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Draft Environmental Impact Statement

Trestle Forest Health Project

Eldorado National Forest
El Dorado County, California

Trestle Forest Health Project

Draft Environmental Impact Statement

El Dorado County, CA.

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Abstract: The Forest Service prepared this Draft Environmental Impact Statement (DEIS) for the Trestle Forest Health Project. This DEIS presents the analysis of four alternative vegetation treatments in forest stands. The overall objective of this project is to reduce the potential loss of important ecosystem components to high severity fire, to improve forest health, and to increase resilience of stands to insects and diseases. Project activities are proposed on National Forest System Lands on the Eldorado National Forest in El Dorado County, California. Four alternatives were developed based on public input and collaborative efforts.

Reviewers should provide the Forest Service with their comments during the review period of the DEIS. This will enable the Forest Service to analyze and respond to the comments at one time and to use information acquired in the preparation of the final Environmental Impact Statement (EIS), thus avoiding undue delay in the decision-making process. Reviewers have an obligation to structure their participation in the National Environmental Policy Act process so that it is meaningful and so that it alerts the agency to the reviewers' position and contentions (Vermont Yankee Nuclear Power Corp. v. NRDC, 435 U.S. 519, 553 (1978)). Environmental objections that could have been raised at the draft stage may be waived if not raised until after completion of the final EIS (City of Angoon v. Hodel (9th Circuit, l986) and Wisconsin Heritages, Inc. v. Harris, 490 F. Supp. 1334, 1338 (E.D. Wis. 1980). Comments on the DEIS should be specific and should address the adequacy of the statement and the merits of the alternatives discussed (40 Code of Federal Regulations (CFR) 1503.3).

The opportunity to comment ends 45 days after the publication of the Notice of Availability (NOA) in the Federal Register.

Send written comments to Laurence Crabtree, c/o Jennifer Ebert, Attn: Trestle Forest Health Project, Placerville Ranger District, 4260 Eight Mile Road, Camino, CA 95709. Comments may also be sent via e-mail to comments-pacificsouthwest-eldorado-placerville@fs.fed.us, via facsimile to 530-647-5311, or via hand-delivery to the address above, during normal business hours (Monday through Friday, 8:00 a.m. to 4:30 p.m.). The acceptable formats for electronic comments are MS Word or Rich Text Format.

Summary

The Eldorado National Forest proposes to treat up to approximately 16,764 acres using a variety of vegetation treatments in forest stands to reduce fire behavior, to improve forest health, and to increase stand resilience (the ability of the forest to survive stress) to the adverse effects of uncharacteristic wildfire behavior, insects, and diseases, while improving conditions for wildlife and enhancing watershed conditions. In its current conditions, many areas of the project landscape do not have a capacity to absorb disturbance and to reorganize while undergoing change, while still retaining essentially the same functions, structures, identities, and responses. For the Mixed Conifer Forests of the Sierra Nevada, achieving resilience can be accomplished by restoring stands to a state which is closer to the vegetation conditions created by an active fire regime (North et al., 2009). This project focuses on establishing the appropriate vegetative composition, structure, pattern, and ecological processes necessary to make the forest ecosystem sustainable, resilient, and healthy under current, as well as changing, climatic conditions. This project builds on past Forest Service projects in the area designed to modify fire behavior and to improve forest health.

Within the Trestle project area, 19,672 acres are identified as Wildland Urban Intermix (WUI), including 3,716 acres within the Defense Zone in the vicinity of the community of Grizzly Flat. The Grizzly Flat Community Wildfire Protection Plan (CWPP) boundary extends into the Eldorado National Forest to include Leoni Meadows and Henry's Diggings properties and approximately one third, or 7,085 acres, of the Trestle project area. The Grizzly Flat Fire Safe Council is in the process of updating their CWPP and possibly extending the boundary to include Gilberts, a private inholding east of Grizzly Flat and within the Trestle project area.

Public scoping began on March 4, 2013 with a Notice of Intent (NOI) to prepare an EIS in the Federal Register, and with the mailing of scoping letters to individuals, organizations, and government agencies, including federally recognized tribal governments, Native American organizations, and non-profit groups. Based on collaborative efforts during project development, concerns regarding potential impacts of the proposed action continued to exist. Important issues included the following:

- Potential effects to the California spotted owl population due to proposed treatment in high quality habitat, and
- The feasibility of the project due to economic considerations.

