer by providing browse, if Forest Orders do not affect public access, deer hunting use in burned areas would likely increase in the short term. Recreation use is also associated with scenic vistas; see the scenery section of this chapter and the Scenery resource report for detailed information.

Recreation Opportunities

[45] Total number of dispersed campsites shown is taken from 2012 Motor Vehicle Use map and does not include campsites in Wilderness or immediately adjacent to forest roads.

The likelihood of damage to infrastructure such as campgrounds and trails would progressively increase. As fire-killed snags continue to fall, it is anticipated that maintenance work and associated costs would increase, as well as the safety hazard to Forest visitors, workers, and volunteers who use or maintain Forest trails and other recreation infrastructure.

If and where access to the recreating public is not restricted, then fire-killed snags and resultant loss of shade would create hot and dry dispersed campsites and trail sections for hikers, adversely affecting their recreational experience. Assuming no Forest Orders are issued closing public access, camping at both developed campgrounds and primitive dispersed campsites would be expected to continue at their current rates.

Cumulative Effects

In response to the 2014 wildfires, private land salvage activities are currently occurring within the Beaver Fire area and may continue into late summer 2015. The operational impacts from the project activities such as increased traffic, noise, dust, and smoke are short-term adverse impacts to recreationists; effects would be temporary in nature. Increased log truck traffic is currently most noticeable on the Beaver Creek Road and Highway 96 State of Jefferson Scenic Byway. Safety signing is posted during active logging operations in appropriate locations to advise Forest visitors.

There are three range management units within the Beaver Fire area. Cattle are a temporary and seasonal use; some recreationists may dislike their presence during hunting season because they feel the cattle affect the quality of their hunt. Others are ambivalent to their presence. Rangeland improvements are minimal and typically limited to fencing which has little or no effect on recreationists.

The cumulative effect of the project and reasonably foreseeable actions on recreational opportunities is an additional increase in the number of log trucks and extending their season of use. Other operational impacts (noise, dust, etc.) would be extended as well. These effects would be temporary and short term.

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

Recreation Use

Recreational use for the Happy Camp Complex area will be the same as for the Beaver Fire area described above.

Recreation Opportunities

Effects on recreational opportunities for the Happy Camp Complex area will be the same as for the Beaver Fire area described above.

Cumulative Effects

In response to the 2014 wildfires, private land salvage activities are currently occurring along the Scott River area and may continue into late summer 2015. The Thom-Seider project proposes commercial thinning and underburning. The operational impacts from these project activities such as increased traffic, noise, dust, and smoke are short-term adverse impacts to recreationists; effects would be temporary in nature. Increased log truck traffic is currently most noticeable on the Scott River Road and Highway 96 State

of Jefferson Scenic Byway. Safety signing is posted during active logging operations in appropriate locations to advise Forest visitors.

There are numerous existing range management units within the Happy Camp Complex project area. Cattle are a temporary and seasonal use; some recreationists may dislike their presence during hunting season because they feel the cattle affect the quality of their hunt. Some hikers dislike cattle in the Wilderness. Others are ambivalent to their presence. Rangeland improvements are minimal and typically limited to fencing which has little or no effect on recreationists.

The cumulative effect of the project and reasonably foreseeable actions on recreational opportunities is an additional increase in the number of log trucks and extending their season of use. Other operational impacts (noise, dust, etc.) would be extended as well. These effects would be temporary and short term.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

Recreation Use

Recreational use for the Whites Fire area will be the same as for the Beaver Fire area described above.

Recreation Opportunities

Effects on recreational use for the Whites Fire area will be the same as for the Beaver Fire area described above.

Cumulative Effects

The Sawyers Underburn, Jess, and Eddy Late Successional Reserve projects are on-going or reasonably foreseeable actions occurring within the Whites Fire area. The operational impacts from the project activities such as increased traffic, noise, dust, and smoke are short-term adverse impacts to recreationists; effects would be temporary in nature. Safety signing is posted during active burning or logging operations in appropriate locations to advise Forest visitors.

There are several range management units within the Whites Fire area. Cattle are a temporary and seasonal use; some recreationists may dislike their presence during hunting season because they feel the cattle affect the quality of their hunt. Some hikers dislike cattle in the Wilderness. Others are ambivalent to their presence. Rangeland improvements are minimal and typically limited to fencing which has little or no effect on recreationists.

The cumulative effect of the project and reasonably foreseeable actions on recreational opportunities is an additional increase in the number of log trucks and extending their season of use. Other operational impacts (noise, dust, etc.) would be extended as well. These effects would be temporary and short term.

Alternatives 2, 3, 4, and 5

While visitors are recreating in these settings, they would see some evidence (visual disturbances) of management activities within various recreation settings. The effects to the naturalness of these settings are measured using Visual Quality Objectives which are compatible with Recreational Opportunity Spectrum Classes. Table 3-71 displays

compatibility between Recreational Opportunity Spectrum Classes and Visual Quality Objectives.

Table 3-71: Compatibility of Visual Quality Objectives and Recreation Opportunity Spectrum Classes.

Visual Quality Objectives					
Recreational Opportunity Spectrum Class	Preservation	Retention	Partial Retention	Modification	Maximum Modification
Primitive (P)	Norm	Inconsistent	Unacceptable	Unacceptable	Unacceptable
Semi-Primitive Non-Motorized (SPNM)	Fully Compatible	Norm	Inconsistent	Unacceptable	Unacceptable
Semi-Primitive Motorized (SPM)	Fully Compatible	Fully Compatible	Norm (1)	Inconsistent	Unacceptable
Roaded Natural (RN)	Fully Compatible	Norm	Norm	Norm	Inconsistent
Rural (R)	Fully Compatible	Fully Compatible	Norm	Norm	Inconsistent
Urban (U)	Fully Compatible	Fully Compatible	Fully Compatible	Fully Compatible	Not Applicable

1 = Norm From Sensitive Roads And Trails.

Source: USDA Forest Service. 2000. Landscape Aesthetics A Handbook For Scenery Management. Agriculture Handbook Number 701. Page F-3.

Some recreation settings would be adversely affected in the short-term from project activities not meeting the compatible Visual Quality Objectives. Salvage harvest and roadside hazard treatments may affect the quality of the recreation experience while driving, floating, hiking, or camping at the following locations: Klamath Wild and Scenic River, Tyler Meadows Trailhead, Cold Spring Trailhead, Grider Creek (recommended Wild and Scenic River), Grider Creek Campground, Grider Creek Road (46N66, 46N24X), Lake Mountain Trail, Bear Creek Trail, and the Pacific Crest Trail (between north boundary of Marble Mountain Wilderness and Forest road 45N72X).

Within Retention Visual Quality Objectives areas, salvage harvest and roadside hazard treatments would likely not meet the Retention Visual Quality Objectives in the short term – where management activities are not visually evident to the casual Forest visitor. The presence of high stumps and tree marking paint (if used) would be noticeable for five to 10 years even after “greening up.” This includes salvage and roadside hazard treatment units located in the foreground distance zone of Klamath Wild and Scenic River, Tyler Meadows Trailhead, Cold Springs Trailhead, Grider Creek (recommended Wild and Scenic River), Grider Creek Campground, Grider Creek road (46N66, 46N24X), and the Pacific Crest Trail (between north boundary of Marble Mountain Wilderness and Forest road 45N72X). A recovery time of up to ten years for “greening up” and plant growth may be required to soften these effects.

Although the action alternatives appear to be inconsistent with the assigned Retention Visual Quality Objective and certain Forest Plan Standards and Guidelines for Retention, an exception is allowed under Forest Plan Standards and Guideline11-7 which states

“In the case of recovery activities after extreme catastrophic events such as intense wildland fires, time periods to achieve the Visual Quality Objectives stated in Forest-wide and Management Area Standards and Guidelines may be extended. This would be

necessary where previously unnoticed scenery alterations are exposed to view due to loss of vegetative screening, or during timber salvage activities where recovery of forest vegetation is determined to be of greater importance than achievement of Visual Quality Objectives within the time periods established."

Within Partial Retention Visual Quality Objectives areas, salvage harvest and roadside hazard treatments in the foreground distance zone along hiking trails would likely not meet the Partial Retention Visual Quality Objectives in the short term– where management activities may be noticeable, but are subordinate to the characteristic landscape. The presence of high stumps and tree marking paint (if used) would be noticeable to hikers for 10 years or more until screening vegetation hides effects. This includes units bisected by both the Tom Martin Peak and Bear Creek trails. However, the same exception under Standard and Guideline11-7 (cited above) also applies to Partial Retention areas for this project.

Thus in the long-term project activities would appear natural or near-natural to Forest visitors and meet Visual Quality Objectives which are compatible with Recreational Opportunity Spectrum Classes. Forest Plan direction would be met. The Scenery and the Wild and Scenic Rivers sections of this chapter and related resource reports provide more information on the relationship between recreation and those resources.

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

Recreation Use

Logging operations are anticipated to begin in late summer 2015. The operational impacts from the project activities such as increased traffic, noise, dust, and smoke are short-term adverse impacts to recreationists; effects would be temporary in nature. Safety signing would be posted during active logging operations in appropriate locations to advise Forest visitors. Visitor information will be provided about area/road/trail closures in news releases, on-site, and on the Forest website.

Recreation Opportunities

Additional field reviews were conducted to evaluated project effects on recreation settings. The analysis concludes Highway 96 State of Jefferson Scenic Byway would meet the compatible Retention Visual Quality Objectives, and therefore the recreation setting would *not* be adversely affected. Analysis verified the Klamath Wild and Scenic River viewshed would not meet a Retention Visual Quality Objectives within three years and the recreation setting *would* be adversely affected. See Scenery section of final EIS for detailed information and see Table 3-72 below for listing of recreation settings adversely affected from project treatments.

The disturbances associated with various project activities such soil disturbance, stumps, burnt vegetation, etc. would be noticeable to recreationists in some other recreation settings. A recovery time of three years would allow seasonal leaf and needle cast, weathering (graying) of tree stumps and chips, and resprouting of vegetation or "greening up" to soften these effects. Hence all activities would appear near natural and easily meet their assigned Visual Quality Objectives. There would be no adverse effects to all other recreation settings (not listed in Table 3-72 below) from project treatments.

Cumulative Effects

The effects are similar to Alternative 1. The private land salvage activities will lead to increased traffic, noise, dust, and smoke are short-term adverse impacts to recreationists; effects would be temporary in nature. Increased log truck traffic is currently most noticeable on the Beaver Creek Road and Highway 96 State of Jefferson Scenic Byway. Safety signing is posted during active logging operations in appropriate locations to advise Forest visitors. When these effects are added to the effects of the Westside Fire Recovery project, there will be no additional recreational settings not meeting Visual Quality Objectives and recreation use is not expected to decrease.

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

Recreation Use

Logging operations are anticipated to begin in late summer 2015. The operational impacts from the project activities such as increased traffic, noise, dust, and smoke are short-term adverse impacts to recreationists; effects would be temporary in nature. Safety signing would be posted during active logging operations in appropriate locations to advise Forest visitors. Visitor information will be provided about area/road/trail closures in news releases, on-site, and on the Forest website.

Some segments of roads, rivers, or trails would be temporarily closed for safety reasons during helicopter logging operations. These closures could be expected to last for 15-20 minutes up to several hours. Pacific Crest Trail hikers would be adversely affected by temporary closures and would likely occur on the Grider Creek road 46N66, the Pacific Crest Trail south of Cold Springs Trailhead, river rafters/fishermen on the Klamath River between Rocky Point and Sluice Box River Accesses, and hikers on the Bear Creek and Lake Mountain trails. These adverse effects from logging operations would occur in fewer locations for Alternative 5 because of less salvage harvest proposed in Grider Creek and Tyler Meadows.

Recreation Opportunities

Additional field reviews were conducted to evaluated project effects on recreation settings. Additional analysis concludes Highway 96 State of Jefferson Scenic Byway, Scott River Road, and Scott Wild and Scenic River would meet the compatible Retention Visual Quality Objectives, and therefore the recreation setting would not be adversely affected. Analysis verified that nine other viewsheds would not meet the Retention Visual Quality Objectives in the short term and the recreation setting would be adversely affected. See Scenery section of final EIS for detailed information and Table 3-72 below for listing of recreation settings adversely affected from project treatments.

The disturbances associated with various project activities such soil disturbance, stumps, and burnt vegetation would be noticeable to recreationists in some other recreation settings. A recovery time of three years would allow seasonal leaf and needle cast, weathering (graying) of tree stumps and chips, and re-sprouting of vegetation or “greening up” to soften these effects. Hence all activities would appear near natural and easily meet their assigned Visual Quality Objectives. There would be no adverse effects to all other recreation settings (not listed in Table 3-72 below) from project treatments.

Cumulative Effects

The effects are similar to Alternative 1. In response to the 2014 wildfires, private land salvage activities are currently occurring along the Scott River area and may continue into late summer 2015. The Thom-Seider project proposes commercial thinning and underburning. The operational impacts from these project activities such as increased traffic, noise, dust, and smoke are short-term adverse impacts to recreationists; effects would be temporary in nature. Increased log truck traffic is currently most noticeable on the Scott River Road and Highway 96 State of Jefferson Scenic Byway. Safety signing is posted during active logging operations in appropriate locations to advise Forest visitors. When these effects are added to the effects of the Westside Fire Recovery project, there will be no additional recreational settings not meeting Visual Quality Objectives and recreation use is not expected to decrease.

Table 3-72: List of Recreation Features with Adverse Effects to recreation settings from project activities not meeting Visual Quality Objectives for Alternatives 2, 3, 4, and 5. There are no recreation setting that do not meet Visual Quality Objectives for the Whites Fire area.

Recreational Feature
Beaver Fire
Klamath Wild & Scenic River
Happy Camp Complex
Klamath Wild & Scenic River
Cold Spring Trailhead
Grider Creek (recommended Wild & Scenic River)
Grider Creek Campground
Grider Creek road (46N66, 46N24X)
Tyler Meadows Trailhead
Lake Mountain Trail
Bear Creek Trail
Pacific Crest Trail (between north boundary of Marble Mountain Wilderness and Forest road 45N72X)

Project Area C: Whites Fire

Direct Effects and Indirect Effects

Recreation Use

Logging operations are anticipated to begin in late summer 2015. The operational impacts from the project activities such as increased traffic, noise, dust, and smoke are short-term adverse impacts to recreationists; effects would be temporary in nature. Safety signing would be posted during active logging operations in appropriate locations to advise Forest visitors. Visitor information will be provided about area/road/trail closures in news releases, on-site, and on the Forest website.

Some segments of roads, rivers, or trails could be temporarily closed for safety reasons during helicopter logging operations. These closures could be expected to last for 15-20 minutes up to several hours and may affect kayakers on the North Fork Salmon River and Forest visitors on the North Fork Salmon River road.

Recreation Opportunities

The disturbances associated with various project activities such soil disturbance, stumps, burnt vegetation, etc. would be noticeable to recreationists in some other recreation settings. A recovery time of three years would allow seasonal leaf and needle cast, weathering (graying) of tree stumps and chips, and re-sprouting of vegetation or “greening up” to soften these effects. Hence all activities would appear near natural and

easily meet the Partial Retention Visual Quality Objectives. There would be no adverse effects to all recreation settings from project treatments (Table 3-72).

Cumulative Effects

The effects are similar to Alternative 1. The Sawyers Underburn, Jess, and Eddy Late Successional Reserve projects are on-going or reasonably foreseeable actions occurring within the Whites Fire area. The operational impacts from the project activities such as increased traffic, noise, dust, and smoke are short-term adverse impacts to recreationists; effects would be temporary in nature. Safety signing is posted during active burning or logging operations in appropriate locations to advise Forest visitors. When these effects are added to the effects of the Westside Fire Recovery project, there will be no additional recreational settings not meeting Visual Quality Objectives and recreation use is not expected to decrease.

Modified Alternative 2

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

The effects of Modified Alternative 2 are the same as described for Alternative 2, 3, 4, and 5.

Cumulative Effects

The effects are the same as Alternative 2, 3, 4, and 5.

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

The effects of Modified Alternative 2 are similar to Alternative 2, 3, 4, and 5.

The addition of several new project design features (Recreation and Scenery 6 through 12) would reduce negative effects to recreation settings at several locations, including along the Pacific Crest Trail, and at the Cold Spring Trailhead. However it is likely that these sites would still be adversely affected and not meet their compatible Visual Quality Objectives of Retention. See Table 3-73 below as well as Section III of the Recreation amendment for a detailed description of effects.

The use of these same project design features at both Bear Creek and Lake Mountain trails would reduce negative effects to acceptable levels; the recreation settings for both trails would meet their compatible Partial Retention Visual Quality Objectives (Table 3-73).

Cumulative Effects

The effects are the same as Alternative 2, 3, 4 and 5.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

The effects of Modified Alternative 2 are the same as for Alternative 2, 3, 4, and 5.

Cumulative Effects

The effects are the same as Alternative 2, 3, 4 and 5.

Table 3-73 : List of Recreation Features with Adverse Effects to recreation settings from project activities not meeting Visual Quality Objectives for Modified Alternative 2.

Recreational Feature
Beaver Fire
Klamath Wild & Scenic River
Happy Camp Complex Fire
Klamath Wild & Scenic River
Cold Spring Trailhead
Grider Creek (recommended Wild & Scenic River)
Grider Creek Campground
Grider Creek road (46N66, 46N24X)
Tyler Meadows Trailhead
Pacific Crest Trail (between Cold Spring and Highway 96)

Modified Alternative 3

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

The effects of Modified Alternative 3 are the similar as described for Modified Alternative 2.

Modified Alternative 3 has removed the roadside hazard treatments proposed in Alternative 2 along County Road 8G004 located on the south side of the Klamath River. (These treatments would have adverse effects to the recreation setting in other alternatives.) As a result of their removal in Modified Alternative 3, there is no effect to the recreation setting of the Klamath Wild and Scenic River (Table 3-74).

Cumulative Effects

The effects are the same as Alternative 2, 3, 4, and 5.

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

The effects of Modified Alternative 3 are the same as described for Modified Alternative 2 except as amended in this report.

In Modified Alternative 3, the inclusion of snag retention areas and field and corporate riparian reserves, combined with unit boundary changes have significantly reduced negative effects to two recreation features. See Scenery section in the final EIS for detailed information. The recreation settings for both Grider Creek Campground and Grider Creek (recommended Wild and Scenic River) would *not* be adversely affected (Table 3-74).

Cumulative Effects

The effects are the same as Alternative 2, 3, 4 and 5.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

The effects of Modified Alternative 3 are the same as described for Modified Alternative 2.

Cumulative Effects

The effects are the same as Alternative 2, 3, 4, and 5.

Table 3-74 : List of Recreation Features with Adverse Effects to recreation settings from project activities not meeting Visual Quality Objectives for Modified Alternative 3.

Recreational Feature
Happy Camp Complex Fire
Klamath Wild & Scenic River
Cold Spring Trailhead
Grider Creek road (46N66, 46N24X)
Tyler Meadows Trailhead
Pacific Crest Trail (between north boundary of Marble Mountain Wilderness and Forest road 45N72X)

Compliant with Law, Policy and the Forest Plan

This project will help achieve Forest Plan direction to maintain existing Recreation Opportunity Spectrum Classes. See the Forest Plan consistency checklist for details about applicable standards and guidelines.

Wild and Scenic Rivers

A Wild and Scenic Rivers evaluation was conducted for three designated and three recommended rivers as part of the Westside Fire Recovery Project. The evaluation used Wild and Scenic Rivers Act (P.L. 90-542, as amended) protection requirements in conjunction with existing Forest Plan direction.

Project activities were evaluated using field review, GIS analysis, and professional judgment for their potential effects to: 1) free flowing conditions; 2) water quality; 3) identified outstandingly remarkable value(s); and 4) Visual Quality Objectives (visual quality objectives).

Analysis determined that all action alternatives would protect these values and would be fully compliant with all Wild and Scenic River Act protection requirements and Forest Plan Standards and Guidelines. Select information on resource effects for outstandingly remarkable values is reiterated in this report as taken from the Aquatic Resources, Hydrology, Wildlife, and Scenery reports. For complete details see those reports.

Methodology

Project activities were evaluated for all three project areas using field review, GIS analysis, and professional judgment for their potential effects to: 1) free flowing conditions; 2) water quality; 3) identified outstandingly remarkable value(s); and 4) Visual Quality Objectives. Select information on resource effects for water quality, fisheries, geology, wildlife, scenery, and vegetation is reiterated in this report as taken from the Aquatic Resources, Hydrology, Wildlife, and Scenery reports. For complete details see those reports.

Analysis Indicators

Analysis indicators are identified for each of the values listed below to be protected or maintained:

Free Flowing Conditions:

As applied to any river or section of a river, means existing or flowing in natural condition without impoundment, diversion, straightening, rip-rapping, or other modification of the waterway.

- **Indicator:** Potential resource effects were evaluated to determine if project activities would be located within the bed and banks of the river and create an obstruction or modification of the free-flowing river characteristics.

Water Quality:

Water quantity and quality must be sufficient to protect river values.

- **Indicators:** Resource effects to beneficial uses, stream temperature and shading, and Cumulative Watershed Effects.

Outstandingly Remarkable Value(s):

Each river shall be managed to protect and enhance the values for which the river was designated, while providing for public recreation and resource uses which do not adversely impact or degrade those values.

- **Indicators:**
  Fisheries: sediment, stream temperatures, and large wood;
  Vegetation: treatments in either old growth or Engleman Spruce stands;
  Wildlife: (1)Bald Eagle—level of disturbance to nest/roost sites and risk to future potential nest areas; (2)Siskiyou Mountain Salamander—risk of disturbance;
  Geology: presence of treatments on Malone landslide;
  Water Quality: risk to sediment and temperature regime alteration.

Visual Quality Objectives:

Scenic Rivers

From the Forest Plan, Standard and Guideline number MA12-7: Design management activities to meet the Retention visual quality objective visual quality objective within the Wild and Scenic River Corridor. Meet the Partial Retention visual quality objective in the foreground and the middleground beyond the Corridor.

Recreational Rivers

From the Forest Plan, Standard and Guideline number MA13-6: Design management activities to meet a Partial Retention visual quality objective visual quality objective within the Wild and Scenic River corridor, in the foreground beyond the Corridor and in the middleground beyond the corridor.

- **Indicators:** Potential effects were evaluated to determine if project activities would meet either a Retention or Partial Retention quality objective as seen from the river corridor.

Spatial and Temporal Context

The spatial analysis boundary for free flowing, water quality and outstandingly remarkable value is the river area or designated corridor. This corridor is approximately

¼ mile on each side of the river. For Retention and Partial Retention visual quality objectives the analysis boundary is the river viewshed out to four miles. Temporal bounding is three years for short term effects, at which time projects are required to meet the assigned visual quality objectives of Retention or Partial Retention. This timeframe is required by Forest Plan Standards and Guidelines[46]. Long term effects would be ten years or longer.

Affected Environment

In 1968 the Wild and Scenic Rivers Act was established to protect American rivers, including free-flowing conditions, water quality and their many values "for the benefit and enjoyment of present and future generations". As of 2012, 203 rivers encompassing 12,598 miles had been included in the National Wild and Scenic River System. Rivers or sections of rivers must be free-flowing and possess at least one "outstandingly remarkable" value, such as fish, wildlife, recreation, scenery, geology, history, cultural features, or other values including ecology. Wild and Scenic Rivers displaying varying degrees of existing human alteration are assigned corresponding classification levels of Recreational, Scenic or Wild. There are six designated or recommended Wild and Scenic Rivers in the three project areas which are potentially affected by the Westside Fire Recovery Project. These are identified and described below:

Designation

The Klamath, Scott, and North Fork Salmon Rivers, which were designated by the Secretary of Interior in 1981 for their outstandingly remarkable anadromous fisheries values, are components of the National Wild and Scenic River System.

Elk, Grider, and South Russian Creeks are recommended for inclusion in the National Wild and Scenic Rivers system in the 1995 Forest Plan. This preliminary administrative recommendation to the Secretary of Agriculture is retained until such time as Congress takes action. These recommended rivers are managed under the same guidance as designated rivers.

[46] However an exception is allowed under Forest Plan Standards and Guideline 11-7 which states "In the case of recovery activities after extreme catastrophic events such as intense wildland fires, time periods to achieve the visual quality objectives stated in Forest-wide and Management Area Standards and Guidelines may be extended. This would be necessary where previously unnoticed scenery alterations are exposed to view due to loss of vegetative screening, or during timber salvage activities where recovery of forest vegetation is determined to be of greater importance than achievement of visual quality objectives within the time periods established."

Outstandingly Remarkable Values

These may include: fish, wildlife, recreation, scenery, geology, history, cultural features, or other values including ecology. Values for potentially affected Wild and Scenic Rivers are listed in Table 3-75 below.

Classification

Wild and Scenic Rivers displaying varying degrees of existing human alteration are assigned corresponding classification levels of Recreational, Scenic or Wild. The Klamath, Scott, and North Fork Salmon Rivers have segments designated with a "recreational" classification. Rivers classified as "Recreational" Wild and Scenic River segments display the most level of development, and may include roads, bridges, buildings, and agricultural or forest clearings.

The Scott River and Grider Creek have segments identified with a "Scenic" classification. The Scenic classification applies to those rivers or sections of rivers that are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but may be accessible in places by roads. River classifications are listed in Table 3-75.

Table 3-75: Summary of Potentially Affected Wild and Scenic Rivers by Segment Number, Classification, and Outstandingly Remarkable Value(s)

Fire Area	River	Segment Number	Segment Description	Classification	Outstandingly Remarkable Value	Description Of Outstandingly Remarkable Value
Beaver and Happy Camp Complex	Klamath River	Kl01	Forest Boundary Near Ash Creek Confluence To Forest Boundary With Six Rivers National Forest	Recreational	Anadromous Fisheries	Anadromous Fisheries
Happy Camp Complex	Scott River	Sc01	Shackleford Creek To McCarthy Creek	Recreational	Anadromous Fisheries	Anadromous Fisheries
Happy Camp Complex	Scott River	Sc02	McCarthy Creek To Scott Bar	Scenic	Anadromous Fisheries	Anadromous Fisheries
Happy Camp Complex	Scott River	Sc03	Scott Bar To Klamath River	Recreational	Anadromous Fisheries	Anadromous Fisheries
Happy Camp Complex	North Fork Salmon River	Nf03	Mule Bridge Campground To Forks Of Salmon	Recreational	Anadromous Fisheries	Anadromous Fisheries

Fire Area	River	Segment Number	Segment Description	Classification	Outstandingly Remarkable Value	Description Of Outstandingly Remarkable Value
Happy Camp Complex	Elk Creek	El03	Bridge In Sec 19 To Bridge In Sec 25	Recreational	Fisheries	Fish And Game Rearing Pond For Chinook, Large Bedrock Holding Ponds Present.
Happy Camp Complex	Elk Creek	El03			Geologic	The Malone Landslide Offers The Opportunity To Observe The Effects Of A Large Slump/Debris Slide On A Major Stream.
Happy Camp Complex	Elk Creek	El04	Bridge In Sec 25 To Klamath River	Recreational	Fisheries	Very Good Spawning Habitat For Salmonids.
Happy Camp Complex	Elk Creek	El04			Wildlife	Siskiyou Mountain Salamander Has Been Located Along This Segment.
Happy Camp Complex	Grider Creek	Gr03	Rancheria Creek To Forest Road 46n24x	Scenic	Fisheries	High Water Quality Supporting Coho, Chinook, And Steelhead.
Happy Camp Complex	Grider Creek	Gr03			Vegetation	Undisturbed "Old Growth" Mixed Conifer Forest Type.
Happy Camp Complex	Grider Creek	Gr03			Wildlife	Bald Eagle (T And E) And Peregrine Falcon Known To Frequent This Segment.
Whites Fire	South Russian Creek	Ru02	Wilderness Boundary To Forest Road 40n54	Recreational	Vegetation	Magnificent Stand Of "Old Growth" Engleman Spruce Along This Segment.
Whites Fire	South Russian Creek	Ru02			Water Quality	Watershed Is Largely Pristine.

Boundaries

Boundaries for Designated Wild and Scenic River corridors were established in the Forest Plan, with legal descriptions listed in Appendix J of the Forest Plan EIS. The corridor boundaries vary in width to include key river features, generally averaging about ½ mile wide (including both sides of the river) for the length of the river.

Boundaries for Recommended Wild and Scenic River corridors were identified in the Forest Plan. The corridor boundaries are a uniform ½ mile width - ¼ mile wide on each side of the river for the length of the river.

Environmental Consequences

Alternative 1

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

Because there would be no management actions under Alternative 1, free flowing conditions and identified Outstandingly Remarkable Value(s) listed in Table 3-75 above would be maintained in this alternative.

The risk posed to water quality (sediment) from 950 identified legacy sediment sites is moderate to high over a ten-year period. Should a significant storm such as a 10-year event occur, there is a high risk of failure. Impacts would be similar to the channel scour, loss of stream shade, increased stream temperatures, and sedimentation that occurred in the 1997 flood as described by De La Fuente and Elder (1998). These impacts would adversely affect beneficial uses.

The risk to water quality and beneficial uses from increased stream temperature related to burnt Riparian Reserve areas is low. Additionally Elk Creek has a high risk for landsliding and perhaps a moderate risk for resulting debris flows that remove vegetation and thus negatively affect stream shade and temperature.

visual quality objectives define acceptable levels of visual disturbance or contrast from management activities. Because there would be no management actions under the Alternative 1, there would be no effect to scenery.

Cumulative Effects

There are no current or reasonably foreseeable future actions which are located in the vicinity of the Beaver Fire which propose activities to be located in the Klamath River Wild and Scenic River corridor. Therefore the additive effect from this project is not anticipated to have any cumulative effects to the Wild and Scenic River Act's "protect and enhance" standards.

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

The effects to the Happy Camp Complex area are the same as described for the Beaver Fire area.

Cumulative Effects

In considering current and reasonably foreseeable future projects, both the Johnny O'Neil and Thom-Seider projects propose activities in the Klamath Wild and Scenic Rivers corridor. Their analyses determined no effect to Wild and Scenic Rivers values. The additive effect from this project's lack of action in this alternative is not anticipated to have any cumulative effects to the Wild and Scenic Rivers Act's "protect and enhance" standards.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

The effects to the Whites Fire area are the same as described for the Beaver Fire area.

Cumulative Effects

In considering current and reasonably foreseeable future projects, the Salmon Salvage project proposed salvage harvest in the North Fork Wild and Scenic River corridor. Analysis determined no effect to Wild and Scenic River values. The Jess project has no proposed activities in the North Fork Wild and Scenic River corridor. The additive effect from this project's No Action is not anticipated to have any cumulative effects to the Wild and Scenic River Act's "protect and enhance" standards.

Alternatives 2, 3, 4, and 5

Free Flowing Conditions

As applied to any river or section of a river, means existing or flowing in natural condition without impoundment, diversion, straightening, rip-rapping, or other modification of the waterway. Although there are portions of harvest units proposed within the river corridor boundaries of the Klamath, Scott, and North Fork Salmon Rivers and Grider Creek, they are located several hundred feet upslope from the river and not proposed within the bed and banks of these Wild and Scenic Rivers. Therefore the Westside Fire Recovery project proposal would have *no effect* on the free flowing conditions of the Wild and Scenic Rivers, since no activities are proposed within the Wild and Scenic River's bed or banks.

Section 7 of the Wild and Scenic River Act does not apply to this project, because it is only pertinent to a "water resource project" such as a dam, water conduit, reservoir, hydropower project, powerhouse or transmission line, and does not directly affect the bed and bank of a Wild and Scenic River. In 1984 the "water resource project" definition was evaluated for its use within the Wild and Scenic River Act, and the Forest Service clarified that timber harvesting or similar activities would not be subject to Section 7 review unless it resulted in an obstruction or modification of the free-flowing river characteristics (Federal Register Vol. 49, No. 10, 1/16/84, page 1901). Therefore all four alternatives will have *no effect* to free flowing conditions.

Water Quality

All four alternatives are not expected to have direct effect on beneficial uses but should help protect water quality for Elk Creek by fixing existing legacy sites. The alternatives are not expected to increase sediment or stream temperature regimes over Alternative 1. A beneficial effect would be legacy site repair. (See Hydrology Report)

Outstandingly Remarkable Value(s)

Each river shall be managed to protect and enhance the values for which the river was designated, while providing for public recreation and resource uses which do not adversely impact or degrade those values. Alternatives 2, 3, 4, and 5 will have no direct effects to vegetation, geologic, or wildlife, values as described by fire area below.

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

Fisheries (Klamath River)

There will be minor and insignificant direct effects from water drafting. Over-all effects to sediment, stream shade, and temperature from project treatments are expected to be discountable and effects to aquatic species are expected to be minor under all action alternatives. Should a severe wildfire occur, could result in cumulative impacts to fish associated with increases in sediment supply, localized increases in water temperature, and reduced long-term large woody debris recruitment. Impacts are expected to minor to moderate depending on the spatial pattern of a high intensity wildfire.

Visual Quality Objectives (Klamath River)

The roadside hazard treatments which occur primarily along County Road 8G004 located on the south side of the Klamath River, would likely be noticeable to floaters and fishermen in some locations because of their closer proximity to the disturbances and slower rate of travel. Existing riverside vegetation would screen some effects. Project treatments would still be noticeable in some locations; up to 6 areas totaling 3.5 miles and likely not meet a Retention visual quality objective in the three year timeframe . Continued "greening up" for five – ten years would allow additional re-sprouting and growth of vegetation to hide these effects.

Table 3-76: Summary of Effects by analysis indicator for the Beaver Fire Area

River By Segment Number	River Value (Indicator)	Alternative 1 River Value Protected Or Maintained - Y/N?	Alternatives 2, 3, 4, 5 River Value Protected Or Maintained - Y/N?	Modified Alternative 2 River Value Protected Or Maintained - Y/N?
KLAMATH RIVER				
KL01	Water Quality	Y	Y	Y
	Fisheries outstandingly remarkable values	Y	Y	Y
	Retention visual quality objective (river corridor)	Y	Y (long term)	Y (long term)
	Partial Retention visual quality objective (middleground)	Y	Y	Y

Cumulative Effects

The cumulative effects on Wild and Scenic Rivers is the same as described in Alternative 1.

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

Fisheries (Klamath, Scott, Elk, Grider)

Minor and insignificant direct effects from water drafting. Over-all effects to sediment, stream shade, and temperature from project treatments are expected to be discountable and effects to aquatic species are expected to be minor under all action alternatives. Should a severe wildfire occur, could result in cumulative impacts to fish associated with

increases in sediment supply, localized increases in water temperature, and reduced long-term large woody debris recruitment. Impacts are expected to minor to moderate depending on the spatial pattern of a high intensity wildfire.

Geologic (Elk)

There are no project activities proposed on the Malone landslide, hence no effect to geologic outstandingly remarkable values.

Wildlife (Elk)

There are no harvest treatments within the river corridor. Hence the risk to Siskiyou Mountain Salamander habitat is low.

Vegetation (Grider)

A GIS data sort using (BARC data) identified one small stand of old growth (OS tree diameter Class 1 – large to giant 30" + QMD) within the roadside hazard treatment area. This stand, which is located east of Grider Creek (across from the campground) is shown with 0 percent basal area mortality loss. It is likely only a few if any trees would be felled and left in place. Therefore, this will be a negligible effect to the old growth stands.

Wildlife (Grider)

As there are no known Bald Eagle or Peregrine nesting sites within the Grider Creek drainage, there are no direct effects to Wildlife outstandingly remarkable values.

Visual Quality Objectives (Klamath River)

The roadside hazard treatments which occur primarily along County Road 8G004 located on the south side of the Klamath River, would likely be noticeable to floaters and fishermen in some locations because of their closer proximity to the disturbances and slower rate of travel. Existing riverside vegetation would screen some effects. Project treatments would still be noticeable in some locations; up to 6 areas totaling 3.5 and miles and likely not meet a Retention visual quality objective in the three year timeframe . Continued "greening up" for five – ten years would allow additional resprouting and growth of vegetation to hide these effects.

Visual Quality Objectives (Scott River)

Roadside hazard, fuels treatments, and portions of several salvage harvest units are proposed within the river corridor. All of these treatments occur along or above County Road 7F01. The Scott River parallels the county road and is vertically separated by an estimated thirty to several hundred feet. Screening vegetation along the road and river would further limit visibility. It is unlikely that kayakers and rafters would notice any of these treatments. Hence activities would easily meet the Partial Retention visual quality objective for river segments Sc01 and Sc03, and a Retention visual quality objective for river segment Sc02. There would be no adverse effect to the river's viewshed.

Visual Quality Objectives (Elk Creek)

There would be no adverse effects from project treatments. The Partial Retention visual quality objective would be met. Treatments would either be not visible or noticeable in Partial Retention visual quality objective area but would appear near natural in three years. The disturbances associated with various project activities such as soil disturbance, stumps, burnt vegetation, etc. would recover in three years' time with seasonal leaf and

needle cast, weathering (graying) of tree stumps and chips, and resprouting of vegetation or "greening up.

Visual Quality Objectives (Grider)

Portions of salvage harvest units (numbers 61 and 62-1) and roadside hazard treatments are proposed for Alternatives 2, 3, and 4 within the river corridor near Grider Creek Campground. The PCT is also located in this area of the river corridor. Project treatments would be highly noticeable to hikers only when in the immediate vicinity of these two units, and likely not meet a Retention visual quality objective in the three year timeframe. Continued "greening up" for five – ten years would allow additional resprouting and growth of vegetation to hide these effects.

Table 3-77: Summary of Effects by analysis indicator for the Happy Camp Complex Area

River By Segment Number	River Value (Indicator)	Alternative 1 River Value Protected Or Maintained - Y/N?	Modified Alternative 2 River Value Protected Or Maintained - Y/N?
KLAMATH RIVER			
KL01	Water Quality	Y	Y
	Fisheries outstandingly remarkable values	Y	Y
	Retention visual quality objective (river corridor)	Y	Y (long term)
	Partial Retention visual quality objective (middleground)	Y	Y
SCOTT RIVER			
SC01	Water Quality	Y	Y
	Fisheries outstandingly remarkable values	Y	Y
	Partial Retention visual quality objective (river corridor)	Y	Y
	Partial Retention visual quality objective (middleground)	Y	Y
SC02	Water Quality	Y	Y
	Fisheries outstandingly remarkable values	Y	Y
	Retention visual quality objective (river corridor)	Y	Y
	Partial Retention visual quality objective (foreground & middleground beyond river corridor)	Y	Y
SC03	Water Quality	Y	Y
	Fisheries outstandingly remarkable values	Y	Y
	Partial Retention visual quality objective (river corridor)	Y	Y
	Partial Retention visual quality objective (foreground & middleground beyond river corridor)	Y	Y
ELK CREEK			
EL03	Water Quality	Y	Y
	Fisheries outstandingly remarkable values	Y	Y
	Geologic outstandingly remarkable values	Y	Y
	Partial Retention visual quality objective (river corridor)	Y	Y

River By Segment Number	River Value (Indicator)	Alternative 1 River Value Protected Or Maintained - Y/N?	Modified Alternative 2 River Value Protected Or Maintained - Y/N?
	Partial Retention visual quality objective (foreground & middleground beyond river corridor)	Y	Y
EL04	Water Quality	Y	Y
	Fisheries outstandingly remarkable values	Y	Y
	Wildlife outstandingly remarkable values	Y	Y
	Partial Retention visual quality objective (river corridor)	Y	Y
	Partial Retention visual quality objective (foreground & middleground beyond river corridor)	Y	Y
GRIDER CREEK			
GR03	Water Quality	Y	Y
	Fisheries outstandingly remarkable values	Y	Y
	Vegetation outstandingly remarkable values	Y	Y
	Wildlife outstandingly remarkable values	Y	Y
	Retention visual quality objective (river corridor)	Y	Y (long term)
	Partial Retention visual quality objective (foreground & middleground beyond river corridor)	Y	Y

Cumulative Effects

The cumulative effects on Wild and Scenic Rivers is the same as described in Alternative 1.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

Fisheries (North Fork)

There will be minor and insignificant direct effects from water drafting. Over-all effects to sediment, stream shade, and temperature from project treatments are expected to be discountable and effects to aquatic species are expected to be minor under all action alternatives. Should a severe wildfire occur, could result in cumulative impacts to fish associated with increases in sediment supply, localized increases in water temperature, and reduced long-term large woody debris recruitment. Impacts are expected to minor to moderate depending on the spatial pattern of a high intensity wildfire.

Vegetation (South Russian)

There are no project treatments proposed in the Engleman Spruce stands. Hence there will be no direct effects to the Vegetation outstandingly remarkable values.

Water Quality (South Russian)

The alternatives have a low risk to increase stream sedimentation and water temperature and are not expected to increase sediment or stream temperature regimes over Alternative 1.

Visual Quality Objectives (North Fork, South Russian)

There would be no adverse effects from project treatments. The Partial Retention visual quality objective would be met. Treatments would either be not visible or noticeable in Partial Retention visual quality objective area but would appear near natural in three years. The disturbances associated with various project activities such as soil disturbance, stumps, burnt vegetation, etc. would recover in three years' time with seasonal leaf and needle cast, weathering (graying) of tree stumps and chips, and resprouting of vegetation or "greening up.

Table 3-78: Summary of Effects by analysis indicator for the Whites Fire Area

River By Segment Number	River Value (Indicator)	Alternative 1 River Value Protected Or Maintained - Y/N?	Modified Alternative 2 River Value Protected Or Maintained - Y/N?
NORTH FORK SALMON RIVER			
NF03	Water Quality	Y	Y
	Fisheries outstandingly remarkable values	Y	Y
	Partial Retention visual quality objective (river corridor)	Y	Y
	Partial Retention visual quality objective (foreground & middleground beyond river corridor)	Y	Y
SOUTH RUSSIAN CREEK			
RU02	Water Quality	Y	Y
	Vegetation outstandingly remarkable values	Y	Y
	Water Quality outstandingly remarkable values	Y	Y
	Partial Retention visual quality objective (river corridor)	Y	Y
	Partial Retention visual quality objective (foreground & middleground beyond river corridor)	Y	Y

Cumulative Effects

The cumulative effects on Wild and Scenic Rivers is the same as described in Alternative 1.

Alternative 2 Modified

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

The effects for the Beaver Fire area are the same as for Alternative 2.

Cumulative Effects

There are no current or reasonably foreseeable future actions which are located in the vicinity of the Beaver Fire which propose activities to be located in the Klamath River Wild and Scenic River corridor. Therefore the additive effect from this project is not anticipated to have any cumulative effects to the Wild and Scenic River Act's "protect and enhance" standards.

Project Area A: Happy Camp Complex

Direct Effects and Indirect Effects

Modified Alternative 2 proposes decreases from Alternative 2 in salvage harvest acres within both the Klamath River and Grider Creek corridors from 425 acres to 422 acres and 41 acres to 10 acres respectively. Even with these acreage reductions, the scenery effects are the same as Alternative 2. Both of these corridors are managed with a Retention Visual Quality Objective (visual quality objective). As stated in the Scenery Resource report (see Table 5), salvage harvest or roadside hazard treatments would not meet Retention in the short term. Therefore the Klamath River and Grider Creek would not meet Retention in the short term. All other treatment acres for all other rivers are the same as Alternative 2. Therefore there is no change to effects.

Cumulative Effects

In considering current and reasonably foreseeable future projects, both the Johnny O'Neil and Thom-Seider projects propose activities in the Klamath Wild and Scenic Rivers corridor. Their analyses determined no effect to Wild and Scenic Rivers values. The additive effect from this project's lack of action in this alternative is not anticipated to have any cumulative effects to the Wild and Scenic Rivers Act's "protect and enhance" standards.

Project Area A: Whites Fire

Direct Effects and Indirect Effects

Modified Alternative 2 proposes an increase from Alternative 2 in salvage harvest acres within the North Fork Salmon River corridor from 83 acres to 108 acres. Because the river corridor is managed with a Partial Retention Visual Quality Objective (visual quality objective) and salvage harvest would meet this objective in three years as stated in the Scenery Resource report, there is no change to effects.

All other treatment acres for both the North Fork Salmon River and South Russian Creek are the same as Alternative 2. Therefore there is no change to effects.

Cumulative Effects

The cumulative effects are the same as described in Alternative 1.

Modified Alternative 3

Project Area A: Beaver Fire

Direct Effects and Indirect Effects

Modified Alternative 3 proposes a significant decrease in total acres treated from Alternative 2; all salvage harvest has been removed from the project area and all roadside hazard removed along County Road 8G004. This has resulted in a no effect to the Klamath River viewshed. The effects to all other river values are the same as described for Alternatives 2-5.

Cumulative Effects

The cumulative effects on Wild and Scenic Rivers is the same as described in Alternative 2, 3, 4, and 5.

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

Modified Alternative 3 proposes a decrease in total acres treated for all river segments from Alternative 2; fuels treatments stayed the same or increased, harvest stayed the same or decreased, and roadside hazard acres were decreased for all river segments.

With the removal of roadside hazard in Grider Creek and the addition of snag inclusion areas in harvest units, Grider Creek would meet the Retention VQO in the short term. The effects to all other rivers and river values are the same as described for Alternatives 2-5.

Cumulative Effects

The cumulative effects on Wild and Scenic Rivers is the same as described in Alternative 2, 3, 4, and

Project Area C: Whites Fire

Direct Effects and Indirect Effects

Modified Alternative 3 proposes a slight increase from Alternative 2 in fuels treatment acres within the South Russian Creek corridor from 84 acres to 89 acres. Because the river corridor is managed with a Partial Retention Visual Quality Objective (VQO) and fuels treatments would meet this objective in three years as stated in the Scenery Resource report, there is no change to effects. All other treatment acres for South Russian Creek are the same as Alternative 2. Therefore there is no change to effects.

Cumulative Effects

The cumulative effects on Wild and Scenic Rivers is the same as described in Alternative 2, 3, 4 and 5.

Compliance with law, regulation, policy, and the Forest Plan

All Wild and Scenic Rivers Act protection requirements will be met for this project. Free flowing conditions, water quality, and identified outstandingly remarkable value(s) will be protected. River classifications will be maintained.

The project treatments associated with the project must meet the Retention and Partial Retention Visual Quality Objectives (visual quality objectives) from within the river corridor, in the foreground beyond the corridor, and in middleground areas visible from the river corridor. For management activities to meet the Retention visual quality objective, the management activity must not be noticeable (see Scenery report). For management activities to meet the Partial Retention visual quality objective, the management activity must remain visually subordinate to the characteristic landscape (see Scenery report).

The noticeable visual disturbances within the Klamath River Scott Rivers and Grider Creek corridors would likely not meet the assigned Retention Visual Quality Objectives (visual quality objective) in the short term (3-5 years) when visible from the river corridors. Re-sprouting and growth of vegetation will green up disturbed areas to meet the Retention visual quality objective in the long term.

Not meeting a visual quality objective in the three year timeframe inconsistent with Forest Plan Standards and Guidelines numbers MA12-7 and MA13-6. However an exception is allowed under Forest Plan Standards and Guidelines number 11-7 which states ”In the case of recovery activities after extreme catastrophic events such as intense wildland fires, time periods to achieve the visual quality objectives stated in Forest-wide and Management Area Standards and Guidelines may be extended. This would be necessary where previously unnoticed scenery alterations are exposed to view due to loss of vegetative screening, or during timber salvage activities where recovery of forest vegetation is determined to be of greater importance than achievement of visual quality objectives within the time periods established.”

The desired future conditions for both scenic and recreational rivers will be met; scenic river areas and shorelines will remain largely primitive and undeveloped, and recreational river waterways will remain generally natural and riverine in appearance.

Inventoried Roadless Areas

Information on six inventoried roadless areas (IRAs) within the Westside Fire Recovery project area is analyzed in this section, and the effects of the project on these IRAs are disclosed. The detailed history of IRAs and Forest Service direction for management in IRAs is included in the body and appendices of the Inventoried Roadless Area resource report, available on the project website.

Methodology

Geographic Information System (GIS) layers provide information for the location of IRAs and proposed activities that may affect IRAs. A synopsis of the conditions of IRAs at the time the Record of Decision for the Forest Plan was published (1995) is provided in Appendix C of the Forest Plan final EIS.

Analysis indicators

Acres of IRA where roadless characteristics potentially will be affected by treatments proposed in the project, and degree of effect, are analysis indicators. Factors used to determine whether or not roadless characteristics will be affected by treatments, identified in the Roadless Area Conservation Rule of 2001 (36 CFR Part 294), are listed on

Table 3-79:

Table 3-79: Factors used to measure effects on roadless character

Roadless Area Characteristics	Roadless Character Descriptions (from 36 CFR Part 294, Special Areas; Roadless Area Conservation Rule, 2001)	Factors used to measure effects
High quality or undisturbed soil, water and air resources (See Soils, Water Quality (Hydrology), Air Quality and Aquatic Conservation Strategy sections for more information)	"These three key resources are the foundation upon which other resource values and outputs depend. Healthy watersheds catch, store, and safely release water over time, protecting downstream communities from flooding; providing clean water for domestic, agricultural and industrial uses; helping maintain abundant and healthy fish and wildlife populations; and are the basis for many forms of outdoor recreation."	Soil—acres of soil disturbance due to use of mechanical equipment Water—temperature, sediment, peak flow, channel morphology, Aquatic Conservation Strategy objectives Air—air (criteria) pollutant emissions relative to air quality standards.
Sources of public drinking water (See the Water Quality (Hydrology) section for more information)	"Maintaining [watersheds contributing to drinking water] in a relatively undisturbed condition saves downstream water filtration costs. Careful management of these watersheds is crucial in maintaining the flow and affordability of clean water to a growing population."	Existence and effects on municipal watersheds
Diversity of plant and animal communities (See the Botany and Wildlife sections for more information)	"Roadless areas are more likely than roaded areas to support greater ecosystem health, including the diversity of native and desired nonnative plant and animal communities due to the absence of disturbances caused by roads and accompanying activities. Inventoried roadless areas also conserve native biodiversity by serving as a bulwark against the spread of nonnative invasive species."	Diversity of tree species Diversity of terrestrial and aquatic wildlife species and communities Diversity of fish and aquatic species and communities Risk of introducing or spreading non-native invasive plant populations

Roadless Area Characteristics	Roadless Character Descriptions (from 36 CFR Part 294, Special Areas; Roadless Area Conservation Rule, 2001)	Factors used to measure effects
Habitat for Threatened, Endangered, Proposed, Candidate, and Sensitive species and species dependent on large undisturbed areas of land (See the Wildlife, Botany, and Evaluation, Fisheries sections for more information)	Roadless areas are biological strongholds and refuges for many species. Roadless areas support a diversity of aquatic habitats and communities, providing or affecting habitat for more than 280 TES species."	Likelihood of affecting existing Threatened, Endangered, Proposed and Candidate botanical populations Likelihood that effects to Sensitive botanical populations will result in a trend toward listing Likelihood of adversely affecting Threatened, Endangered, Proposed, and Candidate terrestrial wildlife species, especially those that are dependent on large undisturbed areas of land Likelihood that the effects to Sensitive wildlife species will result in a trend toward listing Effects to habitat for Management Indicator Species that depend on large undisturbed areas of land Likelihood of affecting Threatened, Endangered, Proposed and Sensitive species of fish and aquatic species if dependent on large undisturbed areas of land
Primitive, semi-primitive non-motorized, and semi-primitive motorized classes of recreation (See the Recreation section for more information)	"Roadless areas often provide outstanding dispersed recreation opportunities such as hiking, camping, picnicking, wildlife viewing, hunting, fishing, cross-country skiing and canoeing. These areas can also take pressure off heavily used wilderness areas by providing solitude and quiet, and dispersed recreation opportunities."	Recreation opportunities (wildlife viewing, relatively undisturbed scenery viewing, etc.)
Reference landscapes for research study or interpretation	"Reference landscapes of relatively undisturbed areas serve as a barometer to measure the effects of development on other parts of the landscape."	Existing or recommended research natural areas
Natural appearing landscapes with high scenic quality (See the Scenery section for more information)	"High quality scenery, especially scenery with natural-appearing landscapes, is a primary reason that people choose to recreate. In additional, quality scenery contributes directly to real estate values in nearby communities and residential areas."	Scenic character and integrity (Visual Quality Objectives) from Forest Plan identified scenic viewpoints

Roadless Area Characteristics	Roadless Character Descriptions (from 36 CFR Part 294, Special Areas; Roadless Area Conservation Rule, 2001)	Factors used to measure effects
Traditional cultural properties and sacred sites (See the Cultural Resources section for more information)	"Traditional cultural properties are places, sites, structures, art, or objects that have played an important role in the cultural history of a group. Sacred sites are places that have special religious significance to a group. Traditional cultural properties and sacred sites may be eligible for protection under the National Historic Preservation Act. However, many of them have not yet been inventoried especially those that occur in inventoried roadless areas."	Sites identified as eligible or potentially eligible for listing on the National Register of Historic Places or identified by tribes as traditional cultural properties and sacred sites
Other locally identified unique characteristics	"Inventoried roadless areas may offer other locally identified unique characteristics and values. Examples include uncommon geological formations, which are valued for their scientific and scenic quality, or wetland complexes. Unique social, cultural or historical characteristics may also depend on the roadless character of the landscape. Examples include ceremonial sites, places for local events, areas prized for collection on non-timber forest products or exceptional hunting and fishing opportunities."	Existing, inventoried and un-inventoried special interest areas (botanical, geologic)

The effects of the project on the currently roadless portions of IRAs and the portions that include roads are analyzed and disclosed separately because retaining roadless character is difficult, if not impossible, in areas of IRAs that already include roads.

Spatial and temporal bounding

The spatial boundary for analysis includes the IRAs within the project area boundary because only activities that occur within the IRAs affect the roadless characteristics of the IRAs.

The short-term temporal bounding is one to eight years because effects will be realized during and shortly after project implementation. The long-term timeframe is 20 years because effects will fade by the end of that time.