These issues led the agency to develop alternatives to the proposed action, including the following:

- Alternative 1 – No activities proposed would take place.
- Alternative 4 – Treat areas in a way that provides a low risk of reducing owl occupancy and of reducing owl use of individual territories.
- Alternative 5 – Treat areas in a way that provides a low risk of reducing owl occupancy and of reducing owl use of individual territories, and that provides for an effective fire modification strategy that can be implemented in a relative short time frame.

Effects:

- Completion of this project would increase the resiliency of this landscape to wildfire and to insect mortality; reduce the fire risk to adjacent communities and to public municipal water supplies; protect valuable forest resources including large, old trees; reduce potential fragmentation of old forest habitats; and provide for sustainable recreational opportunities.
- Significant impacts on any forest resources are not expected to result from implementation of this project; however, this project would result in the short-term risk of minor adverse effects to some forest resources, including, but not limited to, some Forest Service sensitive wildlife and plants species, watershed, and air quality.

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Chapter 1. Purpose of and Need for Action

Document Structure

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

- **Chapter 1. Purpose of and Need for Action:** 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.
- **Chapter 2. Alternatives, including the Proposed Action:** 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. The end of the chapter includes a summary table comparing the proposed action and alternatives with respect to their environmental impacts.
- **Chapter 3. Affected Environment and Environmental Consequences:** This chapter describes the environmental impacts of the proposed action and alternatives.
- **Chapter 4. Consultation and Coordination:** This chapter provides a list of preparers and agencies consulted during the development of the DEIS.
- **Appendices:** The appendices provide more detailed information to support the analyses presented in the DEIS.
- Index: The index provides page numbers by topic.

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at the Placerville Ranger District in Camino, California.

Background

The Eldorado National Forest identified the Trestle project area as an area in great need of improved forest health and sustainable landscape. According to the desired conditions defined in the 2004 Sierra Nevada Forest Plan Amendment (SNFPA), the Trestle project area was not in a resilient condition. An interdisciplinary team of research specialists developed a proposal, based on National and Regional management direction for Ecological Restoration and on desired conditions from the Forest Plan, to move stands toward desired conditions.

The project area is located east of the community of Grizzly Flat, including the area surrounding Leoni Meadows, west of Caldor, and north of Big Mountain. The gross area of the project is 20,453 acres. This total includes 1,325 acres of other ownership. The project is located entirely in El Dorado County, California in T.8N., R.13E., in all or portions of Sections 1 and 2; T.8N., R.14E., in all or portions of

Sections 4-6; T.9N., R.13E., in portions of Section 1-3, 11-16, 19-30, 33-36; T.9N., R.14E., in all or portions of Sections 5-10, 14-22, 28-33; and T.10N, R.13E., in all or portions of Sections 35 and 36; Mount Diablo Base & Meridian (MDB&M). The area is accessed from Grizzly Flat using the Capps Crossing Road (9N30) or the North South Road (10N83). Elevations range from 3,200 feet on the west side of the project area to 5,800 feet on east side of the project area.