Affected Environment

The following is information on the affected environment for IRAs displayed by fire-related project area. Project area A (Beaver fire) does not include any IRAs so no information is available for that area. The displayed information is for project area B (Happy Camp complex fires) and project area C (Whites fire).

There are four IRAs totally or partially within the Happy Camp fire area: Grider; Johnson; Kelsey; and Tom Martin. Two IRAs are partially within the Whites fire area: Russian; and Snoozer. Only the Grider IRA in the Happy Camp fire area and the Snoozer IRA in the Whites fire area retain a roadless character for the entire IRA. Roads were constructed in portions of the other IRAs between 1984, when these IRAs were "released" for road construction and other activities by the California Wilderness Act, and 2001 when the Roadless Area Conservation Rule limiting road construction and associated activities in IRAs was published. The total number of acres in each IRA within each fire-related project area, the acres that are considered to retain their roadless

character because no roads were constructed in them, and the acres that no longer retain roadless character are displayed in Table 3-80 which also displays the percentage of each IRA that burned at moderate to high severity in the 2014 fires.

Table 3-80: Acres within each IRA, and within the portions of each IRA that retain roadless character and percentage of acres that burned at moderate to high severity

IRA	Total Acres of IRA within project area	Percentage of burned acres that burned at moderate to high severity	Acres that retain roadless character	Percentage of burned acres that retain roadless character that burned at moderate to high severity	Acres that do not retain roadless character	Percentage of burned acres that do not retain roadless character that burned at moderate to high severity
Project Area B: Happy Camp						
Grider	10,640	57%	10,640	57%	0	0%
Johnson	4,900	22%	3,970	20%	930	28%
Kelsey	3,230	16%	510	23%	2,720	15%
Tom Martin	9,050	47%	5,650	53%	3,400	35%
Totals for Happy Camp Project Area	27,820	43%	20,770	49%	7,050	26%
Project Area C: Whites						
Russian	13,540	34%	11,910	34%	1,630	30%
Snoozer	9,250	43%	9,250	43%	0	0%
Totals for Whites Project Area	22,790	37%	21,160	38%	1,630	30%

Environmental Consequences

Activities or treatments that may potentially affect roadless character include site preparation and planting, fuels treatments and roadside hazard treatments. Although no salvage harvesting will occur within inventoried roadless areas, roadside hazard treatments include harvesting of trees greater than 16 inches in diameter along with cutting and leaving smaller trees for firewood or eventual fuels treatment as described in Chapter 2. Acres treated in each alternative are a proxy for effects on roadless character. Since no roads will be built in IRAs and no salvage harvesting will occur, and these activities that are likely to have a measurable effect on roadless character are not present in any alternative, there will not be substantial effects. In addition, there are no research natural areas or special interest areas within any portion of an IRA that will be treated in any alternative. There are no municipal watersheds within any portion of an IRA that will be treated in any alternative.

Alternative 1

Project Area B: Happy Camp Complex

Direct and Indirect Effects

Since there are no management actions with this alternative, there will be no direct or indirect effects on IRAs.

Cumulative Effects

Since there are no direct or indirect effects, there are no cumulative effects of adding the zero effects of Alternative 1 to the past, ongoing or reasonable foreseeable future actions listed in Appendix C that overlap IRAs in time or space.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

Since there are no management actions with this alternative, there will be no direct or indirect effects on IRAs.

Cumulative Effects

Since there are no direct or indirect effects, there are no cumulative effects of adding the zero effects of Alternative 1 to the past, ongoing or reasonable foreseeable future actions listed in Appendix C that overlap IRAs in time or space.

Alternative 2

Direct and Indirect Effects

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

The direct or indirect effects on roadless characteristics in IRAs are based on the type and extent of activities within each IRA, especially within the roadless portions since the roadless characteristics of the roaded portions have already been affected. Acres of IRAs within the project boundary that retain roadless character and those that do not are displayed in Table 3-81.

About 207 acres of fuels treatment, 121 acres of site preparation and planting, and 74 acres of roadside hazard treatment have the potential to affect roadless character. Project design features requiring hand treatments for site preparation and planting mitigate negative effects of these treatments on roadless character. There is general agreement among resource specialists that fuels treatments will not negatively affect roadless character and that roadside hazard treatments will not negatively affect roadless character of sections of IRAs that retain roadless character due to their placement along roads that are outside the boundaries of the IRAs.

Cumulative Effects

Adding the effects of Alternative 2 to the past, ongoing or reasonable foreseeable future actions listed in Appendix C that overlap IRAs in time and space will produce negligible cumulative effects to roadless characteristics. There are no current or reasonably foreseeable future projects that include any treatments in the four IRAs within this fire-related project area and no private land project or private lands within these IRAs.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

About 5,280 acres of fuels treatment, less than 40 acres of site preparation and planting, and 36 acres of roadside hazard treatments have the potential to affect roadless character. Project design features requiring hand treatments for site preparation and planting

mitigate negative effects of these treatments on roadless character. There is general agreement among resource specialists that fuels treatments will not negatively affect roadless character and that roadside hazard treatments will not negatively affect roadless character of sections of IRAs that retain roadless character due to their placement along roads that are outside the boundaries of the IRAs.

Cumulative Effects

Adding the effects of Alternative 2 to the past, ongoing or reasonable foreseeable future actions listed in Appendix C that overlap IRAs in time and space will produce negligible cumulative effects to roadless characteristics. There are no current or reasonably foreseeable future projects that include any treatments in the two IRAs within this fire-related project area and no private land project or private lands within these IRAs.

Table 3-81: Alternative 2 proposed activities within each IRA, in portions that retain and do not retain roadless character

IRA	Acres within IRA	% of IRA with Activity	Acres within IRA retaining roadless character	% of IRA with Activity retaining roadless character	Acres within IRA no longer retaining roadless character	% of IRA with Activity no longer retaining roadless character
Project Area B: Happy Camp Complex						
Grider	148	2%	148	2%	0	0%
Fuels Treatment	43	<1%	43	<1%	0	0%
Site prep./plant	82	1%	82	1%	0	0%
Roadside Hazard	23*	<1%	23*	<1%	0	0%
Johnson	511	10%	198	5%	313	34%
Fuels Treatment	160	3%	114	3%	47	5%
Site prep./plant	184	4%	39	1%	146	16%
Roadside Hazard	167	3%	46*	1%	121	13%
Kelsey	318	10%	5	<1%	313	12 %
Fuels Treatment	0	0%	0	0%	0	0%
Site prep./plant	44	1%	0	0%	44	2%
Roadside Hazard	274	8%	5*	1%	269	10%
Tom Martin	750	8%	50	1%	700	20%
Fuels Treatment	213	2%	50	1%	163	5%
Site prep./plant	47	<1%	0	0%	47	1%
Roadside Hazard	490	5%	0	0%	490	14%
Happy Camp Totals	**1,727**	**6%**	**402**	**2%**	**1,327**	**19%**
Fuels Treatment	416	2%	207	1%	210	3%

IRA	Acres within IRA	% of IRA with Activity	Acres within IRA retaining roadless character	% of IRA with Activity retaining roadless character	Acres within IRA no longer retaining roadless character	% of IRA with Activity no longer retaining roadless character
Site prep./plant	357	1%	121	<1%	237	3%
Roadside Hazard	954	3%	74*	<1%	880	12%
Project Area C: Whites Fire						
Russian	2,296	17%	1,853	16%	442	27%
Fuels Treatment	1,935	14%	1,782	15%	153	9%
Site prep./plant	131	1%	39	<1%	92	6%
Roadside Hazard	230	2%	32*	<1%	197	12%
Snoozer	3,463	37%	3,463	37%	0	0%
Fuels Treatment	3,459	37%	3,459	37%	0	0%
Site prep./plant	0	0%	0	0%	0	0%
Roadside Hazard	4*	<1%	4*	<1%	0	0%
Whites Totals	5,759	25%	5,316	25%	442	27%
Fuels Treatment	5,394	24%	5,241	25%	153	9%
Site prep./plant	131	<1%	39	<1%	92	6%
Roadside Hazard	234	1%	36*	<1%	197	12%

*Acres are within 200 feet of a road that is outside the IRA.

Alternative 3

Direct and Indirect Effects

The actions proposed in this alternative are the same as Alternative 2; therefore, direct and indirect effects will be the same as for Alternative 2.

Cumulative Effects

Adding the effects of Alternative 3 to the past, ongoing or reasonable foreseeable future actions listed in Appendix C will produce the same cumulative effects to roadless characteristics as for Alternative 2.

Alternative 4

Direct and Indirect Effects

The actions proposed in this alternative are the same as Alternative 2; therefore, direct and indirect effects will be the same as for Alternative 2.

Cumulative Effects

Adding the effects of Alternative 4 to the past, ongoing or reasonable foreseeable future actions listed in Appendix C will produce the same cumulative effects to roadless characteristics as for Alternative 2.

Alternative 5

Direct and Indirect Effects

No site preparation and planting actions are proposed in IRAs in this alternative as noted below in Table 3-82. The direct and indirect effects on roadless characteristics are due to fuels treatments and roadside hazard treatments; these treatments are the same as for Alternative 2.

Cumulative Effects

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

About 207 acres of fuels treatment and 74 acres of roadside hazard treatments have the potential to affect roadless character. There is general agreement among resource specialists that fuels treatments will not negatively affect roadless character and that roadside hazard treatments will not negatively affect roadless character of sections of IRAs that retain roadless character due to their placement along roads that are outside the boundaries of the IRAs.

Cumulative Effects

Adding the effects of Alternative 5 to the past, ongoing or reasonable foreseeable future actions listed in Appendix C that overlap IRAs in time and space will produce negligible cumulative effects to roadless characteristics. There are no current or reasonably foreseeable future projects that include any treatments in the four IRAs within this fire-related project area and no private land project or private lands within these IRAs.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

About 5,280 acres of fuels treatment and 36 acres of roadside hazard treatments have the potential to affect roadless character. There is general agreement among resource specialists that fuels treatments will not negatively affect roadless character and that roadside hazard treatments will not negatively affect roadless character of sections of IRAs that retain roadless character due to their placement along roads that are outside the boundaries of the IRAs.

Cumulative Effects

Adding the effects of Alternative 5 to the past, ongoing or reasonable foreseeable future actions listed in Appendix C that overlap IRAs in time and space will produce negligible cumulative effects to roadless characteristics. There are no current or reasonably foreseeable future projects that include any treatments in the two IRAs within this fire-related project area and no private land project or private lands within these IRAs.

Table 3-82: Alternative 5 proposed activities within each IRA, in portions that retain and do not retain roadless character

IRA	Acres within IRA	% of IRA with Activity	Acres within IRA retaining roadless character	% of IRA with Activity retaining roadless character	Acres within IRA no longer retaining roadless character	% of IRA with Activity no longer retaining roadless character
Project Area B: Happy Camp Complex						
Grider	66	1%	66	1%	0	0%
Fuels Treatment	43	<1%	43	<1%	0	0%
Site prep./plant	0	0%	0	0%	0	0%
Roadside Hazard	23*	<1%	23*	<1%	0	0%
Johnson	327	7 %	160	4%	168	18%
Fuels Treatment	160	3%	114	3%	47	5%
Site prep./plant	0	0%	0	0%	0	0%
Roadside Hazard	167	3%	46*	1%	121	13%
Kelsey	274	8%	5	1%	269	10%
Fuels Treatment	0	0%	0	0%	0	0%
Site prep./plant	0	0%	0	0%	0	0%
Roadside Hazard	274	8%	5*	1%	269	10%
Tom Martin	703	8%	50	1%	653	19%
Fuels Treatment	213	2%	50	1%	163	5%
Site prep./plant	0	0%	0	0%	0	0%
Roadside Hazard	490	5%	0	0%	490	14%
Happy Camp Totals	**1,370**	**5%**	**281**	**1%**	**1.090**	**15%**
Fuels Treatment	416	2%	207	1%	210	3%
Site prep./plant	0	0%	0	0%	0	0%
Roadside Hazard	954	3%	74*	<1%	880	12%
Project Area C: Whites Fire						
Russian	2,165	16%	1,814	15%	350	21%
Fuels Treatment	1,935	14%	1,782	15%	153	9%
Site prep./plant	0	0%	0	0%	0	0%
Roadside Hazard	230	2%	32*	<1%	197	12%
Snoozer	3,463	37%	3,463	37%	0	0%
Fuels Treatment	3,459	37%	3,459	37%	0	0%
Site prep./plant	0	0%	0	0%	0	0%
Roadside Hazard	4*	<1%	4*	<1%	0	0%
Whites Totals	**5,628**	**25%**	**5,277**	**25%**	**350**	**21%**
Fuels Treatment	5,394	24%	5,241	25%	153	9%
Site prep./plant	0	0%	0	0%	0	0%
Roadside Hazard	234	1%	36*	<1%	197	12%

*Acres are within 200 feet of a road that is outside the IRA.

Alternative 2 Modified

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

The actions proposed in this alternative are the same as Alternative 2; therefore, direct and indirect effects will be the same as for Alternative 2.

Cumulative Effects

Adding the effects of Alternative 2 Modified to the past, ongoing or reasonable foreseeable future actions listed in Appendix C will produce the same cumulative effects to roadless characteristics as for Alternative 2.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

The actions proposed in this alternative are the same as Alternative 2; therefore, direct and indirect effects will be the same as for Alternative 2.

Cumulative Effects

Adding the effects of Alternative 2 Modified to the past, ongoing or reasonable foreseeable future actions listed in Appendix C will produce the same cumulative effects to roadless characteristics as for Alternative 2.

Alternative 3 Modified

Project Area B: Happy Camp Complex

Direct Effects and Indirect Effects

About 288 acres of fuels treatment, 120 acres of site preparation and planting, and 31 acres of roadside hazard treatments have the potential to affect roadless character. There is general agreement among resource specialists that fuels treatments will not negatively affect roadless character. Roadside hazard treatments, and site preparation and planting, occur primarily within parts of IRAs that did not retain roadless character in 1995. The small number of acres of roadside hazard treatments within parts of IRAs that did retain roadless character is along roads that are adjacent to IRAs within minor inclusions into the edges of IRAs; therefore, roadside hazard treatments will not measurably affect roadless character. Site preparation and planting will be all by hand treatment and will not measurably affect roadless character.

Cumulative Effects

Adding the effects of Alternative 3 Modified to the past, ongoing or reasonable foreseeable future actions listed in Appendix C that overlap IRAs in time and space will produce negligible cumulative effects to roadless characteristics. There are no current or reasonably foreseeable future projects that include any treatments in the four IRAs within this fire-related project area and no private land project or private lands within these IRAs.

Project Area C: Whites Fire

Direct Effects and Indirect Effects

About 5,240 acres of fuels treatment, 39 acres of site preparation and planting, and 34 acres of roadside hazard treatments have the potential to affect roadless character. There is general agreement among resource specialists that fuels treatments will not negatively affect roadless character. Roadside hazard treatments, and site preparation and planting, occur primarily within parts of IRAs that did not retain roadless character in 1995. The small number of acres of roadside hazard treatments within parts of IRAs that did retain roadless character is along roads that are adjacent to IRAs within minor inclusions into

the edges of IRAs; therefore, roadside hazard treatments will not measurably affect roadless character. Site preparation and planting will be all by hand treatment and will not measurably affect roadless character.

Table 3-83: Alternative 3 Modified proposed activities within each IRA, in portions that retain and do not retain roadless character

IRA	Acres within IRA	% of IRA with Activity	Acres within IRA retaining roadless character	% of IRA with Activity retaining roadless character	Acres within IRA no longer retaining roadless character	% of IRA with Activity no longer retaining roadless character
Project Area B: Happy Camp Complex						
Grider	227	2%	227	2%	0	0%
Fuels Treatment	124	1%	124	1%	0	0%
Site prep./plant	82	1%	82	1%	0	0%
Roadside Hazard	22*	<1%	22*	<1%	0	0%
Johnson	227	9%	156	4%	271	29%
Fuels Treatment	160	3%	114	3%	47	5%
Site prep./plant	184	4%	39	1%	146	16%
Roadside Hazard	83	2%	4*	<1%	79	8%
Kelsey	133	4%	5	1%	127	5%
Fuels Treatment	0	0%	0	0%	0	0%
Site prep./plant	44	1%	0	0%	44	2%
Roadside Hazard	88	3%	5*	1%	83	3%
Tom Martin	613	7%	50	1%	562	16%
Fuels Treatment	213	2%	50	1%	163	5%
Site prep./plant	47	1%	0	0%	47	1%
Roadside Hazard	352	4%	0	0%	352	10%
Happy Camp Totals	**1,401**	**5%**	**440**	**2%**	**961**	**14%**
Fuels Treatment	497	2%	288	1%	209	3%
Site prep./plant	358	1%	120	1%	237	3%
Roadside Hazard	546*	2%	31*	<1%	514	7%
Project Area C: Whites Fire						
Russian	2,266	17%	1,854	16%	412	25%
Fuels Treatment	1,936	14%	1,783	15%	153	9%
Site prep./plant	122	1%	39	<1%	83	5%
Roadside Hazard	209	2%	32*	<1%	177	11%
Snoozer	3,460	37%	3,460	37%	0	0%
Fuels Treatment	3,458	37%	3,458	37%	0	0%
Site prep./plant	0	0%	0	0%	0	0%
Roadside Hazard	2*	<1%	2*	<1%	0	0%
Whites Totals	**5,726**	**25%**	**5,314**	**25%**	**412**	**25%**
Fuels Treatment	5,393	24%	5,240	25%	153	9%
Site prep./plant	122	<1%	39	<1%	83	5%
Roadside Hazard	211	1%	34*	<1%	177	11%

*Acres are within 200 feet of a road that is outside the IRA.

Cumulative Effects

Adding the effects of Alternative 3 Modified to the past, ongoing or reasonable foreseeable future actions listed in Appendix C that overlap IRAs in time and space will

produce negligible cumulative effects to roadless characteristics. There are no current or reasonably foreseeable future projects that include any treatments in the two IRAs within this fire-related project area and no private land project or private lands within these IRAs.

Summary of Effects

Table 3-84: Summary of Effects by analysis indicator for the Happy Camp Fire Area.

Indicator	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 2 Mod.	Alt. 3 Mod.
Acres of treatments in parts of IRAs in which roadless character is retained	0	402	402	402	281	402	440
Acres of IRA on which roadless character will be affected	0	0	0	0	0	0	0

Table 3-85: Summary of Effects by analysis indicator for the Whites Fire Area

Indicator	Alt. 1	Alt. 2	Alt. 3	Alt. 4	Alt. 5	Alt. 2 Mod.	Alt. 3 Mod.
Acres of treatments in parts of IRAs in which roadless character is retained	0	5,316	5,316	5,316	5,277	5,316	5,314
Acres of IRA on which roadless character will be affected	0	0	0	0	0	0	0

Comparison of Effects

There is little difference among alternatives in effects on roadless character of IRAs because the treatments proposed in any alternative have little effect on the roadless areas that retain roadless characteristics. Alternative 1 does not propose any treatments in IRAs; IRAs will regenerate naturally as described in the vegetation section of this chapter. In action alternatives, only prescribed burning affects a sizeable number of acres; this action mimics the effects of low intensity wildfire and will not substantially affect roadless character. Construction and maintenance of shaded fuel breaks on a small number of acres that retain their roadless characteristic and removal of small fuels (generally less than 3 inches in diameter at breast height) will also not substantially affect roadless character. Alternative 3 Modified includes more acres of fuels treatment in the Happy Camp fire area than other alternatives because some of the additional fuelbreaks recommended by the Karuk Alternative are included; roadless character will not be substantially affected by these added acres of fuels reduction. Roadside hazard treatments, primarily along roads within the portions of the inventoried roadless areas that do not retain roadless character, will have little effect on roadless character. Site preparation and planting using hand tools and methods in Alternatives 2, 3, 4, Alternative 2 Modified and Alternative 3 Modified (with implementation of project design feature IRA-1) will have a minor effect; this will occur on only 160 acres of areas that currently retain roadless character (about 120 for Happy Camp and almost 40 for Whites fire-related areas). No site preparation and planting will occur in Alternative 5; effects of natural regeneration will be the same as for Alternative 1.

Compliance with law, policy, regulation and the Forest Plan

All alternatives will comply with the Roadless Area Conservation Rule and applicable Forest Plan standards as amended by this rule.

Climate Change

Increasingly, the relationships between human-caused emissions, climate change, and the role of the forests as carbon sinks (carbon sequesters) are being documented (IPCC 2007). Although uncertainty exists in quantifying the impact of emissions on climate, a global warming of 1.4 to 5.8 degrees centigrade is projected by 2100 (USDA Forest Service 2007b). Adapting to climate change and its potential impacts poses challenges and opportunities to managing resources. Forests and rangelands are seen as part of the solution to reducing atmospheric carbon dioxide and other greenhouse gases due to their ability to sequester or store carbon. However, the magnitude of the opportunity for carbon storage is not well quantified or thoroughly understood, especially at the project level.

The use of future climate scenarios and ecological models suggests that the impact of climate change on ecosystems in the United States may include increases in ecosystem productivity in the short term and shifts in the distribution of plants and animals in the long term (Joyce and Birdsey 2000). As climate changes advance, there are some indications that there will be increases in disturbances such as wildfires, drought, and insects (USDA Forest Service 2007b).

Although climate change simulations vary considerably in making future predictions of climate change, in most scenarios relatively little change in overall precipitation is projected. Most precipitation will continue to occur during winter storms. However, increased winter temperatures may mean that more of the winter precipitation falls as rain and less as snow. Snow accumulations may decrease and spring snow melt is projected to occur earlier. There is no local scientific information to suggest that storms may increase in size or frequency so no projections are made concerning the effects of storm events on the project area. Dry seasons may be drier, warmer and longer, with resulting increases in the frequency and size of wildfires as seen in 2014. This project may allow some adaptation to climate change effects on the local level.

Based on the best available science, it is still speculative to factor any specific ecological trends or substantial changes in climate into the analysis of environment impacts of individual projects. Currently, the best available science concerning climate change is not adequate to support reliable predictions about ecological interactions and trends at the local project level. Local information concerning precipitation and temperature in the vicinity of the Westside Fire Recovery project suggests that national predictions on increasing temperature may be reflected at the project level but precipitations trends are more variable (USDA Forest Service 2011b). Based on regional predictions of a warming climate and increases in disturbances such as wildfire and insect infestations, it is expected that treatments proposed in the action alternatives for this project will benefit forests through fuel-reduction treatments designed to promote species diversity, favor fire-resistant tree species, and reduce risk of loss due to wildfire. Specifically, the following may occur:

- Increases in average temperatures, with earlier snowmelt, may lead to an increase in the size and frequency of wildfires with warmer and longer fire seasons as was evident in 2014
- Harvest of burned areas can reduce fuels, especially those that are slow to ignite but burn at high intensities lead heated soils that damage soil productivity.

- From our current state of understanding, climate change may bring about increases in insect and pathogen outbreaks.

The contribution of this project to factors that may affect climate change such as greenhouse gas emissions is disclosed in the Air Quality section of this chapter and referenced Air Quality resource report.

Active forest management is believed to be an effective method of carbon sequestration (IPCC 2007). Although there is some controversy about whether older trees are more successful in storing carbon than younger trees (Coulson et al. 2015), there is general agreement that forests are an important factor in carbon storage (Fitzsimmons, et al. 2004, US EPA 2013, Pan et al. 2011). Likewise, there is general agreement that less carbon is stored in decaying wood than in wood content in lumber and manufactured wood products (Skog 2008, Finkral and Evans 2008) and that stand-replacing wildfire releases carbon into the atmosphere (Vose et al. 2012).

Selecting trees for reforestation that are likely to survive if climate change predictions are fulfilled in the project area is discussed in the discussion of site preparation and planting in Chapter 2 and the Vegetation section of this chapter of the final EIS. Harvest, fuel breaks and other fuel-reduction treatments will not eliminate wildfire from the project area but can help change fire behavior (as discussed in the Fire and Fuels section of this chapter and Fire and Fuels resource report), thereby likely reducing carbon dioxide emissions resulting from wildfire. Effects on future global climate change from this project are too small to measure.

Aquatic Conservation Strategy

Introduction

The Forest Plan contains the components, objectives and standards and guidelines for consistency of projects with the Aquatic Conservation Strategy (ACS). The Record of Decision (ROD) for the Forest Plan (USFS, 1995c) is the guiding document for Forest projects; the Forest Plan ROD incorporates the Aquatic Conservation Strategy standards and guidelines from the ROD for Amendments to Forest Service and Bureau of Land Management Planning Documents within the Range of the Northern Spotted Owl (commonly known as the Northwest Forest Plan) (USDA Forest Service and USDI Bureau of Land Management 1994b).

The Aquatic Conservation Strategy has four components. These are Riparian Reserves, Key Watersheds, Watershed Restoration, and Watershed Analysis (Forest Plan, page 4-25). Within Riparian Reserves are standards that prohibit and regulate activities that retard or prevent attainment of Aquatic Conservation Strategy objectives (Forest Plan, page 4-106). This analysis documents the consistency of the project with the Aquatic Conservation Strategy objectives at the site scale and the 5th field watershed scale. The consistency is analyzed at the short-term (during implementation up to the first 1-2 years) and the longer-term scales (>2 years).

This discussion will summarize the comprehensive information provided in the project Aquatic Conservation Strategy Report and Amendment. Those reports provide detailed descriptions of the existing watershed condition including the important physical and biological components of the 5th field watersheds and a discussion of the natural range of

variability for potentially affected processes. The complete discussion of relevant recommendations of watershed analyses is also found in the Aquatic Conservation Strategy Report and Amendment. This summary focuses on the treatments proposed in Modified Alternative 3 since this alternative is the preferred alternative. Detailed descriptions of the actions proposed are in Chapter 2 of the final EIS.

Riparian Reserves

The interim widths defined in the Forest Plan were used to define the Riparian Reserve widths for analysis and project design. See project design feature table in Chapter 2 of the final EIS for details on the widths defined by the Forest Plan.

Key Watersheds

The Westside Fire Recovery project contains portions of Key Watersheds as defined by the Forest Plan. These are the Elk Creek, North Fork Salmon River and South Fork Salmon River (minor project acreage) 5th field watersheds and the Grider Creek 6th field watershed (which was considered a 5th field watershed at the time of the Forest Plan ROD).

Watershed Restoration

Although watershed restoration is not the explicit purpose of the Westside Fire Recovery project, proposed actions within hydrologic Riparian Reserves were developed with input from wildlife and fish specialists and earth scientists to insure that Forest Plan direction and Best Management Practices from the Pacific Southwest Region Water Quality Management for Forested Lands in California publication are met (USFS 2011). Project-specific Best Management Practices and project design features were developed to reduce potential negative effects and meet the requirement of the Forest Plan (p. 4-106) to prohibit and regulate activities in Riparian Reserves that can retard or prevent attainment of the Aquatic Conservation Strategy Objectives.

Watershed restoration, including fish passage improvement, removing and upgrading roads and stream crossings, and restoration of large trees in Riparian Reserves, is an ongoing program on the Forest but not specifically the purpose and need for the Westside Fire Recovery project. However, treatments proposed in the project are intended to speed the recovery of mature forests which will improve watershed function. Additionally, repairing legacy sediment sites in the Elk Creek Key Watershed is included and will reduce risk over the long term to beneficial uses that are impacted by sediment and temperature impairment.

Existing Condition

There are twelve 5th field watersheds that are at least partly contained in the project area. Soil burn severity is used to assess post-fire existing conditions because it best represents the watershed's response to a wildfire. Fifty-four percent of the hydrologic Riparian Reserves in the Seiad Creek-Klamath River watershed was burned by the 2014 wildfires. Four-two percent, twenty-nine percent, twenty-five percent, nineteen percent, fifteen percent, thirteen percent and four percent of the hydrologic Riparian Reserves in Elk Creek, Lower Scott River, North Fork Salmon River, Beaver Creek, Horse Creek-Klamath River, Tompkins Creek and Humbug Creek watersheds were burned. South

Fork Salmon River, French Creek, Ukonom Creek and Indian Creek watersheds have less than one percent burn from the 2014 wildfires.

The Indian Creek and French Creek 5th field watersheds have no treatments; there will be no effects either at the site or watershed-scale and, therefore, these watersheds were not analyzed for compliance with Aquatic Conservation Strategy Objectives.

Watershed Analysis Recommendation

The project is compliant with all relevant watershed analysis recommendations. The Aquatic Conservation Strategy Report outlines the compliance in detail.

Treatments in Riparian Reserves

For the purposes of this analysis 'Hydrologic Riparian Reserve' includes the interim riparian buffers along intermittent and perennial streams (hydrologic Riparian Reserve) and inner gorges. Active landslides, toe zones of dormant landslides and steep-weathered granitic lands are Riparian Reserves but for this report they will be referred to as unstable lands to avoid confusion.

There will be no salvage harvest in hydrologic Riparian Reserve. Trees that pose a hazard to the road system will be felled but not removed from Riparian Reserves where needed to meet coarse wood objectives (see project design features in Chapter 2 of the final EIS). Modified Alternative 3 includes hand treatments in Riparian Reserves in all three fire areas and these treatments may include planting. The hand treatments in hydrologic Riparian Reserve are within site preparation units in plantations that have moderate and high vegetation burn severity. Trees up to 10 inches diameter at breast height will be felled, lopped and scattered. Material in excess of 7 tons per acre will be hand-piled and burned or broadcast burned. Hydrologic Riparian Reserves not in site preparation units are not included for hand treatment. The purpose of this treatment is to improve ground cover and reduce potential post-fire surface erosion, and thus reduce sediment production to stream channels in the short term. Also, this treatment provides an opportunity for maintenance underburning and reduction of accumulations of dead trees and brush; and planting if needed to re-establish conifers as a component of the regenerating forests. Acres of proposed hand treatments in hydrologic Riparian Reserve are summarized in Table 7 of the Aquatic Conservation Strategy Report Amendment. Fuels treatments will occur in hydrologic Riparian Reserve with limitations described in the project design features table in Chapter 2 of the final EIS.

There are treatments recommended for unstable lands, outside of hydrologic Riparian Reserves and inner gorges. The acres treated and effects as a result of the treatments are summarized in the Geology section of this chapter and Objective 4 below.

Objective 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.

Range of Natural Variability

Watershed complexity, for this analysis will consider effects to large wood (a minimum of 50 feet long and 24 inches in diameter as defined in the Forest Plan EIS, page 3-68)

recruitment to streams and coarse woody debris (defined as woody material, at least 20 inches in diameter from whatever source that is dead and lying on the forest floor in the Forest Plan glossary) on the upland slopes.

Little quantitative data is available regarding the historic range of variability of large woody debris and coarse woody debris on the upland slopes. Assumptions can be made considering the history of disturbance. The sources of large woody (in-channel wood) and coarse woody (upslope downed wood) debris have been reduced from historical conditions by commercial harvest and 'stream cleaning' operations that occurred from approximately 1960 through the early 1980s; these operations removed large wood from many streams on the Forest with the intent of preventing damage to infrastructure and improving fish passage. Prior to effective fire suppression on the landscape scale, frequent wildfires would have contributed to well-distributed large woody and coarse woody debris by creating snags that eventually fall; some of these are recruited to stream channels.

Actions that remove large wood from near stream areas on Forest lands, for the most part, ended when the current Forest Plan and its Aquatic Conservation Strategy was put in place in 1994; currently only the removal of hazard trees in administrative and recreation sites, in limited circumstances, results in the loss of any large wood from near stream areas. Forest Plan Standards and Guidelines help move toward the desired condition of large wood in the streams and coarse wood in the upslope areas. Standard and Guideline MA10-56 (page 4-112) outlines the large wood requirements for 3rd to 5th order streams. Standard and Guideline 6-16 outlines the upslope coarse wood requirements at the landscape scale (pages 4-23 and 4-24).

Proposed Action Influence on Objective

There is no salvage harvest proposed in hydrologic Riparian Reserve (see definition in Treatments in Riparian Reserves section above), therefore these actions would not influence habitat elements or processes described in this Objective. Hand treatments are proposed in hydrologic Riparian Reserve in site preparation units (see Treatments in Riparian Reserves). Snag, legacy component and coarse woody debris retention standards are included in the project description (Chapter 2 of the final EIS) and will ensure that the project retains these habitat elements on the landscape. Snag retention will allow for long-term recruitment of coarse wood on the upslope and large wood in the hydrologic Riparian Reserve. The project meets the Forest Plan Standards and Guidelines by retaining a portion of snags and coarse wood.

Roadside hazard reduction is the only action that could have a measurable effect on the presence of large trees near streams and large wood recruitment. Considering that the probability of wood entering an active stream channel from greater than one tree height is generally low (FEMAT 1993), the project includes a design feature (Watershed-12) that requires all hazard trees 26 inches in diameter at breast height and greater that are felled within the first site tree from all defined streams (fish-bearing, perennial non-fish-bearing, and intermittent) are left on site. Additionally, any tree that would contact a fish bearing stream channel, if felled that direction, will be retained on site. This ensures that trees larger than the standard site tree height but further than that height from the channel will not be removed. Due to these protection measures, potential effects are limited along those stream reaches affected by the action to loss of dead trees 14-26 inches dbh within

one site tree distance from stream channels that are deemed hazardous to the road, and loss of hazard trees of any size from the outer Riparian Reserve (farther than one site tree height from fish bearing streams) where they are not likely to be recruited to stream channels but are more important for terrestrial species and habitat.

As part of project planning and effects analysis, biologists and fuels specialists worked to find consensus on what fuels reduction actions are needed in Riparian Reserve in order to manage these areas within their historical range of variability. The team relied upon Forest Plan direction, historic information including fire history, field review, and best available information including scientific literature. Research specific to fire regimes and forest management in the Klamath Mountains are particularly relevant, including Skinner, 1997; Taylor and Skinner, 1998; and Skinner, 2003. In order to manage riparian areas within their natural range of variability, the historical fire regime must be an important and explicit consideration (Skinner 1997). As described in the literature, the Mediterranean climate of the Klamath Mountains is characterized by pronounced annual drought (independent of any prolonged drought). Even Riparian Reserves in the Klamath Mountains regularly experience conditions where fires can easily ignite and spread. Field review of existing conditions in the project area further reinforced for biologists the need to propose fuels and site preparation treatments in Riparian Reserves, and that removal of hazard trees 14-26 inches dbh within Riparian Reserves is consistent with Forest Plan LWD objectives and appropriate management to maintain and restore riparian function within the natural range of variability. Field review also included evaluation of potential effects of proposed hazard tree removal in the outer Riparian Reserve (farther than one site tree distance from fish-bearing streams). In consideration of both the historic fire regime (frequent mixed severity fire) and the current fire regime which is a product of mostly effective suppression then high severity fire, allowing hazard tree removal in these outer portions of the Riparian Reserve is likely to provide for more effective fuels management and decrease the probability that future high severity fire would reach near stream areas. For these reasons, and considering the relatively minor amount of near stream habitat that would be exposed to effects of these actions, proposed hazard tree removal would have only discountable effects to large wood recruitment.

Project fuels treatments will occur within hydrologic Riparian Reserve and include specific protection measures to ensure that these actions do not reduce the presence of large snags or downed wood. Because no large trees will be removed, coarse wood and snag Forest Plan Standards and Guidelines will be met in the short term and the long term. Also, the treatment will reduce the risk of high severity fire in the project area in the long term. Especially considering the fire regime of the Klamath Mountains, this action will restore and maintain this objective at the watershed and site scales for the short and long term.

Site preparation and planting will not reduce large trees, snags, or downed wood in hydrologic Riparian Reserves in the short term and may actually speed the development of large trees in the long term due to reforestation efforts. Because no large trees will be removed, coarse wood and snag Forest Plan Standards and Guidelines will be met in the short term and the long term. Also the treatment is likely to reduce the time it takes to recover the mature conifer forest in the project area in the long term.

Temporary road actions within Riparian Reserves are subject to the same project design features that reduce potential loss of large wood as described above. New temporary road

segments outside of hydrologic Riparian Reserve are short features that are used to facilitate salvage and site preparation. As a result of these actions, there may be minor site level reduction of large wood where trees are removed from the roadbed; however, snag retention project design features ensure that snags of the largest size and pre-existing (prior to wildfire) snags and coarse woody material would remain on site. This action will meet the Forest Plan Standards and Guidelines for coarse wood and snag retention.

Use of new landings in hydrologic Riparian Reserve could result in felling of hazard trees and snags; however, project design feature watershed-12 ensures that if any hazard tree equal to or greater than 26 inches in diameter at breast height is felled within one site tree height distance from any stream channel it will remain on site. New and existing landings in hydrologic Riparian Reserve will be shaped and treated for erosion control at the end of each season of use, and hydrologically restored at project completion (including sub-soiling and covering with slash/mulch as needed). New and existing landings in hydrologic Riparian Reserve will have site specific erosion control measures to reduce risk of sediment delivery into streams. New landings outside of hydrologic Riparian Reserve may require removal of large trees or snags in some cases. Snag and coarse woody debris retention standards are included in the project description and design features. They ensure that these habitat elements persist on the landscape within and outside of hydrologic Riparian Reserve.

5th Field Watershed Analysis

As described above, roadside hazard tree removal in hydrologic Riparian Reserve is the only action that may result in removal of near stream large wood and thus influence this objective. As shown in

Table 3-86, a relatively small proportion of the total intermittent and perennial streams within any given watershed may be affected by proposed roadside hazard tree actions.

Table 3-86. Miles of intermittent and perennial stream in close proximity to roadside hazard tree removal proposed in Modified Alternative 3.

5th field watershed	Miles of perennial stream within 200 feet from roadside hazard tree removal roads	Miles of intermittent stream within 200 feet from roadside hazard tree removal roads	Total stream miles in watershed -intermittent and perennial Percentage of streams miles potentially affected by Project roadside hazard tree removal
Beaver Creek	3	4	277 2.5%
Horse Creek-Klamath River	0	2	322 0.6%
Seiad Creek-Klamath River	6	0	205 2.9%
Lower Scott River	4	5	476 1.9%
Thompson Creek-Klamath River	2	4	297 2.0%
Elk Creek	5	4	300 3.0%
North Fork Salmon River	11	5	654 2.4%
TOTAL	31	24	2,531 2.2%

Based on inclusion of watershed project design features, and project specific Best Management Practices, field review of hazard tree removal areas, and consideration of the proportion of watersheds that would be affected, this analysis concludes that hazard tree removal actions are consistent with large woody debris objectives and maintain and restore habitat elements and processes described in this objective.

Objective 2

Maintain and restore spatial and temporal connectivity between watersheds. Lateral, longitudinal, and drainage network connections include floodplains, wetlands, upslope areas, headwater tributaries, and intact refugia. These network connections must provide chemically and physically unobstructed routes to areas critical for fulfilling life history requirements of aquatic and riparian-dependent species.

Range of Natural Variability

Watershed connectivity for this analysis takes into consideration effects to aquatic and terrestrial species passage and habitat connectivity and focuses on physical blocking of the stream channels and snag retention.

Historically, watershed connectivity would have ranged from high to impaired on any given reach of the Klamath, Scott, and North Fork Salmon rivers and their tributaries due to natural landslides, flood events and wildfires (See Fire and Fuels section for details on range of snags and coarse wood).

Proposed Action Influence on Objective

Salvage will not occur in hydrologic Riparian Reserves and there would be no effect to connectivity of aquatic or riparian habitat due to salvage harvest. The amount of salvage

relative to the fire-affected area is small and, therefore, the project is not likely to impact connectivity at the 5th field watershed scale but may reduce connectivity at the site scale. The project maintains all large trees and snags in hydrologic Riparian Reserves, and retains legacy components and snags within units so it meets Forest Plan Standards and Guidelines for retention of large wood and coarse woody material and minimizes effects to connectivity.

Roadside hazard tree removal will occur in hydrologic Riparian Reserves with restrictions on heavy equipment and the requirement of retention of 26 inch diameter at breast height or larger trees within the first site tree in hydrologic Riparian Reserves. These protection measures ensure that roadside hazard removal will not impact stream habitat and thus will have no impact on aquatic habitat connectivity at the watershed or site scale for the short or long term. The roadside hazard tree removal will be intermittent along the roadways and green tree 'bridges' will be left along the corridors which will serve to provide connectivity for terrestrial species. These effects would occur where habitat connectivity is already impacted by roadways and will have minimal effect to habitat connectivity at the watershed scale (see Chapter 3 of the EIS and the wildlife resource report for further discussion).

Hazardous fuels reduction are designed to reduce fuels accumulations and small trees (less than 16 inches) to provide some protection for future watershed condition and function especially if/when a fire occurs greater than five years in the future. Because near stream areas are protected from disturbance by project design features and no large trees will be removed by fuels treatments, coarse wood and snag Forest Plan Standards and Guidelines will be met in the short term and the long term (see the wildlife section of Chapter 3 of the EIS and the wildlife resource report).

Site preparation and planting will have beneficial effects to aquatic and riparian species because it is designed to achieve near-term ground cover and to encourage regeneration in the hydrology Riparian Reserves and unstable lands (See Geology Section). No large trees will be removed; coarse wood and snag Forest Plan Standards and Guidelines will be met in the short term and the long term. Site preparation and planting will reduce the time it takes to recover the mature conifer forest in the project area in the long term. In the long term, terrestrial connectivity may be improved as planting is likely to result in a forest with larger trees faster than without planting.

Temporary road actions that involve crossings on perennial stream channels would temporarily impact aquatic habitat connectivity. Modified Alternative 3 includes only two such crossings, on a perennial non fish-bearing tributary of lower Grider Creek (see fisheries section of Chapter 3 of the EIS and aquatic resources report). The impact of these actions would be limited to the in channel work area and a short distance downstream, this involves only a small amount of aquatic habitat that would be temporarily affected (approximately 0.5 miles). These minor site level impacts would not influence aquatic habitat connectivity at the 7th or 5th field watershed scale. The openings in the canopy from temporary access activities are not large enough to affect connectivity at the site or watershed scale for terrestrial wildlife.

The project includes a project design feature that generally precludes new landing construction in hydrologic Riparian Reserves. However, six new landings in outer portions of Riparian Reserve were considered appropriate for use by watershed

specialists because field visits confirmed they were on stable landforms and slope positions, were in the outer zone of the hydrologic Riparian Reserves, and/or were separated from streams by existing, stable road segments. New landings in Riparian Reserve may have site-level impacts to terrestrial habitat connectivity where large trees or snags are removed. The average size of the landings proposed is no larger than natural openings; therefore, these actions will not prevent connectivity but they may increase the risk of predation for individuals until the canopy cover is recovered (greater than 10 years in some areas).

5th Field Watershed Analysis

Proposed salvage may affect terrestrial habitat connectivity at the site scale in Seiad Creek-Klamath River, Lower Scott River, Elk Creek and North Fork Salmon River watersheds. Proposed temporary road actions that involve stream crossing work would temporarily affect aquatic habitat connectivity at the site of two perennial stream crossings in Seiad Creek-Klamath River watershed. The 5th field statistics for roadside hazard reduction and new landings is described under objective 1 above.

Objective 3

Maintain and restore the physical integrity of the aquatic system, including shorelines, banks, and bottom configurations.

Range of Natural Variability

Aquatic systems integrity will consider potential effects to channel morphology from increased peak flows, as measured by the ERA model, and landslide likelihood, as defined in the Geology section. In the historic range of variability, the banks, shorelines and stream bottoms would have been varied and heterogeneous. Historically, floods and debris flows affected and altered morphology along miles of stream channels; however, there would have been a high percentage of streams with functioning channel beds and banks comprised of varied substrates.

Proposed Action Influence on Objective

Potential effects to peak flow are only measurable at the watershed scale. Grant et al. (2008) demonstrated a correlation between watershed ERA and peak flow. However, potential increased peak flow related to timber salvage is indistinguishable beyond increases expected to result from the 2014 wildfires based on model results. Salvage harvest is not expected to affect base flow beyond influences of the 2014 wild fires. The removal of dead or dying trees (salvage harvest) does not increase the landslide likelihood (See Geology Report and Amendment).

Hazard trees may be felled in hydrologic Riparian Reserves where they pose a threat to adjacent roadways. The direct effects to bank integrity will be minimal because project design features prohibit the removal of any hazard tree within 25 feet of a channel and trees greater than 26 inches diameter at breast height in the first site tree of a channel. The removal of dead or fire-injured trees does not increase the landslide likelihood (Geology Report and Amendment). The project design features require the use of directional felling and avoiding removing trees anchored in the banks of stream channels to minimize impacts to the aquatic integrity.

There are not likely to be direct effects to stream channels from hazardous fuels treatments. Hazardous fuels reduction will not decrease root strength, which is identified as the main driver of landslide process in the Geology Report and Amendment, so it will not increase landslide likelihood. There will be hand treatments and planting in the hydrology Riparian Reserves in Alternative 3 Modified intended to increase ground cover and encourage regeneration of conifer forest. This has a benefit to physical integrity of aquatic systems because the roots from the re-established conifer forest will increase the stability of the stream banks and bottoms.

The effect to peak flow from temporary roads and new landings is not measurable because of the relatively small percentage of watersheds affected. There are six new landings in hydrologic Riparian Reserves for the entire project area. Temporary road actions and new landing construction will increase landslide likelihood at the site scale for the first winter after completion. The temporary roads and landings will be hydrologically stabilized which minimizes the effects to landslide likelihood (See Geology Report Amendment). New landings in hydrologic Riparian Reserves can have unstable fills which may have small landslides affecting the stream banks or the banks can be disturbed by heavy equipment while constructing the landings. In these cases, stream banks will likely experience long-term effects. However, the roads and new landings are used to facilitate salvage harvest and site preparation as well as planting which benefit the physical aquatic system via accelerated reforestation and recovery of forest over the long term.

5th Field Watershed Analysis

The actions with measureable effects on stream channel integrity are temporary road actions and new landing construction in Hydrologic Riparian Reserves. The 5th field statistics for roadside hazard reduction and new landings is described under Objective 1 above.

Objective 4

Maintain and restore water quality necessary to support healthy riparian, aquatic, and wetland ecosystems. Water quality must remain within the range that retains the biological, physical, and chemical integrity of the system and benefits survival, growth, reproduction, and migration of individuals composing aquatic and riparian communities.

Range of Natural Variability

This objective related to water quality is evaluated based on potential impacts to stream temperature, which is also influenced by sediment-related effects. The North Fork Salmon River, the Scott River and the Klamath River are listed in the 303 (d) Clean Water Act for stream temperature impairment (Hydrology resource report and water quality section of Chapter 3 of the EIS). The Total Maximum Daily Loads (TMDLs) for the Klamath, Scott, and Salmon Rivers contain numeric targets that represent attainment of State water quality standards for temperature and sediment. The water quality analysis for this objective will focus on the effects to stream temperature. Sediment is covered in Objective 5.

The California Regional Water Quality Control Board North Coast Waiver of Waste Discharge Requirements for Non-point Source Discharges Related to Certain Federal

Land Management Activities on National Forest System Lands (Order No. R1-2010-0029) states that the Forest shall manage and maintain hydrologic Riparian Reserves on a trajectory such that natural shade conditions occur. The natural shade conditions are defined as the shade on a watercourse that results from the site potential naturally occurring vegetative community and topographic configuration. Shade can vary from very low in open meadows to upwards of 85% in heavily forested areas. Wildfire is a natural process in the Klamath Mountains and areas with moderate to high vegetation burn severity will have relatively low shade cover on intermittent and perennial streams.

Proposed Action Influence on Objective

No effects to shade as a result of salvage harvest are expected because salvage would not occur within hydrologic Riparian Reserves. Roadside hazard reduction will only occur only where trees were affected by the 2014 wildfires. These trees will be dead or fire-injured and are not likely providing effective shade to stream channels. Hazardous fuels reduction and site preparation and planting will occur within hydrologic Riparian Reserves and may remove dead trees up to 10 inches in diameter at breast height. Project design features limit these activities in near-stream areas so that no meaningful effect to shade is likely, at the site or watershed scale. The effects to shade from temporary road actions in hydrologic Riparian Reserves will be localized at stream crossings. The six new landings in hydrologic Riparian Reserves are considered appropriate because their use would not require removal of any vegetation that provides shade over streams; therefore, water temperature would not be affected at the site or watershed scale.

5th Field Watershed Analysis

Table 3-87displays near stream temporary road actions. Only the site on road 46N41YA may involve work within an active stream channel, and therefore may result in short term effects to stream shade at the site scale.

Table 3-87. Modified Alternative 3 near stream temporary road actions.

Receiving Stream Name	Road Type	Confirmed Stream Type Crossing	Comments
Grider Creek	Decomm. Road 46N41YA	2 perennial	One crossing is legacy site; the Project will reduce sediment in the long term by properly hydrologically stabilizing this crossing.
Cliff Valley Creek	Decomm. Road 46N77	1 Intermittent	Stable, moderate risk
China Creek	Decomm. Road 46N78	1 Intermittent	Stable, low risk
Kuntz Creek	Existing and New Temporary Road	No crossing involved in road (except crossing of private diversion ditch)	Road has drainage problems; use of road is low risk; the Project will reduce sediment long term

Objective 5

Maintain and restore the sediment regime under which aquatic ecosystems evolved. Elements of the regime include the timing, volume, rate, and character of sediment input, storage, and transport.

Range of Natural Variability

The sediment regime analysis will consider the effects of sediment delivery to streams as estimated by the Universal Soil Loss Equation and mass wasting (landslide) models at the 5th field watershed scale. The USLE and the mass wasting model have an approximation of the 'background' levels of soil erosion and landsliding on the landscape. The 'background' volumes of sediment are compared against the 'current' modeled sediment to derive the risk ratios for the 5th field watersheds. A risk ratio of 1.0 or greater is considered a 'yellow flag' where the risk of negative effects to beneficial uses is increased. The model results for background, current, indirect effects of the alternatives and the future foreseeable actions can be found summarized in the Hydrology report and in the Cumulative Watershed Effects results in the project record. Under natural conditions there would be a mosaic of vegetation and root support across the landscape and the landslide likelihood would be likely across the landscape. The duration of elevated risk for the 5th field watersheds will be also considered in meeting or not preventing attainment of this objective.

Proposed Action Influence on Objective

There will be no salvage, and no ground based equipment off roads, in the hydrologic Riparian Reserves. There are project design features intended to mitigate potential soil erosion and sediment delivery from salvage and it is not expected to increase the risk of sediment delivery to stream channels. Field review of hazard tree removal areas, and spatial analysis of the distribution and extent of proposed hazard tree removal, confirm that this action is likely to have only discountable effects to sediment regimes and site level sediment production. Hazardous fuels treatments are designed to reduce the adverse effects of future wildfires, therefore, would provide some protection for future watershed condition and function, especially if/when fires occur greater than five years in the future. The reduction of the risk of high severity fire will reduce the risk to the sediment regime at the site and watershed scale in the long term.

Proposed hand treatments in the hydrologic Riparian Reserves in site preparation units are intended to increase soil cover and thus lower the risk of surface erosion, as well as improve soil productivity. These actions will improve the hydrologic Riparian Reserves ability to filter sediment, and allow for reduction of dead fuels accumulations which allows for improved watershed condition over the long-term especially considering fire regimes. Planting in the salvage and site preparation units, if more than 25% of the high and moderate vegetation severity burned, will reduce the duration of elevated risk of landslides from greater than 80 years to about 30 years.

At the site scale, temporary road actions that involve stream crossings may increase the sediment delivered to streams. Watershed specialists identified all potential stream crossings on proposed temporary roads and reviewed them in the field to determine what actions would be taken and what effects to aquatic habitat may occur. Project design features and best management practices include the requirement to hydrologically stabilize temporary roads and remove any temporary crossings prior to wet weather, fix any current legacy sites on temporary roads the project uses, and adhere to the wet weather operation standards. Proper implementation of these measures is critical to minimizing effects to the sediment regime from this action. Thirty-three miles of Forest System roads will be storm-proofed and 148 legacy sites will be treated in the portion of the Elk Creek watershed in the project area. These treatments will reduce potential sediment delivery during storm events.

Landings constructed within hydrologic Riparian Reserves have a high risk of producing sediment at the site scale. Site-scale effects to sediment from landings depend on landing location, existing condition, and size/use. These effects could be of moderate duration and low to moderate intensity, depending on the volume of potentially unstable material and occurrence of stochastic weather-related events. However, only a limited number of new landings in hydrologic Riparian Reserves were considered appropriate by watershed professionals (landings #DZ03, DZ10, DZ23, L043, L044 and L090) and only if they were on stable/already-compacted landforms and slope positions, were in the outer zone of the hydrologic Riparian Reserves, or were separated from stream channels by existing, stable road segments. The use of the temporary road access and new landings will facilitate reforestation which will lead to accelerated recovery of forested conditions over the long term and thus does not prevent the attainment of the objective.

5th Field Watershed Analysis

The risk ratio for each 5th field watershed analyzed is summarized in Table 3-88. Beaver Creek is the only watershed that is over the threshold of concern with a risk ratio of 1.16 and 1.07 for USLE and mass wasting respectively. The elevated risk ratio is a result of the large amount of private land salvage in the Beaver fire area. Modified Alternative 3 drops all salvage harvest, temporary road actions, and landings in the Beaver Fire area therefore the project does not increase the risk ratio for either model for Beaver Creek. The remaining watersheds have a low risk of adverse effects to beneficial uses from sediment delivery to stream channels.

Table 3-88: Cumulative Watershed Effects model results for 5th field watersheds comparing conditions under the current post-fire conditions and Alternative 3 Modified proposed activities.

5th Field Watershed Name	USLE Risk Ratio Alternative 3 Modified	Mass wasting model Risk Ratio for Alternative 3 Modified
Humbug Creek-Klamath River	0.50	0.84
Beaver Creek	1.16	1.07
Horse Creek-Klamath River	0.81	0.87
Seiad Creek-Klamath River	0.70	0.83
Lower Scott River	0.47	0.57
Thompson Creek-Klamath River	0.30	0.49
Elk Creek	0.31	0.98
Ukonom Creek-Klamath River	0.19	0.56
South Fork Salmon River	0.26	0.40
North Fork Salmon River	0.32	0.72

There is an elevated risk of sediment delivery where temporary stream crossings will be placed in intermitted or perennial stream channels. There is one such crossing in the Thompson Creek watershed on a non-fish bearing intermittent tributary to China Creek, and crossings in the Seiad Creek-Klamath River watershed in the Kuntz, Lower Grider and Cliff Valley drainages. Stream reaches in the Seiad Creek-Klamath River watershed that would have temporary site level impacts related to sediment include a non-fish bearing perennial tributary to lower Grider Creek and a non-fish bearing intermittent tributary to Cliff Valley Creek.