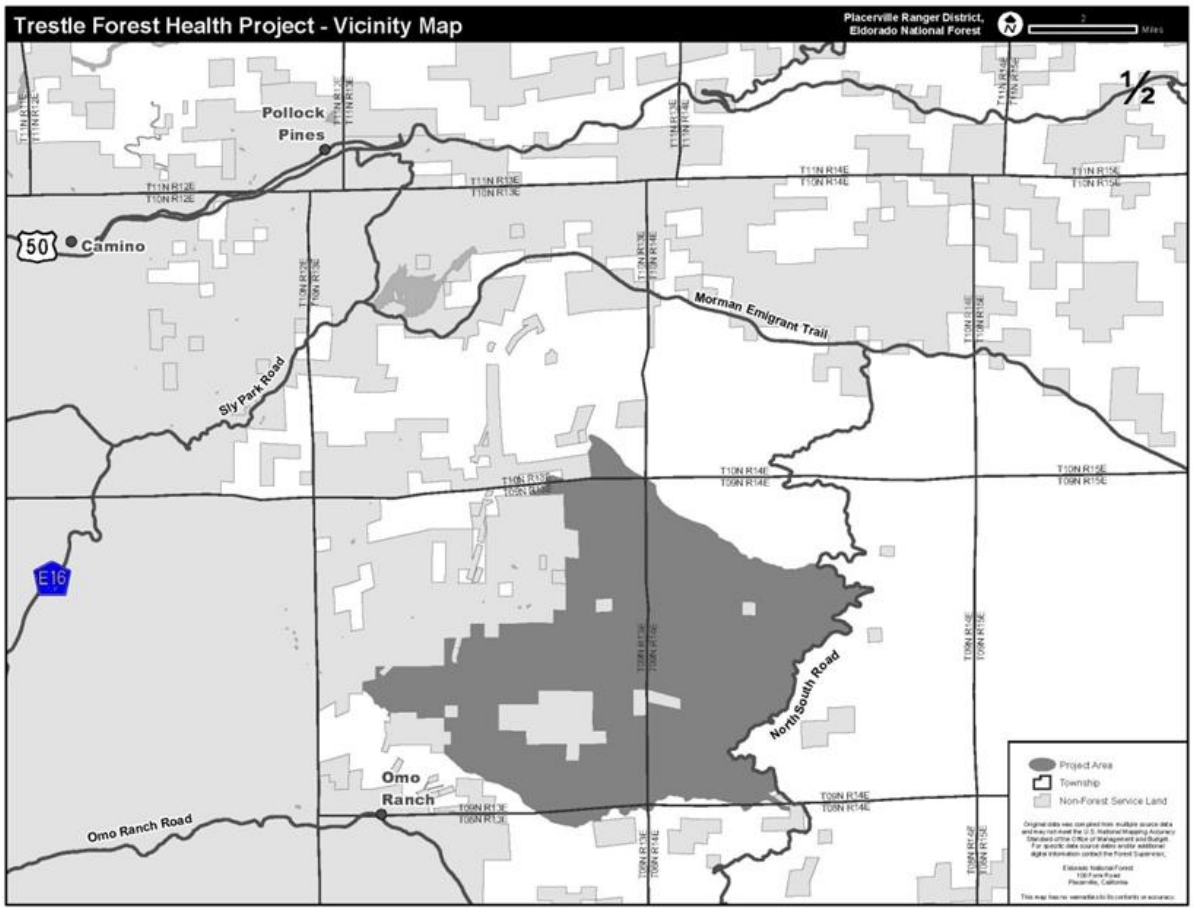

Figure 1. Project Vicinity Map

Purpose and Need for Action

The underlying needs for this proposal include the following:

1. There is a need for reducing fuel loading to reduce the threat of large, high-intensity wildfires and threats to Grizzly Flat, Leoni Meadows, and other landowners. There is a need for changing potential fire behavior during weather conditions that result in extreme fire intensity and severity across a considerable portion of the landscape to increase the fire resilience of stands and to improve options for fire suppression and wildfire management. This is a need because current

conditions put large areas of the landscape at high risk for unacceptable loss from wildfire and that loss jeopardizes the Forest Service's ability to manage the landscape for desired conditions.

The area's watersheds are important sources of clean water for domestic needs, as well as for recreational use and wildlife needs. The threat of large-scale, high-severity wildfires jeopardizes the Forest Service's directive to manage the project area for the recognized multiple-use benefits associated with healthy forests, including diverse wildlife habitat conditions, clean water, quality recreational experiences, and productive soils.

Sufficient treatment, based upon a strategic spatial design, and recognizing the historical ecological processes and landscape patterns, is needed to ensure effectiveness of fire behavior modification and to ensure enhanced stand resilience at the landscape level. The theoretical basis for changing fuel structure to reduce fire hazard is well established (Scott & Reinhardt, 2001; Graham et al., 2004; Peterson et al., 2005; Stephens et al., 2009). Real world reviews of wildfires and their interactions with fuel treatment areas support the theoretical benefits of fuel manipulation (Raymond & Peterson, 2005; Omi et al., 2006; Safford et al., 2012).