The landslide likelihood is not affected by the project for any of the 5th field watersheds. There are ten 7th field watersheds that have enough planting in high and moderate vegetation severity burn areas to reduce the duration of elevated risk at the 7th field scale. In Seiad Creek 5th field watershed the Upper Grider Creek, Cliff Valley Creek, O'Neil Creek, Walker Creek, and Caroline Creek 7th field watersheds have a reduced duration of elevated risk. For the Lower Scott River 5th field the Middle Creek 7th field watershed has a reduced duration of elevated risk. Finally, Upper East Fork Elk Creek, Upper Elk Creek, and Lower East Fork Elk Creek 7th fields, in the Elk Creek 5th field watershed, have a reduced duration of elevated risk. There is a local reduction in landslide rate anywhere planting will occur even if there is not enough high and moderate severity areas treated to see a benefit at the 7th field watershed scale.

Thirty-three miles of Forest System roads will be storm-proofed and 148 legacy sites will be treated in the portion of the Elk Creek watershed in the project area. These treatments will reduce potential sediment delivery during storm events, and reduce chronic erosion from roads along approximately 14 miles of stream.

Objective 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 timing, magnitude, duration, and spatial distribution of peak, high, and low flows must be protected.

Range of Natural Variability

The hydrology report assesses the maintenance and restoration of instream flows by analyzing potential effects to base flow qualitatively. Historically, peak and base flows

have ranged from 100-year events such as the 1964 flood to extreme droughts where snow pack is less than 10% of normal (winter of 2014/2015). Spring-fed perennial streams have less variable base flows than snow-melt dependent streams. Large fires can increase stream flow peaks because of reduced precipitation interception, infiltration capacity (due to water-repellent soils), and ground surface roughness. These functions are provided by live vegetation and soil cover that reduce and slow overland flow and associated transport of sediment in unburned areas. Large fires can also produce temporarily increased base flow as utilization of water by vegetation through transpiration is reduced while burned areas re-vegetate.

Proposed Action Influence on Objective

Salvage harvest will remove only dead or dying trees which do not provide rainfall interception to the degree that live trees do. Mechanical activities in salvage units can decrease existing soil cover and increase soil compaction. However, potential increased peak flow related to timber salvage is indistinguishable beyond increases expected to result from the 2014 wildfires based on model results. Salvage harvest is not expected to affect base flow beyond influences of the 2014 wild fires.

There are no effects on peak flows anticipated from roadside hazard tree removal, hazardous fuels reduction, or site preparation and planting as these treatments will remove individual trees, and dead trees, rather than entire forested areas. With Modified Alternative 3 the length of temporary road proposed for project area 5th field watersheds is small and not expected to increase peak flows at the 5th field watershed scale (Table 3-88). Additionally, temporary roads are hydrologically stabilized and restored after use. The number of new landings being proposed is modest (less than 20) in all project 5th-field watersheds with the exception of Seiad Creek-Klamath River, Lower Scott River, Thompson Creek-Klamath River, and Elk Creek. However, potential increased peak flow related to new landing construction is not distinguishable from increases due to the 2014 wildfires based on ERA model results.

In-stream flows would only be affected at the site scale by project-related water drafting. Water drafting will be implemented according to NOAA specifications (when within Coho Salmon critical habitat) and Forest Best Management Practices (outside of critical habitat) that minimize potential impacts to flows and eliminate the likelihood that sites could be dewatered. Project design features also require that fisheries biologists are involved in where water drafting can occur so that potential impacts to critical thermal refugia habitat are avoided. No more than 10% of streamflow can be taken within NOAA specifications and no more than 20% (fish-bearing reaches) or 50% (non-fish-bearing) per Forest Best Management Practices. Water drafting will result in only slight temporary decreases in flow which will be undetectable both a short distance downstream and in the short term. Water drafting will not measurably affect base and peak flows at the 5th field watershed scale.

5th Field Watershed Analysis

The risk ratios for the ERA model used to determine peak flow changes using methods modified from Grant et al (2008) are summarized in Table 3-88. These numbers include the effects of Alternative 3 Modified and future foreseeable actions. The ERA risk ratio for this watershed is greater than 1.0 as a result of the 2014 wildfire and private land

salvage. Modified Alternative 3 drops all salvage harvest, temporary road actions, and landings in the Beaver Fire area therefore the project does not increase the risk ratio for either model for Beaver Creek. The ERA will be nearly recovered from the fire effects and the project effects in about 10 years. The other watersheds have risk ratios under 1.0 and have a low risk of adverse effects to beneficial uses.

The potential effects of water drafting were further minimized between draft EIS and final EIS by updating project design feature Watershed-34 with National Marine Fisheries Service Fisheries and Karuk Tribe specifically to avoid potential impacts drafting could have on salmonids that are dependent upon thermal refugia areas in summer and early fall. This project design feature specifies that certain areas (lower reaches of cold tributaries) across the project area and several specific creeks in the Happy Camp Fire area that have low base flows and are known to regularly support Coho salmon rearing are to be avoided during summer and fall water drafting (generally June through September). Creeks that will be avoided include Tom Martin Cr, O'Neil Cr, (Little) Horse Cr, and China Cr; aquatic species and habitat in these creeks would not be affected by Project water drafting. The increased protection of salmonid rearing habitat in these creeks, as well as flows in lower reaches of all cold tributaries reduces the chance that water drafting would have measurable negative impacts to fish that are relying upon thermal refugia. The project will not prevent the attainment of this objective.

Objective 7

Maintain and restore the timing, variability, and duration of floodplain inundation and water table elevation in meadows.

Due to the nature of Klamath Mountain physiography, most streams in the project area are steep, confined to relatively narrow valley bottoms, and thus lack sizeable floodplain landforms. Exceptions to this are floodplains along the Klamath River and along downstream portions of some of the larger streams such as Beaver Creek, Grider and Walker Creek.

Activities that could directly influence floodplain inundation are dam installation and removal, large water diversions, and modification of streams channels and floodplains by dredging, infilling, and channel relocation. None of these activities are being proposed in this project; the Westside Fire Recovery project, therefore, has no influence on this aspect of the objective at any scale. Water tables in meadows can be directly influenced by development of springs for domestic or agricultural use, dewatering the meadow via diversion, modification of meadow stream morphology, or disturbance to the surface of the meadow. However, project design features that identify the establishment of hydrologic Riparian Reserves (where no salvage harvest will occur) and guidelines for location and design of roads will prevent disturbance to meadows.

Beyond the direct influences to floodplain inundation discussed above, the disturbance of upland soils and vegetation such that rainfall-runoff relationships are altered and peak flows are increased could potentially influence this objective. Assessment of project effects to peak flow is discussed in detail for Objective 6 and is anticipated to be indistinguishable from increases due to the 2014 wildfires.

Objective 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.

Range of Natural Variability

This analysis considers the expected response of conifer and hardwood trees in the hydrologic Riparian Reserves including species diversity and structural components.

Historically, the project area was rich in species and structural diversity. It was likely dominated by mixed conifer-hardwood forests at lower elevations which transitioned to primarily conifer dominated forests as elevation gradients increased. Stumps in the project area indicate that large trees were historically well distributed in and out of hydrologic Riparian Reserves throughout the project area. Timber harvest, tree planting, and fire exclusion have led to modifications in species composition and structural diversity. In order to facilitate timber production, past activities have likely caused a reduction in species diversity by contributing to the conversion of historically shrub- or hardwood-dominated vegetative assemblages to more conifer-oriented communities. Additionally, these past actions have created dense, stands that are of a more uniform age and composition.

Proposed Action Influence on Objective

Salvage would have no effect on species composition in the short or long term at the site or watershed scale because dead trees cannot produce offspring which are a necessary component for the maintenance and/or restoration of species composition. Since no salvage harvest is proposed in hydrologic Riparian Reserves, the effects of salvage activities on structural diversity would be negligible at the site and watershed scale at both short- and long-term timeframes. The effect of hazard tree removal on structural diversity will be minor on the site and watershed scale at both the long and short-term time frames. Hazardous fuels reduction will increase the long term health and resiliency of the hydrologic Riparian Reserves and upslope to disturbance by moving them towards more historic stocking levels. Reduction in stand density would reduce short- and long-term competition for resources (such as nutrients, water, and sunlight), generating a positive effect on species composition and structural diversity by increasing the growth and vigor of the remaining vegetation.

Site preparation and planting treatments would occur within hydrologic Riparian Reserves that have moderate to high vegetation mortality from the 2014 fires. Treatments include the hand removal of dead trees 10 inches in diameter or less in order to reduce fuel loads, achieve near-term ground cover (if fuel loading does not exceed desired condition), and assist in the reestablishment of riparian vegetation. Following hand treatments, planting will occur only where necessary to reestablish conifers as a component of hydrologic riparian reserves.

Conifer planting would consist of a diversity of species including Douglas-fir, sugar pine, ponderosa pine, incense cedar, white fir and red fire depending on microsite characteristics. Plantings will aim to replicate the natural spatial variability and heterogeneous species composition of nearby stands by using site quality, elevation, and

aspect to determine the best planting locations as well as the appropriate species and quantity to use. More specifically, trees will be planted in clusters in order to mimic natural stand composition, while seedling survival rate and competition from early seral species are expected to create a natural mosaic of species and stocking densities. Follow-up release treatments will facilitate the growth of planted and naturally regenerating conifers and hardwoods. Once planted seedlings both within and surrounding hydrologic Riparian Reserves mature and begin producing seed they would contribute to long-term species composition and structural diversity at the site and watershed scale through the natural recruitment process. This action will maintain and restore the objective at the site and watershed scale for the short and long term.

5th Field Watershed Analysis

The primary effect of diversity in hydrologic Riparian Reserves is the hand treatments and planting. There are no hydrologic Riparian Reserve treatments in the Humbug Creek, Ukonom Creek and South Fork Salmon River watershed. There are 93 acres of hand treatments in the Beaver Creek watershed. There is 205 acres of hand treatments in the Horse Creek watershed. There is 81 acres of hand treatments in the Seiad Creek watershed. There is 75 acres of hand treatments in the Lower Scott River watershed. There are 47 acres of hand treatments in the Thompson Creek. There is 122 acres of hand treatments in the Elk Creek. There are 19 acres of hand treatments in the North Fork Salmon River watershed.

Objective 9

Maintain and restore habitat to support well-distributed populations of native plant and invertebrate riparian dependent species.

Range of Natural Variability

This analysis will consider the effect of the types of vegetation in hydrologic Riparian Reserves and the risk of spreading and introducing non-native invasive species.

Native riparian-dependent communities were historically well distributed within riparian areas and likely consisted of a mix of willow, alder, dogwood, and maple that transitioned into late-successional conifer forests. Logging and mining operations have led to a modification of riparian vegetative communities. Non-native invasive species were not present in riparian areas prior to introduction by humans.

Proposed Action Influence on Objective

Salvage on the landscape surrounding hydrologic Riparian Reserves would have no short- or long-term effect on the distribution of native riparian vegetation at the site or watershed scale since these trees are dead. Disturbance associated with ground-based and skyline logging operations may increase the risk of spreading non-native invasive species in the short term at the site and watershed scale; however, project design features have been incorporated to reduce the risk and limit spread in the long term.

For Roadside hazard reduction, many non-native invasive species populations are located along roads and subsequently these treatments may increase the short-term risk of spreading non-native invasive species at the site and watershed scale; however, project design features have been incorporated to reduce the risk and limit spread in the long

term. Hazardous fuel treatments are not anticipated to have a high risk of spreading non-native invasive species; project design features intended to reduce the likelihood of spread will help further limit this risk at both the site and watershed scale. Ground disturbance associated with actions outside hydrologic Riparian Reserves may increase the risk of spreading non-native invasive species in the short term at the site and watershed scale; however, project design features have been incorporated in order to reduce the risk and limit spread of non-native invasive species.

Hand treatments in the hydrologic Riparian Reserves will increase ground cover and allow for maintenance underburning and planting if needed to re-establish conifers as a component of forests. Hand treatments are likely to help create microsite characteristics favorable for native, riparian-dependent species through the retention of moisture, and improvement of soil productivity and stability, subsequently promoting the long-term development of well-distributed, native, riparian communities. Increased ground cover may also provide a barrier to the establishment of non-native invasive species in the short and long term at the site scale. Increased availability of light and nutrients from hand treatments would promote the growth of planted seedlings and encourage the establishment of pioneering plant species further promoting the distribution of native, riparian plant communities at the site and watershed scale.

The movement of soil associated with temporary road actions and new landing construction has the potential to spread non-native invasive species. Weed-prevention project design features include the exclusion of equipment and vehicles from high priority and large non-native invasive species infestations, required washing of heavy equipment following off-road activities, specific management techniques for infested landings, and the required use of weed-free materials. Additionally, the continuation of the existing Forest weed monitoring and treatment program would detect any new high-priority weed sites that may become established within the project area. Quickly treating these sites will limit new NNIS establishment.

5th Field Watershed Analysis

The primary factor in the spread of non-native invasive species is the presence of populations in the areas where disturbance will happen. There are few populations in the Humbug Creek watershed and limited disturbance. There is 149 acres of non-native invasive species in the project area in the Beaver Creek watershed. There is 238 acres of non-native invasive species in the Horse Creek watershed. There is only 19 acres of non-native invasive species in the Seiad Creek watershed. There is 126 acres of non-native invasive species in the Lower Scott River watershed. There is 75 acres of non-native invasive species in the Thompson Creek watershed. There is 58 acres of non-native invasive species in the project area in the Elk Creek watershed. There is 14 acres of non-native invasive species in the project area in the Ukonom Creek watershed. There are only a small number of populations in the project area in the South Fork Salmon River along with limited ground disturbing activities. Finally, there are 197 acres of non-native invasive species in the project area in the North Fork Salmon River.

Comparison of Alternatives

The components of all alternatives (salvage, roadside hazard, hazardous fuels treatments, site preparation and planting) and connected actions (landing construction, reopening of decommissioned roads, use of temporary roads on existing roadbeds and the construction

of new temporary access roads) are similar. There is no salvage in hydrologic Riparian Reserve or inner gorges for any of the alternatives. There is salvage harvest in unstable lands, which are Riparian Reserves, but salvage harvest in these areas still excludes hydrologic Riparian Reserves and inner gorges. The summary of treatments on unstable lands is in the Geology Section of this Chapter. The project design features intended to minimize effects to water resources and Aquatic Conservation Strategy objectives are the same for all alternatives.

Hand treatment in hydrologic Riparian Reserve is proposed to increase soil cover and to allow for the regeneration of vegetation. Hand treatments in hydrologic Riparian Reserve will include hand-work only (no ground-based equipment) and lop-and-scatter or other fuels reduction will be implemented if fuel loading is above seven tons per acre; fuels may be hand-piled and burned or underburned. The hand treatments in hydrologic Riparian Reserve are slightly different between the alternatives. Alternative 2 includes hand treatments in hydrologic Riparian Reserve within site preparation units in the Whites and Happy Camp fire area only and no planting is included; Modified Alternative 2 includes this same treatment but only in upper 1/3 of slopes in salvage or site preparation units. Alternative 4 includes the same areas as with Alternative 2 but also includes for hand treatment Riparian Reserve within salvage harvest units, and Alternative 4 includes the Beaver Fire area for hand treatments. Modified Alternative 3 includes hand treatments in hydrologic Riparian Reserve in all three fire areas and planting is included where needed to re-establish conifers where they occurred as a natural component of forested stands. Alternatives 3 and 5 do not include hand treatments within Riparian Reserve.

Summary and Conclusion

Project design and specific project design features minimize the effects of the actions on the ACS objectives and are designed to ensure the project will not prevent the attainment of the objectives in the short or long term. The decrease in future risk of high-severity fire due to reduction of heavy fuels in project salvage units will help to maintain and restore watershed processes identified in the ACS objectives. The site preparation and planting will decrease the time needed to recover forests with large conifers, on the acres treated. Proposed fuels reduction treatments will build upon beneficial effects of the wildfires by further reducing small fuels accumulations and conducting maintenance underburns designed to mimic the natural role of fire in the Klamath Mountains. The treatment of legacy sediment sources constitutes a meaningful step in restoring the sediment regime in the Elk Creek 5th watershed over the long term.

For this analysis, watershed specialists considered the affected post-fire environment, proposed actions, and potential cumulative impacts associated with taking action at this time (as compared to not taking action). The analysis considered both short- and long-term potential effects to watershed resources (riparian and aquatic), and evaluated proposed actions at the watershed scale and the site level. We conclude that the activities proposed either maintain and restore the ACS Objectives or at the least do not prevent attainment of the Objectives (Forest Plan Standard and Guideline MA10-3 pg. 4-108).

Short-term Uses and Long-term Productivity

NEPA requires consideration of "the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity" (40 CFR 1502.16). As declared by the Congress, this includes using all practicable means and measures, including financial and technical assistance, in a manner calculated to foster and promote the general welfare, to create and maintain conditions under which man and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of Americans (NEPA Section 101).

Short-term uses are those that occur within the first few years of project implementation. Long-term productivity refers to the capability of the land and resources to continue producing goods and services long after the project is complete. Harvesting or salvaging of standing trees can be considered a short-term use of a renewable resource. Trees can be reestablished and grow if the long-term productivity of the land is maintained. Long-term productivity is maintained through application of management requirements described in Chapter 2, in particular those applicable to soil and water resources.

The action alternatives (2, 3, 4, 5, 2 Modified, and 3 Modified) all would provide for the long-term productivity of the project area through removal of biomass and other fuel reduction actions creating a resilient forest where areas can recover from future fire effects naturally. Harvesting or salvaging standing trees will generate short-term economic returns through the sale of salvage timber, as well as providing for worker and public safety in the most critical areas within a short timeframe.

Unavoidable Adverse Effects

Implementation of any of the alternatives would result in some unavoidable adverse environmental effects. Although formation of the alternatives included avoidance of some effects, other adverse effects could occur that cannot be completely mitigated. The environmental consequences section for each resource area discusses these effects.

Irreversible and Irretrievable Commitments of Resources

Irreversible commitments of resources are those that cannot be regained, such as the extinction of a species or the removal of a mined ore. No irreversible commitments of resources would result from implementation of any of the alternatives because no permanent, irreversible resource loss would occur.

Irretrievable commitments are those that are lost for a period of time such as the temporary loss of timber productivity in forested areas that are kept clear for use as a power line right-of-way or road. Irretrievable losses can be regained over time. Implementation of all action alternatives would not irretrievably commit resources, but help in the long-term recovery of the landscape.

Legal and Regulatory Compliance

The National Environmental Policy Act of 1969 (NEPA) requires that all major federal actions significantly affecting the human environment be analyzed to determine the magnitude and intensity of those impacts and that the results be shared with the public and the public given opportunity to comment. The regulations implementing NEPA

further require that to the fullest extent possible, agencies shall prepare EISs concurrently with and integrated with environmental analyses and related surveys and studies required by the Endangered Species Act of 1973, the National Historic Preservation Act of 1966, and other environmental review laws and executive orders. Other laws and regulations that apply to this project are described below

Clean Air Act

The Clean Air Act of 1970 provides for the protection and enhancement of the nation's air resources. No exceeding of the federal and state ambient air quality standards is expected to result from any of the alternatives. The Clean Air Act makes it the primary responsibility of States and local governments to prevent air pollution and control air pollution at its source. All alternatives are compliant with the Clean Air Act and the Conformity Rule. See the air quality section of Chapter 3 for details.

Clean Water Act

The Clean Water Act of 1948 (as amended in 1972 and 1987) establishes federal policy for the control of point and non-point pollution, and assigns the states the primary responsibility for control of water pollution. The Clean Water Act regulates the dredging and filling of freshwater and coastal wetlands. Section 404 (33 USC 1344) prohibits the discharge of dredged or fill material into waters (including wetlands) of the United States without first obtaining a permit from the U.S. Army Corps of Engineers. Wetlands are regulated in accordance with federal Non-Tidal Wetlands Regulations (Sections 401 and 404). No dredging or filling is part of this project and no permits are required.

Legacy sediment sites will be scheduled for treatment in compliance with the Clean Water Act as a condition of the North Coast Regional Water Quality Control Board waiver of waste discharge requirements (Order No. R1-2010-0029). Compliance of this project will be met through a waiver application and approval process with the board, following the decision. See the hydrology section of Chapter 3 for more information about the Clean Water Act.

Endangered Species Act

Section 7 (d) of the Endangered Species Act of 1973 requires that after initiation of consultation required under section 7(a)(2), a Federal agency "shall not make any irreversible or irretrievable commitment of resources with respect to the agency action which has the effect of foreclosing the formulation or implementation of any reasonable and prudent alternative which would not violate subsection (a)(2)." The Forest Service is undergoing consultation with the U.S. Fish and Wildlife Service and National Marine Fisheries Service for this project and will comply with the Endangered Species Act.

National Historic Preservation Act

The National Historic Preservation Act of 1966 as amended "requires federal agencies to take into account the effects of their undertakings on historic properties." This is accomplished through a four-step process following 36 CFR Part 800, the implementing regulations for Section 106 of the National Historic Preservation Act. The regulations allow alternative procedures for meeting Section 106 to be developed through programmatic agreements. The Pacific Southwest Region of the Forest Service (Region 5) which includes the Forest has entered into a programmatic agreement for complying

with Section 106. Additionally, the Forest is developing the Westside Fire Recovery Programmatic agreement to address project specific issues and concerns. The programmatic agreements allow limited project activities to occur within certain historic properties without adverse effects, as long as project-specific Standard Resource Protection Measures (SRPMs) are applied. The Westside Fire Recovery programmatic agreement, being developed in consultation with the California State Historic Preservation Officer, the Advisory Council on Historic Preservation, and local tribes, tiers to the Regional programmatic agreement and meets the requirements for compliance under Section 106 of the National Historic Preservation Act.

National Forest Management Act

The National Forest Management Act of 1976 amends the Forest and Rangeland Renewable Resources Planning Act of 1974 and sets forth the requirements for Land and Resource Management Plans for the National Forest System. Through consistency with the Forest Plan (as amended) this project is consistent with National Forest Management Act. A Forest Plan consistency checklist is available in the project record.

Executive Orders

The project will be consistent with all applicable executive orders.

Chapter 4 Consultation and Coordination

This Chapter includes a section for Preparers and Contributors followed by a section for Distribution of the EIS.

Preparers and Contributors

The Forest Service worked with the following individuals, federal, state and local agencies, organizations; and tribes during the development of this EIS.

Interdisciplinary Team

Mike Hupp
Team Leader

Education: Bachelor of Science in Forest Management, University of Missouri

Qualifications: Currently employed as a Senior Analyst and NEPA Specialist, North State Resources (NSR) and as an independent Registered Professional Forester in California. Prior to employment with NSR Mr. Hupp worked for the Forest Service in various positions in Oregon and northern California including ranger district staff officer, project team leader, forest planning team leader, forest staff officer for planning and administration and district ranger.

Andrew Skowlund
Team Co-Lead

Education: Graduated from University of Washington in 2009 with a Masters of Public Affairs and the University of Minnesota in 2001 with a Bachelor of Science in Natural Resources Management

Leslie Taylor
NEPA Planner and Writer/Editor

Education: Graduated from University of California, Davis in 2007 with a Bachelor of Science in Community and Regional Development with emphasis in Organizational Management and Community Groups

Qualifications: Contracted though Siskiyou County as a Natural Resource Specialist and GIS Specialist 2011-2014. Forestry Technician for the Forest Service from 2004 to 2011

Wendy Coats
Environmental Coordinator

Education: Graduated from Ohio University in 2001with a Master's of Science in Environmental and Plant Biology. Graduated from the University of Pennsylvania in 1999 with a Bachelors of Arts in Environmental Geography/Biology

Qualifications: Klamath Forest Environmental Coordinator 2010-2015, Klamath Forest NEPA planner since 2008-2010. I have led and served on interdisciplinary NEPA teams since 2004

Clint Isbell
Fuels Planner

Education: Graduated from the University of Idaho in 2005 with a Master's of Science in Fire Ecology. Graduated from California Polytechnic State University in 2004 with a Bachelor of Science in Natural Resources

Qualifications: 15 years' experience with the US Forest Service. Nine years as a Fire Ecologist and 6 years in Fire and Aviation Management

Brian Ebert
Fuels Planner

Education: Graduated from Humboldt State University in 2001 with a Bachelor of Science in Natural Resources Planning and Interpretation

Qualifications: 15 Years' experience with the US Forest Service serving in Fire and Aviation Management: Firefighter, District Assistant Fire Management Officer, District/Forest Fuels Officer, Fire Management Specialist. 2001 – 2015

Jeff Paulo
Silviculturist

Education: Graduated from Humboldt State University in 1976 with a Bachelor of Science-Forest Management

Qualifications: Forestry Technician, Prep Forester, Reforestation TSI Forester, and Silviculturist with the Modoc National Forest, Chequamegon National Forest, and Shasta-Trinity National Forest

Marissa Jones
Forester

Education: Graduated from Humboldt State University in 2006 with a Bachelor of Science in Forestry, Wildland Fire Management. Graduated from University of California, Los Angeles in 2000 with a Bachelor of Art in Psychology

Qualifications: Fuels Management Specialist 2007-2008; Fire Suppression Modules 2001-2005

Carl Varak
Silviculture

Trish Johnson
Wildlife Biologist

Education: Graduated from Humboldt State University with a Bachelor of Science in wildlife management

Qualifications: Wildlife Biologist for the US Forest Service for 22 years.

Chad Bell
Forest Wildlife Biologist

Education: Graduated from Humboldt State University in 2011, with a Master of Science in Wildlife Biology. Graduated from the University of Montana in 2008, with a Bachelor of Science in Wildlife Biology

Qualifications: US Fish and Wildlife Service Wildlife Refuge Manager Papahanaumokuakea Marine National Monument Hawaii from October 2012 to May 2013; US Forest Service, District Wildlife Biologist, Coronado National Forest, Arizona from May 2012 to September 2012

Bryan Yost
Wildlife Biologist

Bobbie Miller
Watershed Coordinator

Education: Graduated from the University of Idaho in 2002 with a Master's of Science in in Biology. Graduated from the University of Illinois Champaign-Urbana in 1998 with a Bachelor of Science in Animal Science

Qualifications: Served as fisheries biologist for Klamath National Forest and National Marine Fisheries Service 2003-2007; environmental coordinator for Shasta-Trinity National Forest 2007-2012

Alice Berg
Fisheries Biologist

Jason Coats
Archeologist

Jeanne Goetz
Archeologist

Education: Graduated from California State University, Chico in 2005 with a Masters in Anthropology, Archaeology Emphasis. Graduated from University of Minnesota, Minneapolis in 1983, with a Bachelor of Individualized Studies.

Qualifications: Forest Heritage Program Manager and Tribal Liaison 2012-2015. Served as Goosenest District Archaeologist, Klamath National Forest from 2002-2012.

Angie Bell
Forest Geologist

Education: Graduated from University of Montana in 2008, with a Master of Science in Geology. Graduated from Edinboro University of Pennsylvania in 2006, with a Bachelor of Science in Geology

Nikos Hunner
Soils Scientist

Educational Background: Graduated from California State University, Cal Poly San Luis Obispo in 2004 with a Bachelor of Science in Soil Science

Qualifications: Soils Scientist, SECOR International, Staff Scientist 2004 to 2006

Joe Blanchard
Soils Scientist

Zach Mondry
Hydrologist

Greg Laurie
Hydrologist

Education: Bachelor of Science in Physical Science-Hydrology, Masters of Science in Watershed Science

Qualifications: U.S. Forest Service Hydrologist for 25 years

Gregg Bousfield
CWE Modelling and Hydrology Input

Education: Graduated from California State University, Humboldt in 2004 with a Bachelor of Science in Forestry; Graduated from California State University, Humboldt in 2008, with a Master of Science in Watershed Management.

Qualifications: Served as a seasonal Hydrologic Technician from 2005-2007 for the Lassen National Forest, Supervisors and Almanor Ranger District Offices; Served as a Hydrologist from 2007-2015 for the Klamath National Forest, Supervisors and Happy Camp Oak Knoll Ranger District Offices

Erin Lonergan
Botanist

Education: Graduated from Humboldt State University in 2009 with a Bachelor of Science in Botany. Graduated from Montana State University, Bozeman in 2012, with a Master's of Science in Plant Science

Qualifications: Botanist with the Forest Service from 2014 to Present, Research Associate at Montana State University 2013-2014, Research Assistant at Montana State University 2011-2012, Plant Disease Diagnostician at Montana State University in 2012

Bob Talley
Scenery, Recreation, and Wild and Scenic Rivers

Education: Graduated from Virginia Polytechnic Institute and State University, Blacksburg in 1979 with a Bachelor of Landscape Architecture

Qualifications: Served as a Landscape Architect from 1988-2013 for the Klamath National Forest

Marla Knight
Botanist

Lori Jackson
Engineering

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Range Specialist

Education: Graduated from Oregon State University with a Bachelor of Science in Animal Science and Rangeland Ecology

Qualifications: Rangeland Specialist with the Klamath National Forest.

Nick Dennis
Economics

Education: Ph.D. Wildland Resource Science, University of California, Berkeley. M.S. in Forest Science from the University of Wisconsin, Madison. Bachelor of Science in Forest Science, University of Wisconsin, Madison.
Qualifications: Socioeconomic analyst and forester, ICF International, Mt. Shasta, CA, 2008 - present; Professional forester, The Hearst Corporation, McCloud, CA, 2000-2008; Socioeconomic

analyst and forester, Jones & Stokes Associates, Sacramento, CA, 1987- 2000; Forest economist, The John Muir Institute, Berkeley, CA, 1981-1986

Peg Boland
Social Economics, Inventoried Roadless Areas, Climate Change, Writer/Editor

Education: Graduated from the University of Michigan in 1959 with a Bachelor of Arts in Sociology and in 1963 with a Masters of Arts in Sociology.

Qualifications: Assistant Professor of Sociology, Mars Hill College in North Carolina from 1973-1980; Served as Sociologist on development of two Land Management Plans and multiple NEPA documents for the National Forests in North Carolina from 1981-1989; Served in the national headquarters of the Forest Service as drafter of appeal decisions on land management plans in California from 1989-1992; Served in the national headquarters of the Forest Service as land management planner from 1992-1995; and reviewed and signed NEPA documents from 1995-1999 for the Los Padres National Forest and from 1999-2007 for the Klamath National Forest.

Melanie Hans
GIS Specialist

Education: Graduated from Southern Illinois University in Carbondale, Illinois with a Bachelor of Science in Zoology.

Qualifications: GIS Coordinator, Klamath National Forest, Wildlife Biologist/GIS Specialist for the Koyukuk/Nowitna National Wildlife Refuge Complex in Galena, Alaska from 2002-2011.

Sher Marantos
GIS Specialist

Debra-Ann Brabazon
Public Affairs

Education: Graduated from Columbia Southern University with a Bachelor of Fire Science Administration. Graduated from Point Park College in 1987, with a Bachelor of Arts in Journalism and Mass Communications

Qualifications: Worked in the print and broadcast publication field from 1985 through 1997, Wildland Firefighter for the Commonwealth of Pennsylvania from 1997 through 2005. Dispatch Center Manager on the Huron-Manistee NF in Region 9 since 2005.I detailed on the Shasta Trinity NF in 2013 as the Dispatch Center Manager and in 2014 as the Public Affairs Specialist. Continue to work in Public Affairs in the Private and Public sector as a freelancer and a detailed specialist.

Josh Veal
Public Affairs

Education: Graduated from Hiwassee College, Madisonville, TN Associate of Science

Qualifications: Currently serve as the Prevention Battalion Chief on the Goosenest Ranger District, background in fire prevention and public affairs. Also serve as a Public Information Officer on wildfire incidents.

Ben Haupt
Vegetation Program Manager

Education: Graduated from Humboldt State University, in 2004 with a Bachelor of Science in Forestry

Qualifications: Served as a Timber Management Officer from 2009-2014 for the US Forest Service, Klamath National Forest and a Forester from 2004-2009 for the US Forest Service, Mendocino National Forest

Travis Coughlin
Logging Systems

Heather Mobley
NEPA Writer/Editor and NEPA Planner

Elizabeth Nielsen
NEPA Writer/Editor and NEPA Planners

Education: Graduated from California State University, Chico in 2010 with a Bachelor of Science in Agricultural Business

Qualifications: NEPA Planner, Klamath National Forest, January 2015-Present, Served as a Water and Lands Specialist from 2010-2012 and a Natural Resources Specialist from 2012-2015 for the Bureau of Reclamation, Klamath Basin Area Office.

Dan Blessing
Consultation and Review

Education: Graduated from University of California, Santa Barbara with a Bachelor of Arts degree in Environmental Biology.

Qualifications: Serves as the Natural Resource Officer for the Klamath National Forest, Supervisors Office. Served as a Forest Vegetation Program Manager from 2005-2010 and Silviculturist on the Goosenest Ranger District from 2003-2005.

Federal, State, and Local Agencies:

Council on Environmental Quality

Environmental Protection Agency

United States Fish and Wildlife Service

National Oceanic and Atmospheric Administration, National Marine Fisheries Service

California State Historic Preservation Office

North Coast Regional Water Quality Control Board of California

Siskiyou County

Advisory Council on Historic Preservation

Tribes:

Klamath Tribes

Quartz Valley Indian Reservation

Shasta Nation, Inc.

Confederated Tribes of Grand Ronde

Confederated Tribes of Siletz Indians

Karuk Tribe

Pit River Tribe

Shasta Indian Nation

Additional Organizations and Individuals:

Citizens Advisory Committee

National Institute for the Elimination of Catastrophic Wildfire

Distribution of the EIS

Federal, State and Local Agencies

Federal Agencies

Advisory Council on Historic Preservation, Director, Planning and Review

Army Corp of Engineers

Environmental Protection Agency, Region 9

Federal Aviation Administration

Federal Highway Administration

National Marine Fisheries Service

USDA Natural Resources Conservation Service

US Coast Guard, Energy, Director, Office of NEPA Policy and Compliance

United States Department of the Interior, Bureau of Land Management

State Agencies

California Department of Fish and Wildlife

California Department of Transportation

California Water Resources Control Board

State Clearing House (California)

Elected Officials

Federal:

US Representative Doug LaMalfa

Senator Barbara Boxer

Senator Diane Feinstein

Siskiyou County Board of Supervisors:

Brandon Criss – District 1

Ed Valenzuela – District 2

Michael N. Kobseff – District 3

Grace Bennett – District 4

Ray A. Haupt – District 5

Organizations:

Fire Safe Councils (all of Siskiyou County)

Siskiyou County Department of Agriculture

Happy Camp Fire Protection District

Sierra Pacific Industries

American Forest Resource Council

Siskiyou County Planning Department

Klamath Siskiyou County Wildlands Center

Timber Products Company

American Forest Resource Council

Klamath Siskiyou Wildland Center

Klamath Forest Alliance

Environmental Protection Information Center

Backcountry Horsemen

Butte Valley Chamber of Commerce

Center for Biological Diversity

California Forest Association

California Wilderness Coalition

Earth Justice Legal Defense Fund

Fort Jones Fire Department Chief

French Creek Fire Safe Council

John Muir Project

Native Plant Society of Oregon

Natural Resources Defense Council

Natural Resources Management Corp

Northcoast Environmental Center

Tribes:

Klamath Tribes

Quartz Valley Indian Reservation

Shasta Tribe Inc.

Confederated Tribes of Grand Ronde

Confederated Tribes of Siletz Indians

Karuk Tribe

Pit River Tribe

Shasta Indian Nation

Yurok Tribe

Individuals

Thousands of emails were sent to individuals alerting them to the distribution of the Draft and Final EIS'. For a complete list of these individuals, please refer to the Project Record.

References

Literature Cited

Abele, S. E. (2010). Gastropod Diversity in the Boreal Mixedwood Forest of Northern Alberta: Variation among Forest Types and Response to Partial Harvesting (Doctoral dissertation, University of Alberta).

Agee, J.K., Skinner, C.N., 2005. Basic principles of forest fuel reduction treatments. Forest Ecology and Management 211, 83–96.

Amaranthus, M., Rice, R., Barr, N., Ziemer, R. 1985. Logging and Forest Roads Related to Increased Debris Slides in Southwestern Oregon. Journal of Forestry.

Ammann, M., Boil, A., Rickli, C., Speck, T., and Holdenrider, O. 2009. Significance of Tree Root Decomposition for Shallow Landslides. Forest Snow Landscapes.

An Appraisal. National Symposium on Watersheds in Transition.

Anderson, P. and Palik, B. 2011. Silviculture for Climate Change. U.S. Department of Agriculture, Forest Service, Climate Change Resource Center. www.fs.usda.gov/ccrc/topics/silviculture

Angwin, Peter A. et al. 2012. Hazard Tree Guidelines for Forest Service Facilities and Roads in the Pacific Southwest Region. Forest Service, Pacific Southwest Region, Forest Health Protection Report #RO-12-01 (April 2012).

Anthony, R. G., Knight, R. L., Allen, G. T., McClelland, B. R., & Hodges, J. I. (1982). Habitat use by nesting and roosting bald eagles in the Pacific Northwest. US Fish & Wildlife Publications, 34.

Arthur, S., Paragi, T., Krohn, W. 1993. Dispersal of juvenile fishers in Maine. Journal of Wildlife Management.

Asami, T. (1993). Interspecific differences in desiccation tolerance of juvenile land snails. Functional Ecology, 571-577.

Banci, V., & Harestad, A. S. (1990). Home range and habitat use of wolverines Gulo gulo in Yukon, Canada. Ecography, 13(3), 195-200.

Bell, A. 2012. Cumulative watershed effects modeling: The abridged version, Klamath National Forest.

Beardsy, Debby; Warbington, Ralph. 1996. Old growth in northwestern California National Forests. Res. Pap. PNW-RP-491. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 47 p.

Berg, Neil H, Azuma, David L. 2010. Bare soil and rill formation following wildfires, fuel reduction treatments, and pine plantations in the southern Sierra Nevada, California, USA. International Journal of Wildland Fire 19:478-489.

Berndt, H., Gibbon, R. 1958. Root Distribution of Some Native Trees and Understory Plants Growing on Three Sites within Ponderosa Pine Watersheds in Colorado. US Department of Agriculture, Rocky Mountain Research Station. Station Paper No. 37.

Beschta, R.L. et al. 1995. Wildfire and salvage logging: recommendations for ecologically sound post-fire salvage logging and other post-fire treatments on federal lands in the west. Portland Oregon: Pacific Rivers Council.

Bond M.L., Lee D.E., Siegel R.B., Ward, J.P. Jr. 2009. Habitat selection and use by California spotted owls in a post-fire landscape. Journal of Wildlife Management 73:1116-1124.

Bond, M. L., Lee, D. E., & Siegel, R. B. (2010). Winter movements by California spotted owls in a burned landscape. Western Birds, 41, 174-180.

Bond, M.L., R.J. Gutierrez, A.B. Franklin, W.S. LaHaye, C.A. May, and M.E. Seamans. 2002. Short-term effects of wildfires on spotted owl survival, site fidelity, mate fidelity, and reproductive success. Wildlife Society Bulletin (30) 1022-1026.

Bonnet, V.H., A.W. Schoettle, and W.D. Shepperd. 2005. Post fire environmental conditions influence the spatial patterns of regeneration for Pinus ponderosa. Canadian Journal of Forest Research 35: 37-47.

Broquet, T., Johnson, C. A., Petit, E., Thompson, I., Burel, F., & Fryxell, J. M. (2006). Dispersal and genetic structure in the American marten, Martes americana. Molecular Ecology, 15(6), 1689-1697.

Brown, J. K., Reinhardt, E. D., & Kramer, K. A. (2003). Coarse Woody Debris: Managing Benefits and Fire Hazard in the Recovering Forest. Rocky Mountain Research Station. Ogden: US Department of Agriculture.

Brown, James K.; Reinhardt, Elizabeth D.; Kramer, Kylie A. 2003. Coarse woody debris: managing benefits and fire hazard in the recovering forest. Gen. Tech. Rep. RMRS-GTR-105. Odgen, UT; U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 16 p.

Burke, T. E., Duncan, N., & Jeske, P. (1999). Management recommendations for terrestrial mollusk species. Cryptomastix devia, 2000-015.

Burns, Russell M., and Barbara H. Honkala, tech. coords. 1990. Silvics of North America: 1. Conifers; 2. Hardwoods. Agriculture Handbook 654. U.S. Department of Agriculture, Forest Service, Washington, DC. vol.2, 877 p.

Buskirk and Ruggerio 1994. American Marten. In: Ruggiero, Leonard F.; Aubry, Keith B.; Buskirk, Steven W.; Lyon, L. Jack; Zielinski, William J., tech. eds. 1994. The Scientific Basis for Conserving Forest Carnivores: American Marten, Fisher, Lynx and Wolverine in the Western United States. Gen. Tech. Rep. RM-254. Ft. Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 184 p.

Buskirk, S.W.; Powell, R.A. 1994. Habitat ecology of fishers and American martens. In: Buskirk, S.W.; Harestad, A.S.; Raphael, M.G., comps., eds. Martens, sables, and fishers: biology and conservation.

Butz, Ramona J. and Hugh Safford. 2011. A Summary of Current Trends and Probable Future Trends in Climate and Climate-driven Processes for the Klamath National Forest and Surrounding Lands. US Forest Service, Unpublished.

Byram, George M. 1959. Combustion of forest fuels. In Forest Fire: control and use (edited by KP Davis), pages 61-89.

California Air Resource Board. 2012. Almanac Emissions Projection Data – 2012 Estimated Annual Average Emissions: Northeast Plateau Air Basin. Retrieved on 16 April 2014 from http://www.arb.ca.gov/app/emsinv/2013/emssumcat_query.php?F_YR=2012&F_DIV=-4&F_SEASON=A&SP=2013&F_AREA=AB&F_AB=NEP#8

California Air Resources Board. 2009. Regional Haze Plan. Retrieved on April 4, 2014 from http://www.arb.ca.gov/planning/reghaze/rhplan.htm.

California Board of Equalization. 2014. Modified harvest values schedule, effective October 1, 2014 through December 31, 2014. Sacramento, CA.

Carroll, C., Zielinski, W., Noss, R. . 1999. Using presence–absence data to build and test spatial habitat models for the fisher in the Klamath Region, U.S.A. Conservation Biology 13:1344–1359.

Carroll, C., Zielinski, W., Noss, R. 2001. Using Presence-Absence Data to Build and Test Spatial Habitat Models for the Fisher in the Klamath Region, U.S.A. Conservation Biology

CEQ. 2014. Revised Draft Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in NEPA Reviews. Federal Registry Vol. 79, No. 247.

Chapin, T. G., Harrison, D. J., & Katnik, D. D. (1998). Influence of landscape pattern on habitat use by American marten in an industrial forest. Conservation Biology, 12(6), 1327-1337.

Chen, J., Franklin, J. F., & Spies, T. A. (1993). Contrasting microclimates among clear-cut, edge, and interior of old-growth Douglas-fir forest. Agricultural and forest meteorology, 63(3), 219-237.

Chen, J., Franklin, J. F., & Spies, T. A. (1995). Growing-season microclimatic gradients from clear-cut edges into old-growth Douglas-fir forests. Ecological Applications, 5(1), 74-86.

Clark D.A. 2007. Demography and Habitat Selection of Northern Spotted Owls in Post-Fire Landscapes of Southwestern Oregon. M.S. Thesis. Oregon State University. 218pp.

Clark D.A., R.G. Anthony, L.S. Andrews. 2013. Relationship between wildfire, salvage logging, and occupancy of nesting territories by northern spotted owls. The Journal of Wildlife Management 77(4):672–688; 2013.

Clark, D. A., Anthony, R. G., & Andrews, L. S. 2011. Survival rates of northern spotted owls in post-fire landscapes of southwest Oregon. Journal of Raptor Research, 45(1), 38-47.

Clayton, D. R., L. M. Olivier, H. H. Welsh, 1999 Survey protocol for the Siskiyou Mountains Salamander (Plethodon stormi). Version 3.0: 37pp.

Cohen, J. D., & Butler, B. W. (1996). Modeling potential structure ignitions from flame radiation exposure with implications for wildland/urban interface fire management. 13th conference on fire and forest meterology, (pp. 81-86). Lorne, Australia.

Comfort, E. J. (2013). Trade-offs between management for fire risk reduction and northern spotted owl habitat protection in the dry conifer forests of southern Oregon. Dissertation, Oregon State University

Connaughton, James L. 2005. Guidance on the Consideration of Past Actions in Cumulative Effects Analysis. Council on Environmental Quality.

Copeland, J. P., & Yates, R. E. (2006). Wolverine population assessment in Glacier National Park. Spring 2006 Progress Report. USDA Forest Service, Rocky Mountain Research Station, Missoula, Montana.

Copeland, J. P., Peek, J. M., Groves, C. R., Melquist, W. E., Mckelvey, K. S., McDaniel, G. W., and Harris, C. E. (2007). Seasonal habitat associations of the wolverine in central Idaho. The Journal of Wildlife Management, 71(7), 2201-2212.

Cover, M., de la Fuente, J., Resh, V.2010. Catastrophic Disturbances in Headwater Streams: The Long-term Ecological Effects of Debris Flows and Debris Floods in the Klamath Mountain, Northern California. Canadian Journal of Fisheries and Aquatic Sciences.

CRANE, P. R. 1990. The phylogenetic context of microsporogenesis. In: S. Blackmore & R. B. Knox (eds) Microspores: Evolution and Ontogeny, pp. 11-41. London: Academic Press.

Davis, F., Seo, C, Zielinski, W. 2007. Regional variation in home range scale habitat models for fisher (Martes pennanti) in California. Ecological Applications.

Davis, Raymond J.; Dugger, Katie M.; Mohoric, Shawne; Evers, Louisa; Aney, William C. 2011. Northwest Forest Plan-the first 15 years (1994-2008): status and trends of northern spotted owl populations and habitats. Gen. Tech. Rep. PNW-GTR-850. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 147 p

Davis, Raymond J.; Hollen, Bruce; Hobson, Jeremy; Gower, Julia E.; Keenum, David. 2015. Northwest Forest Plan—the first 20 years (1994–2013): status and trends of northern spotted owl habitats. Gen. Tech. Rep. PNW-GTR-xxx. Portland, OR: U.S.Department of Agriculture, Forest Service, Pacific Northwest Research Station. 51 p.

De la Fuente, J., and D. Elder. 1998. The flood of 1997, Klamath National Forest Phase I Final Report, Klamath National Forest, 76 pages.

DeBano, L.F., Neary, D.G., and Ffolliott, P.F. 2005. Soil physical properties. In: Neary, D.G., Ryan, K.C., and DeBano, L.F., eds. Wildland Fire in Ecosystems: Effects of Fire on Soil and Water. USDA Forest Service General Technical Report RMRS-GTR-42, vol. 4. p 29-52.

DeGross, D. J., & Bury, R. B. (2007). Science Review for the Scott Bar Salamander (Plethodon asupak) and the Siskiyou Mountains Salamander (P. stormi): Biology, Taxonomy, Habitat, and Detection Probabilities/Occupancy. US Geological Survey.

Dennis, N. 2012. The Siskiyou County Forest Sector Model. Prepared for Siskiyou County Board of Supervisors. Yreka, CA.

Dietz, D. R., & Nagy, J. G. (1976). Mule deer nutrition and plant utilization. In Mule deer decline in the west. Symposium Proceedings, Utah State University, Logan, USA (pp. 71-78).

Dodson, E.K.; Ares, A.; Puettmann, K.J. 2012. Early responses to thinning treatments designed to accelerate late-successional forest structure in young coniferous stands of western Oregon, USA. Canadian Journal of Forest Research. 42: 345–355.

Donato, D.C., Fontaine, J.B., Campbell, J.L., Robinson, W.D., Kauffman, J.B., Law, B.E., 2006. Post-wildfire logging hinders regeneration and increases fire risk, Science, Vol. 311 no. 5759 p. 352.

Dugger, K. M., Wagner, F., Anthony, R. G., and Olson, G. S. 2005. The relationship between habitat characteristics and demographic performance of northern spotted owls in southern Oregon. The Condor, 107(4), 863-878.

Duncan, N., S. Dowlan, and P. Hohenlohe. 2003. Survey protocol for survey and mange terrestrial mollusk species from the Northwest Forest Plan 70pp.

Dunk, J. R., Zielinski, W. J., West, K., Schmidt, K., Baldwin, J., Perrochet, J., ... & Ford, J. (2002). Distributions of rare mollusks relative to reserved lands in northern California.

Ebert, B. (2014, 09 16). Personal Observation: Burn Boss-Hey Joe Prescribed Burn; Division Supervisor-King Fire. Pollock Pines, CA, USA.

Ebert, B. (2014, August). Personal Observation, Beaver Fire August 1-13, 2014. CA, Klamath National Forest.

Elliott B. 1985. Changes in distribution of owl species subsequent to habitat alteration by fire. Western Birds 16:25-28.

Eyes, S. A. 2014. The effects of fire severity on California spotted owl habitat use patterns. Thesis, Humboldt State University.

FEMAT (Thomas, J. W. et al. 1993). 1993. Forest Ecosystem Management: An ecological, economic, and social assessment. Report of the Forest Ecosystem Management Assessment Team Washington, DC: U. S. Govt. Printing Office. Aka FEMAT. 1993. U.S.D.A. Forest Service. Portland, Oregon.

Finkral, A. and Evans. A. 2008. The Effects of a Thinning Treatment on Carbon Stocks in a Northern Arizona Ponderosa Pine Forest. Forest Ecology and Management.

Finney, M. (2006). An Overview of FlamMap Fire Modeling Capabilities. USDA Forest Service, Rocky Mountain Research Station, P-41, 13.

Finney, M. A. (1998). FARSITE: Fire Area Simulator-Model Development and Evaluation. Rocky Mountain Research Station. Fort Collins: United States Department Of Agriculture-US Forest Service.

Fire Behavior Assessment Team, Adaptive Management Services Enterprise Team. (2014). 2014 Beaver Fire, Klamath National Forest, Fire Behavior Assessment Team Summary Report. US Forest Service.

Fites, J. A., Ewell, C., & Bauer, R. (2012). The 2012 Chips Fire, California: A case Study of Fire Behavior. USFS.

Franklin, A.B., D.R. Anderson, R.J. Gutierrez and K.P. Burnham. 2000. Climate change, habitat quality, and fitness in northern spotted owl populations in northwestern California. Ecological Monographs 70:539-590.

Franklin, J. F., K. Cromack, W. Denison, A. McKee, C. Maser, J. Sedell, F. Swanson, and G. Juday. 1981. Ecological characteristics of old-growth Douglas-fir forests. USDA Forest Service, General Technical Report GTR-PNW-118.

Fry, D. L., and S. L. Stephens. 2006. Influence of humans and climate on the fire history of a ponderosa pine-mixed conifer forest in the southeastern Klamath Mountains, California. Forest Ecology and Management 223:428-438.

Gaines, W.L. R.A. Strand and S.D. Piper. 1997. Effects of the Hatchery Complex fires on northern spotted owls in the Eastern Washington Cascades. In J.N. Greenlee ed. Proceedings of the Fire Effects on Rare and Endangered species and habitats conference, International Association of Wildlife and Forestry, Coeur d'Alene, Idaho.

Gervais, J. A., Traveset, A., & Willson, M. F. (1998). The potential for seed dispersal by the banana slug (Ariolimax columbianus). The American midland naturalist, 140(1), 103-110.

Grant, G.E., and Swanson, F.J., 1995. Morpholgy and processes of valley floors in mountain streams, western Cascades, Oregon in Costa J.E., Miller, A.J., Potter, K.W., and Wilcock P., eds., Natural and anthropogenic influences in fluvial geomorphology: The Wolman volume: American Geophysical Union Geophysical Monograph 89, p 83-101.

Grant, G.E., S.L. Lewis, F.J. Swanson, J.H. Cissel, and J.J. McDonnell. 2008. Effects of forest practices on peak flows and consequent channel response: a state-of-science report for western Oregon and Washington. USDA, Forest Service, Pacific Northwest Research Station, GTR-760. Pages i-iii, 34-41

Hanson, C. T. (2013). Habitat use of Pacific fishers in a heterogeneous post-fire and unburned forest landscape on the Kern Plateau, Sierra Nevada, California. The Open Forest Science Journal, 6(1).

Hargis, C. D., Bissonette, J., & Turner, D. L. (1999). The influence of forest fragmentation and landscape pattern on American martens. Journal of applied Ecology, 36(1), 157-172.

Harrod, Richy J.; Gaines, William L.; Hartl, William E.; Camp, Ann. 1998. Estimating historical snag density in dry forests east of the Cascade Range. Gen. Tech. Rep.

PNW-GTR-428. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 16 p.

Headwaters Economics. 2012. Economic Profile System-Human Dimensions Toolkit. 2012. A Profile of Socioeconomic Measures, Selected Geographies: Siskiyou County, CA. (provides a compilation of individual tables referenced below used for this report): http://headwaterseconomics.org/wphw/wp-content/eps-profiles/06093%20-%20Siskiyou%20County%20CA%20Measures.pdf

Heinemeyer, K. S. 2002. Translating individual movements into population patterns: American martens in fragmented forest landscapes. Santa Cruz, CA: University of California – Santa Cruz. 300p. Ph. D.

Hildebrandt, William R. and John R. Hayes. 2007 Settlement Pattern Change in the Mountains of Northwest California: A View from Pilot Ridge. In There Grows a Green Tree, Greg White, et. al., editors. Center for Archaeological Research, Davis, Publication 11.

Holechek, J. L., R. D. Pieper, and C. H. Herbel. 1989. Range Management: Principles and Practices. Englewood Cliffs, N.J.: Prentice-Hall. pp 193-194.

Hood, S. (2010). Mitigating Old Tree Mortality in Long-Unburned, fire-Dependent Forests: A Synthesis. Rocky Mountain Research Station. Fort Collins: USDA Forest Service.

Hornocker, M.G.; Hash, H.S. 1981. Ecology of the wolverine in northwestern Montana. Canadian Journal of Zoology. 59:1286-1301.

Hummel S., Foltz-Jordon S., Polasky S.. 2012. Natural and cultural history of beargrass (Xerophyllum tenax). USDA For. Serv., Gen. Tech. Rep. PNW-GTR-864, Pacific Northwest Research Station, Portland, OR. 80 p.

Intergovernmental Panel on Climate Change. 2007. Intergovernmental Panel on Climate Change: Fourth assessment report, climate change 2007. Synthesis Report. http://www.ipcc.ch/ipccreports/ar4-syr.htm.

Irwin, L. L., Rock, D. F., & Rock, S. C. 2012. Habitat selection by northern spotted owls in mixed-coniferous forests. The Journal of Wildlife Management, 76(1), 200-213.

Jackson, M., Roering, J. 2009. Post-fire geomorphic response in steep, forested landscapes: Oregon Coast Range, USA. Quaternary Geology.

Jacobson, K. 2013. Interview by B. Ebert with K. Jacobson, Assistant District Fire Management Officer for Fuels on July 18, 2013.

Jenness, J. S., Beier, P., & Ganey, J. L. (2004). Associations between forest fire and Mexican spotted owls. Forest Science, 50(6), 765-772.

Jenness, J.S. 2000. The effects of fire on Mexican spotted owls in Arizona and New Mexico. MS Thesis, Northern Arizona University, Flagstaff, Arizona.

Johnson, C. A., Fryxell, J. M., Thompson, I. D., & Baker, J. A. (2009). Mortality risk increases with natal dispersal distance in American martens. Proceedings of the Royal Society of London B: Biological Sciences, rspb20081958.

Johnson, M. 2013. Interview by B. Ebert with M. Johnson, Assistant District Fire Management Officer on July 20, 2013.

Jones, J. L., and E. O. Garton. 1994. Selection of successional stages by fishers in north-central Idaho. In S. W. Buskirk, A. S. Harestad, M. G. Raphael, & R. A. Powell (Eds.), Martens, sables and fishers: biology and conservation (pp. 377-388). Ithaca, NY: Cornell University Press.

Joyce, Linda A. and Richard Birdsey eds. 2000. The impact of climate change on America's forests: A technical document supporting the 2000 USDA Forest Service RPA Assessment. Gen. Tech. Rep. RMRS-GTR-59. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Kappes, H. (2005). Influence of coarse woody debris on the gastropod community of a managed calcareous beech forest in western Europe. Journal of Molluscan Studies, 71(2), 85-91.

Karlin, E. J. (1961). Ecological relationships between vegetation and the distribution of land snails in Montana, Colorado and New Mexico. American Midland Naturalist, 60-66.

Keller, E.A., Swanson, F.J., 1979. Effects of large organic material on channel form and fluvial processes. Earth Surface Processes. 4: 361-380

Kelly, M.B., Allen Diaz, B. & Kuzmina, N. (2005) Digitization of a historic dataset: the Wieslander California Vegetation Type Mapping Project. Madroño, 52, 191-201. Data available at: http://vtm.berkeley.edu/

Kirk, T. A., & Zielinski, W. J. (2009). Developing and testing a landscape habitat suitability model for the American marten (Martes americana) in the Cascades mountains of California. Landscape ecology, 24(6), 759-773.

Klamath National Forest; California State Historic Preservation Officer and the Advisory Council on Historic Preservation Regarding the Westside Fire Recovery Project.

Knapp, E. J. 2015. Long-term dead wood changes in a Sierra Nevada mixed conifer forest: Habitat and fire hazard implications. Forest Ecology and Management 339 (2015) 87–95

Kyle, C. J., & Strobeck, C. (2003). Genetic homogeneity of Canadian mainland marten populations underscores the distinctiveness of Newfoundland pine martens (Martes americana atrata). Canadian Journal of Zoology, 81(1), 57-66.

Lee, D. E., & Bond, M. L. 2015b. Previous year's reproductive state affects Spotted Owl site occupancy and reproduction responses to natural and anthropogenic disturbances. The Condor, 117(3), 307-319.

Lee, D. E., Bond, M. L., Borchert, M. I., & Tanner, R. 2013. Influence of fire and salvage logging on site occupancy of spotted owls in the San Bernardino and San Jacinto Mountains of southern California. The Journal of Wildlife Management, 77(7), 1327-1341.

Lee, D.E., Bond M.L., Siegel R.B. 2012. Dynamics of California Spotted Owl breeding-season site occupancy in burned forests. The Condor. 114:792-802.

Lee, D.E., M.L. Bond. 2015a. Occupancy of California spotted owl sites following a large fire in the Sierra Nevada, California. The Condor, Ornithological Applications 117 pp 228-236.

Lehmkuhl, J.F., K.D. Kistler, J.S. Begley, and J. Boulanger. 2006. Demography of northern flying squirrels informs ecosystem management of western interior forests. Ecological Applications 16(2):584-600.

Lindenmayer, D.B. and Noss, R.F. 2006. Salvage logging, ecosystem processes, and biodiversity conservation, Conservation Biology, Volume 20, 949-958.

Lindstrand, L. 2006. Detections of Pacific Fisher around Shasta Lake in Northern California. Transactions of the Western Section of the Wildlife Society 42: 47-52.

Lloyd, R.M. 1964. Ethnobotanical uses of California Pteridophytes by Western American Indians. American Fern Journal 54(2): 76-82.

Locasciulli, O., & Boag, D. A. (1987). Microdistribution of terrestrial snails (Stylommatophora) in forest litter. Canadian Field-Naturalist.

Lowell, Eini;Willits, Susan; Krahmer, Robert (1992). Deterioration of Fire-Killed and Fire-Damaged Timber in the Western United States. PNW-GTR-292. 27pp.Rose, R. and D.L. Hasse. 2005. Rapid response reforestation: studies in fire reforestation. RMRS-P-35. USDA Forest Service Proceedings.

Magoun, A.J. 1985. Population characteristics, ecology and management of wolverines in northwest-ern Alaska. Fairbanks, AK: University of Alaska. Ph.D. thesis. 197 p.

McGinnis, T. W., Keely, J. E., Stephens, S. L., & Roller, G. B. (2010). Fuel buildup and potential fire behavior after stand-replacing fires, logging fire-killed trees and herbicide shrub removal in Sierra Nevada forests. Forest Ecology and Management, 22-35.

Millar. C., Stephenson, N., Stephens, S. 2007. Climate Change and Forests of the Future: Managing in the Face of Uncertainty. Ecological Applications

Miller, J. D., C. N. Skinner, H. D. Safford, E. E. Knapp, and C. M. Ramirez. 2012. Trends and causes of severity, size, and number of fires in northwestern California, USA. Ecological Applications 22:184-203.

Moeur, Melinda; Ohmann, Janet L.; Kennedy, Robert E.; Cohen, Warren B.; Gregory, Matthew J.; Yang, Zhiqiang; Roberts, Heather M.; Spies, Thomas A.; Fiorella, Maria. 2011. Northwest Forest Plan–the first 15 years (1994–2008): status and trends of late-successional and old-growth forests. Gen. Tech. Rep. PNW-GTR-853. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 48 p.

Mondry, Z. 2004. 1997 Flooding in Three Klamath Mountain Streams: Geomorphic effectiveness and Sediment and Large Wood Budgets. M.S. Thesis, Humboldt State University, Arcata, California. 81p.

Monsanto, P. G., & Agee, J. K. (2008). Long-term post-wildfire dynamics of coarse woody debris after salvage logging and implications for soil heating in dry forest of the eastern Cascades, Washington. Forest Ecology and Management, 3952-3961.

Murphy, K., & Sexton, T. T. (2007). An assessment of fuel treatment effects on fire behavior, suppression effectiveness and structure ignition on the Angora Fire. Vallejo: USDA Forest Service.

Nakamura, F., and Swanson, F.J., (1994), Distribution of coarse woody debris in a mountain stream, western Cascade Range, Oregon, Can J. For. Res., 24, 2395-2403.

Naney, R. H., L. L Finley, E. C. Lofroth, P. J. Happe, A. L. Krause, C. M. Raley, R. L. Truex, L. J. Hale, J. M. Higley, A. D. Kosic, J. C. Lewis, S. A. Livingston, D. C. Macfarlane, A. M. Myers, and J. S. Yaeger. 2012. Conservation of Fishers (Martes pennanti) in South-Central British Columbia, Western Washington, Western Oregon, and California–Volume III: Threat Assessment. USDI Bureau of Land Management, Denver, Colorado, USA.

National Wildland Coordination Group. 2014. Glossary of Wildland Fire Terminology. Retrieved January 29, 2015, from the National Wildland Coordination Group: http://www.nwcg.gov/pms/pubs/glossary/pms205.pdf

Neary, D.G., Ryan, K.C., DeBano, L.F., eds. 2005. Wildland fire in ecosystems: effects of fire on soil and water. U.S. Forest Service General Technical Report, RMRS-GTR-42-Vol. 4.

North Coast Region Water Quality Control Board. 2010. Problem statement and pollutant source analyses, Chapters 2.5.2.2 and 4.2.4 in: Final staff report for the Klamath River Total Maximum Daily Loads (TMDLs) addressing temperature, dissolved oxygen, nutrient, and microcystin impairment in California, the proposed site specific dissolved oxygen objectives for the Klamath River in California, and the Klamath River and Lost River implementation Plans. http://www.swrcb.ca.gov/northcoast/water_issues/programs/tmdls/klamath_river/100927/staff_report/00_CoverPage_TableofContents.pdf

North Coast Regional Water Quality Control Board (NCRWQCB). 2005. Salmon River, Siskiyou County, California Total Maximum Daily Load for Temperature and Implementation Plan Adopted June 22, 2005, NCRWQCB Resolution No. R1-2005-0058 Prepared by North Coast Regional Water Quality Control Board Total Maximum Daily Load Development Unit Staff. Accessed at http://www.waterboards.ca.gov/northcoast/water_issues/programs/tmdls/salmon_river/062405/part_1_salmon_temperature_tmdl_report_adopted.pdf

North Coast Regional Water Quality Control Board, 2005. Staff Report for the Action Plan for the Scott River Watershed Sediment and Temperature TMDLs.

North Coast Regional Water Quality Control Board. 2011. Water Quality Control Plan for the North Coast Region. http://www.waterboards.ca.gov/northcoast/water_issues/programs/basin_plan/basin_plan.shtml

Odion, D. C., Frost, E. J., Stritholt, J. R., Hong, J. D., & Moritz, M. A. (2004). Patterns of Fire Severity and Forest Conditions in the Western Klamath Mountains. Conservation Biology, 927-936.

Ollivier, L. M., Welsh Jr, H. H., & Clayton, D. R. (2001). Habitat correlates of the Siskiyou Mountains salamander, Plethodon stormi (Caudata: Plethodontidae); with comments on the species' range. US Department of Agriculture Forest Service, Redwood Science Laboratory, 1700.

Omi, P. N., & Kalabokidis, K. D. (1991). Fire damage on extensively vs. intensively managed forest stands within the North Fork Fire, 1988. Northwest Science, 65(4).

Osborne, K. 2015. Interview by B. Ebert with K. Osborne, District Fuels Technician, Happy Camp/Oak Knoll Ranger District on January 22, 2015.

Pabst, R.J. and Spies, T.A. 2001. Ten years of plant succession on a debris-flow deposit in Oregon. Journal of the American Water Resources Association 37(6): 1693-1708

Pacific Southwest Region (Region 5), California State Historic Preservation Officer, Nevada State Historic Preservation Officer, and the Advisory Council on Historic Preservation Regarding the Processes for Compliance with Section 106 of the National Register of Historic Preservation Act for Management of Historic Properties by the National Forests of the Pacific Southwest Region.

Pan, Y., Chen, J. M., Birdsey, R., McCullough, K., He, L., and Deng, F.: Age structure and disturbance legacy of North American forests, Biogeosciences, 8, 715–732, doi:10.5194/bg-8-715-2011, 2011b.

Paragi, T. F., Johnson, W., Katnik, D. D., & Magoun, A. J. (1996). Marten selection of postfire series in the Alaskan taiga. Canadian Journal of Zoology, 74(12), 2226-2237.

Parsons, A., Robichaud, P., Lewis, S., Napper, C., Clark, J. 2010.Field Guide for Mapping Post-fire Soil Burn Severity. US Department of Agriculture, Rocky Mountain Research Station. RMRS-GRT 245.

Peterson, D. L., Agee, J. K., Aplet, G. H., Dykstra, D. P., Graham, R. T., Lehmkuhl, J. F., et al. (2009). Effects of Timber Harvest Following Wildfire in Western North America. Portland: USDA - Forest Service.

Peterson, D. W., & Harrod, R. J. (2010). Fuel succession, post-fire logging, and future fire behavior: addressing the "reburn Problem.". Joint Fire Science Program.

Peterson, D. W., Dodson, E. K., & Harrod, R. (2014). Post-fire logging reduces surface woody fuels up to four decades following wildfire. Forest Ecology and Management, 84-91.

Peterson, D.W. and Harrod, R.J. 2010. Post-fire logging reduces surface woody fuels up to four decades following wildfire. Forest Ecology and Management, 84-91.

Powell, R. and Zeilinski, R. 1994. Effects of scale on habitat selection and foraging behavior of fisher in winter. Journal of Mammalogy.

Powell, Roger A.; Buskirk, Steven W.; Zielinski, William J. 2003. Fisher and marten. Wild Mammals of North America: Biology, Management, and Conservation, p. 635-649

Reid LM, Page MJ (2002). Magnitude and frequency of landsliding in a large New Zealand catchment. Geomorphology 49 (1–2), 71–88.

Rice, R. M, Rothacher, J., Megahan, M. 1972. Erosional consequences of Timber Harvesting:

Ritchie, M. W., Knapp, E. E., & Skinner, C. N. (2012). Snag longevity and surface fuel accumulation following post-fire logging in a ponderosa pine dominated forest. Forest Ecology and Management, 113-122.

Roberts, S. L., van Wagtendonk, J. W., Miles, A. K., & Kelt, D. A. (2011). Effects of fire on spotted owl site occupancy in a late-successional forest. Biological Conservation, 144(1), 610-619.

Robichaud, P.R. 2011. Evaluating post-fire salvage logging effects on erosion. Joint Fire Science Program Final Report 06-3-4-21

Rogers, G., Hann, W., Martin, C., Nicolet, T., & Morgan., P. (2008). Fuel treatment effects on fire behavior, suppression effectiveness, and structure ignition. USDA. Vallejo: USDA Forest Service.

Rose, R. and D.L. Hasse. 2005. Rapid response reforestation: studies in fire reforestation. RMRS-P-35. USDA Forest Service Proceedings.

Rothermel, R. C. (1972). A Mathematical Model for Predicting Fire Spread in Wildland Fuels. Intermountain Forest and Range Experiment Station. Ogden: US Department of Agriculture, US Forest Service.

Rothermel, R. C., & Burgan, R. E. (1984). BEHAVE: Fire Behavior Prediction and Fuel Modeling Systems-FUEL Subsystem. Intermountain Forest and Range Experiment Station. Ogden, UT: US Department of Agriculture, US Forest Service.

Ruggiero, L. F., K.B. Aubry, S.W. Buskirk, J.L. Lyon, W.J. Zielinski, tech. eds. 1994. The Scientific Basis for Conserving Forest Carnivores: American Marten, Fisher, Lynx and Wolverine in the Western United States. Gen. Tech. Rep. RM-254. Ft. Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 184 p

Russell, R.E., V.A. Saab, J.G. Dudley and J.J. Rotella. 2006. Snag longevity in relation to wildfire and postfire salvage logging. Forest Ecology and Management 232, p. 179-187.

Salvage Logging and a Skid Trail Treatment on Ground Cover, Soils, and Sediment Production in the Interior Western United States. Forest Ecology and Management, 335: 176-193.

Scott, J. H., & Burgan, R. E. (2005). Standard Fire Behavior Fuel Models: A Comprehensive Set for Use with Rothermel's Surface Fire Spread Model. Rocky Mountain Research Station. Fort Collins: US Department of Agriculture, US Forest Service.

Scott, J. H., & Reinhardt, E. D. (2001). Assessing crown fire potential by linking models of surface and crown fire behavior. Fort Collins: USDA -Forest Service.

Self, S. and Kerns, S. 2001. Pacific fisher use of a managed landscape in northern California. Sierra Pacific Research and Monitoring Wildlife Research Paper No. 6.

Sessions, J., Bettinger, P., Buckman, R., Newton, M., & Hamann, J. (2004). Hastening the return of complex forests following fire: the consequences of delay. Journal of Forestry, 102(3), 38-45.

Shatford, Hibbs and Puettman 2007; Joint Fire Science Program Final Report, Project 05-2-1-40 2009

Shatford, J.P.A., D.E. Hibbs, and K.J. Puettman. 2007. Conifer Regeneration after forest fire in the Klamath-Siskiyou's: how much, how soon? Journal of Forestry. April/May 2007: 139-146.

Siskiyou County, CA. 1996. Siskiyou County Comprehensive Land and Resource Management Plan. Yreka, CA.

Skinner, C. N., A. H. Taylor, and J. K. Agee. 2006. Klamath Mountains bioregion. Pages 170-194 in N. G. Sugihara, J. W. van Wagtendonk, K. E. Shaffer, J. Fites-Kaufman, and A. E. Thode, editors. Fire in California's Ecosystems. University of California Press, Berkeley and Los Angeles, CA.

Skinner, C. N. 2002. Influence of fire on the dynamics of dead woody material in forests of California and Southwestern Oregon. Pages 445-454 in Symposium on the ecology and management of dead wood in western forests, November 2-4, 1999, Reno, Nevada.

Skog, K. 2008. Sequestration of Carbon in Harvested Wood Products for the United States. Forest Products Journal. Vol 58, no. 6, pages 56-72

Spencer, W.D., P. Beier, K. Penrod, K. Winters, C. Paulman, H. Rustigian-Romsos, J. Strittholt, M. Parisi, and A. Pettler. 2010. California Essential Habitat Connectivity Project: A Strategy for Conserving a Connected California. Prepared for California Department of Transportation, California Department of Fish and Game, and Federal Highways Administration.

Stewart, J. H., and V. V. La Marche Jr. 1967. Erosion and deposition by the flood of December 1964 on Coffee Creek, Trinity County, California. USGS Professional Paper 422 – K, US Government Printing Office, Washington, DC.

Taylor, A. H., and C. N. Skinner. 1997. Fire regimes and management of old-growth Douglas fir forests in the Klamath Mountains of Northwestern California. Pages 203-208 in Fire Effects on Threatened and Endangered Species and Habitats. International Association of Wildland Fire, Fairfield, WA, Coeur d'Alene, ID.

Suzuki, N., Olson, D. H., & Reilly, E. C. (2008). Developing landscape habitat models for rare amphibians with small geographic ranges: a case study of Siskiyou Mountains salamanders in the western USA. Biodiversity and conservation, 17(9), 2197-2218.

Taylor, A. H., & Skinner, C. N. (1998). Fire history and landscape dynamics in a late-successional reserve, Klamath Mountains, California, USA. Forest Ecology and Management, 285-301.

Taylor, A. H., & Skinner, C. N. (2003). Spatial Patterns and Controls on Historical Fire Regimes and Forest Structure in the Klamath Mountains. Ecological Applications, 704-719.

Taylor, A. H., Skinner, C. N., & Agee, J. A. (2006). Klamath Mountains bioregion. In N. G. Sugihara, J. W. Van Wagtendonk, K. E. Shaffer, J. Fites-Kaufman, & A. E. Thode, Fire in California's ecosystems (pp. 170-1994). Berkeley and Los Angeles: University of California Press.

Tempel, D.J., R.J. Gutiérrez, S.A. Whitmore, M.J. Reetz, R.E. Stoelting, W.J. Berigan, M.E. Seamans, and M.Z. Peery. 2014. Effects of forest management on California Spotted Owls: implications for reducing wildfire risk in fire-prone forests. Ecological Applications 24: 2089-2106.

Thompson, C. M., Zielinski, W. J., & Purcell, K. L. (2011). Evaluating management risks using landscape trajectory analysis: a case study of California fisher. The Journal of Wildlife Management, 75(5), 1164-1176.

Thompson, J. R., Spies, T. A., & Ganio, L. M. (2007). Reburn severity in managed and unmanaged vegetation in a large wildfire. Proceedings of the National Academy of Sciences, 10743-10748.

Thompson, J. R., Spies, T. A., & Olsen, K. A. (2011). Canopy damage to conifer plantations within a large mixed severity wildfire varies with stand age. Forest Ecology and Management, 355-360.

Thompson, J.R., T.A. Spies and L.M. Ganio. 2007. Reburn severity in managed and unmanaged vegetation in a large wildfire. Proceedings of the National Academy of Sciences Volume 104, No.25: 10743-10748

Truex, R., Zielinski, R., Golightly, R., Barrett, R and Wisely, S. . 1998. A meta-analysis of regional variation in fisher morphology, demography, and habitat ecology in California. Draft report submitted to California Department of Fish and Game. United States Forest Service, Pacific Southwest Research Station, Arcata, California.

U.S Global Change Research Program.2014. Climate Change Impacts in the United States: The Third National Climate Assessment. U.S. National Climate Assessment

US Environmental Agency. 2013. Inventory of U.S. Greenhouse Gas Emissions and Sink: 1990-2011. EPA 430-R-13-001.

USDA Forest Service 2013. Federally Listed and Sensitive Plant Species. July 2013. Klamath National Forest. Yreka, CA.

USDA Forest Service and USDI Bureau of Land Management, January 2001. 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 Forest Service Natural Resource Manager National Visitor Use Monitoring Program. 2012. Visitor Use Report, Region 5 Klamath National Forest http://apps.fs.usda.gov/nrm/nvum/results/A05005.aspx/Round2USDA, Forest Service. 2009.

USDA Forest Service, Pacific Southwest Region. 1995a (updated through 2010). Land and resource management plan: Klamath National Forest. Yreka, CA.

USDA Forest Service, Pacific Southwest Region. 1995b. Final Environmental Impact Statement for the Land and resource management plan: Klamath National Forest. Yreka, CA.

USDA Forest Service, Pacific Southwest Region. 1995c. Record of decision for the final environmental impact statement for the Klamath National Forest.

USDA Forest Service, Pacific Southwest Region. 2001. Sierra Nevada National Forest Environmental Impact Statement, Appendix K Rangeland Capability and Suitability. Forest Service.

USDA Forest Service. 2013. Programmatic Agreement Among U.S.D.A Forest Service,

USDA Forest Service. 2015. Programmatic Agreement Among U.S.D.S Forest Service,

USDA Forest Service. 2000. Landscape Aesthetics - A Handbook for Scenery Management. Agriculture Handbook Number 701. Page F-3.

USDA Forest Service. 2004. Cumulative Watershed Effects Analysis: Quantitative Models for Surface Erosion, Mass-wasting and ERA/TOC. Prepared by Don Elder and Mark Reichert, Klamath National Forest, Yreka, CA.

USDA Forest Service 2015. Hoover, L. et al. Survey and Manage Category B Fungi Strategic Survey Report. Pacific Southwest Region, Northwest Forest Plan Area. May 2015.

USDA Forest Service. 2012. Road Sediment Source Inventory and Risk Assessment, Klamath National Forest, Forest-wide road inventory database.

USDA-USDOC-USDI. 2004. Analytical Process for Developing Biological Assessments for Federal Actions Affecting Fish Within the Northwest Forest Plan Area. Accessed at http://www.blm.gov/or/esa/reports/Analytical_Process_110504.doc

USDC NMFS. 2014. National Marine Fisheries Service. 2014. Final Recovery Plan for the Southern Oregon/Northern. California Coast Evolutionarily Significant Unit. Accessed at http://www.westcoast.fisheries.noaa.gov/protected_species/salmon_steelhead/recovery_planning_and_implementation/southern_oregon_northern_california_coast/southern_oregon_northern_california_coast_recovery_plan_documents.html

USDI Fish and Wildlife Service. 2012. Critical Habitat Units for the Northern Spotted Owl (Strix occidentalis caurina). U.S. Fish and Wildlife Service, Region 1. Portland, OR.

USDI FWS. 2013. 2008. Sensitive Species List for the KNF. Accessed at http://www.fws.gov/yreka/ES/KlamathNF_TEC_list_with_links.pdf

USDI U.S. Fish and Wildlife Service (2007). National Bald Eagle Management Guidelines. Department of the Interior. Portland, OR:25 pp.

USDI U.S. Fish and Wildlife Service (2009). Regulatory and Scientific Bass for the U.S. Fish and Wildlife Service Guidance for Evaluation of Take for Northern Spotted Owls in Private Timberlands in California's Northern Interior. Department of the Interior. Portland, OR: 77pp.

USDI U.S. Fish and Wildlife Service (2011). Revised Recovery Plan for the Northern Spotted Owl (Strix occidentalis caurina). Department of the Interior. Portland, OR: xvi + 258 pp.

USDI U.S. Fish and Wildlife Service (2012). Final Rule: Designation of Revised Critical Habitat for the Northern Spotted Owl (Strix occidentalis caurina). Department of the Interior. Portland, OR: 790pp.

USDI-BLM; USDA-FS; USDA-NRCS, Cooperative Extension Service. 1999a. Sampling Vegetation Attributes. Interagency Technical Reference 1734-4. Bureau of Land Management. Available at http://www.blm.gov/nstc/library/pdf/samplveg.pdf.

USDI-BLM; USDA-FS; USDA-NRCS, Cooperative Extension Service. 1999b. Utilization studies and residual measurements. Interagency Technical Reference 1734-3. Bureau of

Van Nieuwstadt, M., Sheil, D., Kartawinata, K. 2001. The Ecological Consequences of Logging

Van Nieuwstadt, M., Sheil, D., Kartawinata, K. 2001. The Ecological Consequences of Logging in the Burned Forests of East Kalimantan, Indonesia. Conservation Biology Volume 15, No. 4, August, 2001.

Vose, J., Sun, G., Ford, C. R., Bredemeier, M., Ostsuki, K., Wei, X., Zhang, Z., and Zhang, L.: Forest ecohydrological research in the 21st century: what are the critical needs?, Ecohydrology, 4,146–158, 2011.

Wagenbrenner, J.W., MacDonald, L.H., Coats, R.N., Robichaud. P.R. 2014. Effects of Post-Fire

Weatherspoon, P. C., & Skinner, C. N. (1995). An Assessment of Factors Associated with Damage to Tree Crowns from the 1987 Wildfires in Northern California. Forest Science, 430-451.

Weir, R. D., & Corbould, F. B. (2008). Ecology of fishers in the sub-boreal forests of north-central British Columbia, final report. Peace/Williston Fish and Wildlife Compensation Program, Prince George, British Columbia, Canada, Report, 315, 1-178.

Weir, R. D., & Corbould, F. B. (2010). Factors affecting landscape occupancy by fishers in north-central British Columbia. The Journal of Wildlife Management, 74(3), 405-410.

Weir, R.D., M. Phinney, and E.C. Lofroth. 2012. Big, sick, and rotting: Why tree size, damage, and decay are important to fisher reproductive habitat. Forest Ecology and Management 265:230-240.

Welsh Jr, H. H., Stauffer, H., Clayton, D. R., & Ollivier, L. M. (2007). Strategies for modeling habitat relationships of uncommon species: an example using the Siskiyou Mountains salamander (Plethodon stormi). Northwest Science, 81(1), 15-36.

Wengert, G. M., Gabriel, M. W., Foley, J. E., Kun, T., & Sacks, B. N. (2013). Molecular techniques for identifying intraguild predators of fishers and other North American small carnivores. Wildlife Society Bulletin, 37(3), 659-663.

Wieslander, A.E. 1935. A vegetation type map of California. Madroño, 3, 140-144.

Wills, R. D., and J. D. Stuart. 1994. Fire history and stand development of a Douglas-fir/ Hardwood forest in northern California. Northwest Science 68:205-212.

Yaeger, J. 2005. Habitat at fisher resting sites in the Klamath Province of North America. Master's Thesis, Humboldt State University, California.

York, E. 1996. Fisher population dynamics in north-central Massachusetts. M.S. thesis, University of Massachusetts, Amherst.

Zabel, C. J., Dunk, J. R., Stauffer, H. B., Roberts, L. M., Mulder, B. S., & Wright, A. (2003). Northern Spotted Owl habitat models for research and management application in California (USA). Ecological Applications, 13(4), 1027-1040.

Zack, S., T. L. George, and W. F. Laudenslayer, Jr. 2002. Are There Snags in the System? Comparing Cavity Use among Nesting Birds in "Snag-rich" and "Snag-poor" Eastside Pine Forests. USDA Forest Service Gen. Tech. Rep. PSW-GTR-181.

Zhang, J., J. Webster, R.F. Powers, and J. Mills. 2008. Reforestation after the Fountain Fire in northern California: an untold success story. Journal of Forestry, December, 2008. 425-430 pp.

Zhao,F., Sweitzer, R., Guo, Q, Kelly, M. 2012. Characterizing habitats associated with fisher den structures in the southern Sierra Nevada, California using discrete return radar. Forest Ecology and Management.

Zielinski, W. J., Spencer, W. D., & Barrett, R. H. (1983). Relationship between food habits and activity patterns of pine martens. Journal of Mammalogy, 64(3), 387-396.

Zielinski, W. J., Truex, R. L., Dunk, J. R., & Gaman, T. (2006). Using forest inventory data to assess fisher resting habitat suitability in California. Ecological Applications, 16(3), 1010-1025.

Zielinski, W. J., Truex, R. L., Schmidt, G. A., Schlexer, F. V., Schmidt, K. N., & Barrett, R. H. (2004). Home range characteristics of fishers in California. Journal of Mammalogy, 85(4), 649-657.

Ziemer, R. 1981. The role of vegetation in the stability of forested slopes. Pacific Southwest Research Station, Arcata, CA.

Ziemer, R., Swanston, D. 1977. Root Strength Changes After Logging in Southeast Alaska.

US Department of Agriculture, US Forest Service Pacific Northwest Experimental Station.

Glossary

Activity Centers (ACs) (Northern Spotted Owl)	The area that includes the Northern Spotted Owl home range and core area.
Anadromous Fish	The species of fish, commonly salmon and steelhead, born in fresh water, migrate to the ocean to mature, and return to fresh water to lay eggs (spawn).
Home Range (Northern Spotted Owl)	An area defined by a 1.3-mile radius around a NSO activity center within which owls forage, nest, and roost.
Core Area (Northern Spotted Owl)	An area defined by a 0.5-mile radius around a NSO activity center that owls use most often, especially during the nesting season.
Aquatic Conservation Strategy (ACS)	A strategy developed to restore and maintain the ecological health of watersheds and aquatic ecosystems contained within them on public lands.
Aquatic Hydrologic Reserves	Refer to Hydrologic Riparian Reserves.
Area of Potential Effects (APE)	The area within which project activities are expected to occur that may affect historic properties.
Basal Area	The area of a section of land that is occupied by the cross-section of tree trunks and stems at their base.
Best Management Practices (BMPs)	A codified series of about 100 practices for protecting water quality when conducting forest management activities. BMPs are referenced in R5 FSH 2509.22, Soil and Water Conservation Handbook; Chapter 10, Water Quality Management Handbook.
Best Management Practices Evaluation Program (BMPEP)	A program for monitoring and evaluating the implementation and effectiveness of application of BMPs.
Broadcast Burning	Prescribed burning of the understory of an area.
Burned Area Emergency Response (BAER)	A Forest Service activity of immediate post-wildfire response to assess and reduce the risk of loss of human life, property damage, and adverse effects to critical natural and cultural resources from threats caused by the fire.
Burned Area Reflectance Classification (BARC)	A model using pre- and post- fire satellite imagery to derive a preliminary classification using of landscape change as a result of a wildfire that, after field verification, will become soil burn severity.
Clear-cut Logging (clearcutting)	An even-aged management silvicultural system applied to green forest stands for the purpose of regenerating a new age class. Trees are selected and removed in groups up to 40 acres in size followed by artificial or natural regeneration.
Coarse Woody Debris (CWD)	Woody material at least 20-inches in diameter from whatever source that is dead and lying on the forest floor. Term used for terrestrial species habitat.
Code of Federal Regulations (CFRs)	A codification of the general and permanent rules published in the Federal Register by the Executive departments and agencies of the Federal Government.

Connected Actions	Actions that: (i) automatically trigger other actions which may require environmental impact statements; (ii) cannot or will not proceed unless other actions are taken previously or simultaneously; or, (iii) are interdependent parts of a larger action and depend on the larger action for their justification (40 CFR 1508.25).
Connectivity	The degree to which the landscape facilitates animal movement and other ecological flows. The linkage of similar but separated vegetation stands by patches, corridors, or “stepping stones” of like vegetation. This term can also refer to the degree to which similar habitats are linked.
Critical Habitat	Areas designated for the survival and recovery of federally listed threatened or endangered species.
Cumulative Effects	Those effects resulting from incremental effects of actions, when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions.
Cumulative Watershed Effects (CWE)	A model for Cumulative Watershed Effects with three components: Equivalent Roaded Acres (ERA), sediment delivery from surface erosion (Universal Soil Loss Equation or USLE), and sediment delivery from mass wasting (GEO). The model quantifies disturbances and land sensitivity at the watershed scale (usually the 7th field watershed scale but also at larger scales). The estimated results fall on a continuum. As disturbances increase over time and space, at some point the risk of initiating or contributing to existing adverse cumulative watershed impacts becomes a cause for concern. Concern thresholds have been identified for each component based on field observations in the KNF. The CWE models may measure the additive direct and indirect effects of various activities within an alternative but may also be used to add the effects of alternative actions for a project to the effects of reasonably foreseeable future actions.
Decommissioned Road	Road that has been administratively removed from the National Forest Transportation System. Many such roads have undergone activities that result in the stabilization and restoration of unneeded roads or trails to a more natural state (FSM 7703.2(1)).
Danger Tree	Refer to Hazard Tree.
Degrade (Habitat)	The habitat characteristics will be affected but it will still function as the pre-treatment habitat.
Diameter at Breast Height (DBH)	The diameter of a tree trunk 4.5 feet above the ground.
Direct Effects	Those effects occurring at the same time and place as the initial cause or action.
Dispersal Habitat	Northern Spotted Owl habitat that where there is a moderate level of canopy closure (compared to nesting/roosting) and trees large enough to provide shelter and potential foraging opportunities for traveling NSO.
Downed Large Wood	Refer to Large Woody Debris.
Downgrade (Habitat)	Habitat prior to treatment will no longer function as that type of habitat but will function as a lower quality habitat.

Draft Environmental Impact Statement (DEIS)	A detailed written statement as required by section 102(2) (C) of the NEPA (40 CFR 1508.11) that is released to governmental agencies and the general public for review and comment.
Egress	A route that provides a way out of an area.
Endangered Species	Those plant or animal species that are in danger of extinction throughout all or a significant portion of their range. Endangered species are identified by the Secretary of the Interior in accordance with the Endangered Species Act of 1973.
Environmental Justice	The state (or condition) which all populations are provided the opportunity to comment before decisions are rendered on, are allowed to share in the benefits of, are not excluded from, and are not affected in a disproportionately high and adverse manner by government programs and activities affecting human health or the environment.
Equivalent Roaded Acres (ERA)	Refer to Cumulative Watershed Effects.
Erosion Hazard Rating (EHR)	A rating system used to classify the relative vulnerability of soil to erosion.
Fire Affected Nesting/Roosting Habitat	Nesting/Roosting habitat that burned at moderate severity.
Fire Behavior	The variable characteristics of an active flaming front.
Fire Hazard	A fuel complex, defined by volume, type condition, arrangement, and location, that determines the degree of ease of ignition and of resistance to control.
Fire Perimeter	The entire outer edge or boundary of a fire.
Fire Regime	The combination of fire frequency, predictability, intensity, seasonality, and distinctive characteristics of fire in an ecosystem. Agee (1993) defines three broad categories of fire severity “based on the physical characters of fire and the fire adaptations of vegetation:” Low Severity Fire Regime: Effect of typical fire is benign. Fires are frequent (often < 20 years), of low intensity, and the ecosystems have dominant vegetation well adapted to survive fire. Mixed Severity Fire Regime: Fires are of intermediate frequency (25-100 years), range from low to high intensity, and have vegetation with a wide range of adaptation. High Severity Fire Regime: Fires are usually infrequent (often >100 years) but may be of high intensity, most vegetation is at least top-killed.
Fire Return Interval	Number of years between two successive fires in a specified area.
Fire Severity	The level of effects of fire on the post burn landscape. In most cases when the term fire behavior is used to indicate fire severity, it adds the qualifier “problem fire behavior”.
Fireline	A corridor, which has been cleared of organic material to expose mineral soil. Firelines may be constructed by hand or by mechanical equipment (e.g., dozers).

Fish-Bearing Streams	Fish-bearing streams are distinguished from intermittent streams by the presence of any species of fish for any duration. Many intermittent streams may be used as spawning and rearing streams, refuge areas during flood events in larger rivers and streams, or travel routes for fish emigrating from lakes.
Flame Length	The length of flame measured in feet. Increased flame lengths increase resistance to control and likelihood of torching events and crown fires.
Foraging Habitat (F)	Northern Spotted Owl habitat where the canopy cover is slightly less than Nesting/Roosting habitat with fewer large trees but still enough space in the understory for Northern Spotted Owl to maneuver through the trees for hunting prey.
Fuel Management Zones	A system of linear or mosaic patch treatments of forest or shrub vegetation designed and treated to reduce fire spread, intensity, and create barriers to fire spread.
Geologic Riparian Reserves	Refer to Unstable Lands.
Green Hazard Trees (Not Fire-damaged)	Trees that have not been fire-damaged and that meet the definition of a hazard tree. For the purposes of this project, these green trees will not be cut and removed by roadside hazard treatments unless they are an immediate hazard (unless they have a high hazard potential).
Green Trees that are Fire-damaged	For the purposes of salvage harvest, green trees are those that have 30 percent or greater chance of survival for 3-5 years. In salvage harvest units, trees with greater than 70 percent or greater probability of mortality in 3-5 years would be considered a dead or dying tree and could be harvested where appropriate. In roadside hazard units, green trees are those that have 40 percent or greater chance of survival for 3-5 years. In roadside hazard units trees that have a 60 percent or greater chance of mortality in 3-5 years would be considered a dead or dying tree and could be harvested as appropriate. Criteria for evaluating probability of mortality come from “Marking Guidelines for Fire-Injured Trees in California” (Smith and Cluck, 2011).
Ground Cover	Natural organic and inorganic material that covers the watershed ground surface in sufficient quantity to allow a satisfactory rate of water infiltration to replenish ground water and limit erosion to natural rates. Ground cover usually consists of perennial vegetation, forest floor litter and duff, rock, downed wood, or similar erosion resistant material.
Grubbing	The removing all vegetation within a minimum of a five foot radius from planted or natural regenerated seedlings.
Habitat Connectivity	Refer to Connectivity.
Hand Piling	The piling of limbs and branches by hand for burning at a later time.
Hazard Tree	A standing tree that presents a hazard to people due to conditions such as deterioration of or damage to the root system, trunk, stem, or limbs or the direction or lean of the tree (29 CFR 1910.266(c); FSH 6709.11, glossary). Synonymous with danger tree for purposes of this project.

High Hazard Potential	Hazard tree rating is defined in the Hazard Tree Guidelines for Forest Service Facilities and Roads in the Pacific Southwest Region (Report #RO-12-01). The hazard potential is determined by the probability of the tree falling or part of the tree falling and the potential effect of the tree falling. A high hazard potential requires prompt removal of the tree or part of the tree (mitigation).
High-priority danger tree hazard	A road or road segments where danger trees are determined to be highly likely to fail and where those failures would be highly likely to cause injuries (FSH7709.59 Section 40.5).
Hydrologic Riparian Reserves	Riparian Reserves associated with intermittent stream channels, perennial stream channels, wetlands or springs.
Hydrologic Stabilization	Activities that ensure that roads and trails will not contribute negative effects to water sources. Methods for hydrologic stabilization include water-barring, removing culverts, covering and seeding as stated in Best Management Practices.
Indirect Effects	Those effects occurring later in time or that are spatially removed from the activity.
Ingress	A route that allows access into an area.
Inner Gorges	Slopes greater than 65% which occur along rivers and streams.
Intermittent Stream	Any non-permanent flowing drainage feature having (1) a definable channel and (2) evidence of annual scour or deposition. This includes what are sometimes referred to as ephemeral streams if they meet these two physical criteria. Some intermittent streams flow after July 1 and are termed “late-flowing” intermittent streams.
Inventoried Roadless Area	Areas identified in a set of inventoried roadless area maps, contained in Forest Service Roadless Area Conservation, Final Environmental Impact Statement, Volume 2, dated November 2000, which are held at the National headquarters office of the Forest Service, or any subsequent update or revision of those maps.
Irretrievable	A term that applies to the loss of production, harvest, or use of natural resources. For example, some or all of the timber production from an area is lost irretrievably while an area is serving as a winter sports site. The production lost is irretrievable, but the action is not irreversible. If the use changes, it is possible to resume timber production.
Irreversible	A term that describes the loss of future options. Applies primarily to the effects of use of nonrenewable resources, such as minerals or cultural resources, or to those factors, such as soil productivity that are renewable only over long periods of time
Issue	Point of discussion, debate, or dispute about the environmental effects of the proposed action.
Landslide Risk	The intersection of the likelihood of a landslide event and the consequences of a landslide event. The analysis is on the 7th field watershed scale.
Large Woody Debris	Woody material, at least 24” in diameter and 50 feet long, that is dead and lying on the forest floor. Term used for aquatic habitat.

Late Successional Reserve (LSR)	Large blocks of habitat that are distributed across the range of the northern spotted owl and spaced closely enough to facilitate dispersal of owls. Late successional reserves are managed to provide habitat for late successional and “old growth” species.
Limited Operating Periods (LOPs)	Specified dates that restrict management activities (1) near known wildlife nesting sites or un-surveyed suitable nesting habitat during the breeding season; or (2) restrict equipment use during periods of wet weather to minimize or avoid sedimentation into streams (also known as periods when wet weather operating standards (WWOS) will apply).
Maintenance Level	Defines the level of service provided by, and maintenance required for, a specific road, consistent with road management objectives and maintenance criteria.
Maintenance Level 1 Road	Roads that have been placed in storage between intermittent uses. A Maintenance Level 1 road is closed to vehicular traffic but may be available and suitable for non-motorized uses.
Maintenance Level 2 Road	Roads open for use by high clearance vehicles. Traffic is normally minor, usually consisting of one or a combination of administrative, permitted, dispersed recreation, or other specialized uses. Passenger cars are discouraged or prohibited.
Maintenance Level 3 Road	Roads open and maintained for travel by a prudent driver in a standard passenger car. Roads in this maintenance level are typically low speed with single lanes and turnouts.
Maintenance Level 4 Road	Roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most level 4 roads are double lane and aggregate surfaced, but may single lane, paved and/or dust abated.
Maintenance Level 5 Road	Roads that provide a high degree of user comfort and convenience. These roads are normally double lane, paved facilities. Some may be aggregate surfaced and dust abated.
Management Area (MA)	A distinct geographical area with specified objectives and prescriptions.
Moderate Hazard Potential	Hazard tree rating is defined in the Hazard Tree Guidelines for Forest Service Facilities and Roads in the Pacific Southwest Region (Report #RO-12-01). The hazard potential is determined by the probability of the tree falling or part of the tree falling and the potential effect of the tree falling. A moderate hazard potential requires the documentation and tag and map the tree (monitor) or the removal of the hazard tree (mitigate).
Monitoring	Process of collecting information to evaluate if objective and anticipated or assumed results of a management plan are being realized or if implementation is proceeding as planned.
National Environmental Policy Act (NEPA)	Codifies the national policy of encouraging harmony between humans and the environment by promoting efforts to prevent or eliminate damage to the environment, thereby enriching our understanding of ecological systems and natural resources. It declares the federal government to be responsible for: (a) coordinating programs and plans regarding environmental protection; (b) using an interdisciplinary approach to decision-making; (c) developing methods to ensure that non-quantifiable amenity values are included economic analyses; and (d) including in every recommendation, report on proposals for legislation, or other major federal actions significantly affecting the quality of the environment a detailed environmental impact statement (EIS).

National Forest Management Act (NFMA)	An amendment to the Resource Planning Act providing direction for the development of land and resource management plans for each national forest.
National Forest System Land	Consists of units of federally owned forest, range and related lands united into a nationally significant system dedicated to the long-term benefit for present and future generations. The NFS includes all national forest lands acquired through purchase, exchange, donation or other means; the national grasslands; and other lands, waters or interests which are administered by the Forest Service.
National Forest Transportation System (NFTS)	The system of National Forest System roads, National Forest System trails, and airfields on National Forest System lands (36 CFR 212).
Naturally Occurring Asbestos	Natural geologic occurrence of various types of asbestos minerals that pose a potential health risk if released into the air through ground-disturbing activities.
Nesting/Roosting Habitat (NR or N/F)	Northern Spotted Owl habitat that is in mid- to late-seral forests that contain stands of large trees with high canopy cover (≥60%), multilayered canopies, and nesting platforms.
Non-native Invasive Species	Any plant or plant product that can directly or indirectly injure or cause damage to crops (including nursery stock or plant products), livestock, poultry, or other interests of agriculture, irrigation, navigation, the natural resources of the United States, the public health, or the environment.
Noxious Weed	See Non-native Invasive Species.
One-hour Fuels	Fine flashy fuels, dried herbaceous plants or round wood less than 1/4" diameter. Also includes the uppermost layer of litter on the forest floor.
One-hundred-hour Fuels	1" to 3" diameter sticks and brush.
Outstanding Remarkable Value	A river-related value must be a unique, rare, or exemplary feature that is significant at a comparative regional or national scale.
Perennial Stream	A stream which normally flows throughout the year.
Plantation	A group of trees that have been planted together.
Post-fire Foraging Habitat (PFF)	Foraging habitat that burned at moderate and high vegetation severity or nesting/roosting that burned at high severity.
Prescribed Fire or Prescribed Burning	A type of fuel treatment whereby fire is intentionally set in wildland fuels under prescribed conditions and circumstances.
Primary Constituent Elements (PCE)	The physical and biological features that provide the essential life history requirements of the species.
Project Design Features (PDF)	Mitigations developed and incorporated into the alternatives considered in detail to minimize or eliminate negative effects of the project, and protect and promote late successional habitat, consistent with the Forest Plan.

Rapid Assessment of Vegetation Conditions (RAVG) after wildfire	The product is generated for National Forest Service lands (including wilderness) to provide information that can assist post-fire vegetation management planning designed to address a number of management objectives. The product provided to the Forest are Map and GIS products showing location of basal area loss within fire perimeter. Summary table of vegetation affected by the fire, separated into four classes of basal area loss. Refer to Vegetation Burn Severity for description of categories of severity.
Reforested/Reforestation	The natural or artificial restocking of an area with trees.
Regeneration	The act of renewing tree cover by establishing young trees naturally or artificially-generally, promptly after the previous stand or forest has been removed.
Release	Release treatments include manually removing competing plants or water uptake from competing plant roots by “grubbing” around conifer seedlings or natural hardwood seedlings.
Removal of Trees and Fuels	For salvage, this is the act of removing trees, which includes yarding of the tree, intermediate decking of logs and the eventual hauling of the logs off site. For fuel loading, removal could also include prescribed burning of the material.
Removal of Habitat	Habitat prior to treatment is lost and will no longer function as habitat (for Northern Spotted Owl and other species) after treatment.
Resistance to Control	The relative difficulty of constructing and holding a control line as affected by resistance to line construction and fire behavior; also called “difficulty of control.”
Riparian Reserves (Unstable Lands (Geologic) and Hydrologic)	A land allocation in the Forest Plan that includes an aquatic ecosystem and the adjacent upland areas directly affecting it. It also includes unstable and potentially unstable lands that are not associated with aquatic areas. Specific standards and guidelines provide direction for these areas as outlined in Management Area 10 of the Forest Plan. For the purposes of this project, a hydrologic Riparian Reserve includes areas associated with bodies of water (primarily streams) and inner gorges that may be associated with streams, and geologic Riparian Reserves are associated with factors such as unstable lands but do not include inner gorges.
Risk Ratios (For Cumulative Watershed Effects Models)	The amount of the disturbance in the watershed relative to the hydrologic or sediment inference point.
Roadless Area	Refer to Inventoried Roadless Areas.
Salvage Harvest (salvage logging)	The removal of dead trees after a natural event (for example, after a wildfire) to remove hazards to public safety, capture the economic value of burned trees, and/or remove excessive fuel accumulation. Dead trees (or snags) exceeding those needed by other resources (e.g. for wildlife habitat) are removed. Although some salvage harvested areas may appear similar to clearcuts, the different is that salvage trees are dead and their size and location were determined by the natural event. Salvage harvest is also a fuels reduction activity that will over time, help protect the remaining adjacent late-successional habitat and promote the late-successional character by accelerating the regeneration to a forested stand that will eventually regain late-successional characteristics.

Scenic Character	The aggregate of features and traits that form the individual scenic nature of an area.
Second Entry Burns	Prescribed fire that will occur after an initial fuels reduction treatment.
Sensitive Species	Plant or animal species which are susceptible to habitat changes or impacts from management activities. The official designation is made by the USDA Forest Service at the regional level and is not part of the designation of threatened or endangered species made by the U.S. Fish And Wildlife Service.
Site Preparation	The removal or reduction of competing vegetation or logging debris, to prepare the area for planting and to promote the growth and survival of desired tree species.
Snag	A standing dead or dying tree that has lost most of its branches, or the standing portion of a broken-off tree. Snags provide cavities for nesting, perches, and feeding sites for wildlife.
Snag Retention	Areas where snags will be left on site and standing where they do not pose a hazard to implementers.
Soil Burn Severity	The effect of a fire on ground surface characteristics, described in terms of char depth, organic matter loss, altered color and structure of soil, and reduced infiltration. Soil burn severity is measured in high, moderate and low classes based upon the degree of effects.
Soil Organic Matter	The amount of organic matter within the mineral soil, indicated by the color and thickness of the upper soil horizon, is within the normal range of characteristics for the site, and is distributed normally across the area. The upper soil horizon is not displaced or eroded to the degree or extent that soil productivity is decreased for the desired vegetation.
Soil Stability	An adequate level of soil cover is maintained to prevent accelerated erosion, and erosion prevention measures are effectively implemented following soil disturbing activities. Effective soil cover includes organic surface materials, living vegetation less than 3 feet tall (grasses, forbs and low growing shrubs), surface rock fragments larger than ¾ inch, or where needed applied mulches.
Soil Structure	State of having pores or holes in the soil that hold air or water; permeability
Stand	A group of trees that occupies a specific area and is similar in species, age and condition.
Standard and Guideline	A principle requiring a specific level of attainment, a rule to measure against.
Subsoiling	Mechanical lifting and shattering of the layer of soil beneath the topsoil in order to reduce soil density and strength, improve moisture infiltration and retention, and increase root penetration in the soil.
Suitable Lands	Land where the harvest activities could occur without causing irreversible damage to soil or watershed.

Surface Organic Matter	The amount of organic material on top of the mineral soil is maintained at levels to sustain soil microorganisms and provide for nutrient cycling. Organic materials may range in size from amorphous and fine organic matter that makes up the O horizon, needles and twigs, to coarser materials such as branches and logs.
Temporary Roads	Roads authorized by contract, permit, lease, other written authorization, or emergency operation, not intended to be a part of the forest transportation system and not necessary for long-term resource management (36 CFR 212.1).
Ten-hour Fuels	Needle cast and small dead/downed material primarily fuels < 1" diameter.
Understory Vegetation	Vegetation (trees or shrubs) growing under the canopy formed by taller trees.
Underburning	Prescribed burning of the understory.
Universal Soil Loss Equation (USLE)	Refer to Cumulative Watershed Effects.
Unstable Lands	Riparian Reserves associated with active landslides (including earth flows), inner gorges, toe zones of dormant landslides, or steep-weathered granitic lands.
Unsuitable Lands	Forest land withdrawn from timber utilization by statute or administrative regulation or identified as not appropriate for timber production in the forest planning process, i.e., irreversible soils damage and non-reforestable in five years.
Vegetation Burn Severity	Most trees within high severity burn areas are expected to die in the three to five years. Areas characterized by moderate-severity burns experienced 50 to 75 percent vegetation mortality, substantial reduction in canopy, understory cover, duff layers and large woody debris. Areas characterized by low or very low severity burns experienced zero to 50 percent vegetation mortality and a reduction in fuel loading. Refer to Rapid Assessment of Vegetation Conditions (RAVG) for process.
Vegetation Burn Severity	The effect of a fire on vegetation, often described by the degree of scorch, consumption, and mortality of vegetation. Vegetation burn severity is measured by classes of canopy mortality or basal area loss.
Viewshed	A total landscape seen or potentially seen from specific points on a logical part of a travel route or water body.
Watershed:	The entire land area that drains to a specific point. 5th field watershed: A watershed that is usually more than 40,000 acres in size. 6th field watershed: A watershed that ranges from about 10,000 to 40,000 acres in size. 7th field watershed: A watershed or drainage that ranges from about 2,500 to 10,000 acres in size.
Wild and Scenic River	A river that is either already designated or proposed for designation because of its free flowing condition and outstanding remarkable values.

Wildland Urban Interface (WUI) Commonly referred to as the WUI (woo-ee). This is an area, or zone, where structures and other human development meet or intermingle with undeveloped wildland or vegetative fuels. It generally extends out for 1.5 miles from the edge of developed private land into the wildland.

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