Stand structure, as it relates to live and dead fuel loading and ladder fuels, strongly influences fire behavior in the Sierra Nevada mixed conifer forest. Fuels in the area vary because of topography and previous natural and human activity. A variety of fuel conditions exist and vary between areas which have a lot of ladder fuels and those which do not. High-density stands with large amounts of ladder and surface fuels increase probability of crown fires, high flame lengths, and high fireline intensities. Surface fuels that promote high flame lengths include shrub and understory with ladder fuels present. Based on the 2014 Fuels and Fire Behavior Synopsis (Riesenhuber, 2014), areas that currently exhibit a build-up of fuels would easily allow a fire burning under 90th percentile weather conditions to make the transition from a surface fire to a crown fire, causing high mortality and the continuation of fire spread into the surrounding forest stands. Other areas are identified as needing maintenance treatments to modify fire behavior and to maintain or improve desired conditions.

The number, size, and intensity of wildfires within the Sierra Nevada have been altered from their historical range (Miller et al., 2009; Bouldin, 1999; Beesly, 1996; and McKelvey & Johnston, 1992). The lower-montane forest zone best represents the vegetation type within the project area. Major vegetation types include California black oak (*Quercus kelloggii*), Ponderosa pine (*Pinus ponderosa*), White fir (*Abies concolor*) mixed conifer, Douglas-fir (*Pseudotsuga menziesii var. menziesii*) mixed conifer, and mixed evergreen forests. Interspersed within the forests are chaparral stands, riparian forests, and meadows and seeps. Historically, fires within this zone had a frequent fire return interval. All sites in the lower-montane zone experienced fire frequently enough to reduce fuel accumulations and vegetation density, and, as a result, these fires were primarily of low to moderate intensity and severity (Sugihara et al., 2006). The general area has had a long and rich history of human use and activity. Past activities (including historic grazing of domestic animals; historic logging practices that included selective logging of larger pines and no follow-up slash treatment; mining; and, more

recently, several decades of fire exclusion) have contributed to altered fire regimes. Stand-replacing fire at the current potential level is neither a sustainable nor a desired event in these systems.

Desired Conditions:

For 0-2X plantations (trees less than 12" diameter at base height (dbh):

- Surface fuel load smaller than 3 inches and less than 5 tons per acre; less than 0.5 foot fuel bed depth; stocking levels that provide well-spaced tree crowns; less than 50% surface area with live fuels (brush); and tree mortality less than 50% of existing stocking under 90th percentile fire weather conditions in 2x plantations (USDA-FS 2004).

For brush and shrub patches:

- An average of 4 foot flame lengths under 90th percentile weather conditions; double fireline production rates; and ensure treatments are effective for 5 to 10 years, achieved by removing appropriate amounts of vegetative material (2004 SNFPA ROD, p. 50).

For conifer forest types:

- Reduced fuel concentrations resulting in shorter flame lengths (< 4 feet) during 90th percentile weather conditions; increased fireline production rates for suppression forces; and treatments effective for more than 5 to 10 years (2004 SNFPA ROD, p. 51).
- Canopy fuels arranged so that the fuel continuity is broken both horizontally and vertically. Probability of crown fire initiation less than 20% during 90th percentile weather conditions (2004 SNFPA ROD, p. 50).
- Potential fire intensity decreased to a level where tree mortality would be less than 20% of the dominant and codominant trees under 90th percentile weather conditions (2004 SNFPA ROD, p. 50).

2. There is a need to improve forest health and to restore a composition of tree species and size classes that is more resilient to disturbance by applying appropriate silvicultural techniques to increase age class diversity and to favor species better adapted to disturbances typical of this forest type, so that stands are likely to be more sustainable into the future. The reasons for this need are that over-dense stands experience high levels of inter-tree competition for resources, resulting in declined health of desired species, an abundance of desired species, and an increased risk for high levels of mortality (Barrett, 1982; Oliver, 1995; Cochran & Barrett, 1995), thus threatening the ability of National Forest System lands to be managed for desired conditions. Reducing competition for moisture, nutrients, and sunlight among trees reduces stress and enables trees to withstand stress-causing situations, such as bark beetle attack. While some insect and disease activity within the forest is a natural and important part of the forest, high mortality levels can limit management options for manipulating stands to achieve desired conditions and can increase the amount of dead fuels and the potential for extreme fire behavior.

Achieving desired conditions in these stands includes providing conditions that favor desired species and size classes of trees. In the Sierra Nevada mixed conifer forest type and ponderosa pine type, shade tolerant species (cedars and firs) currently grow at higher density levels than shade intolerant species (pines and California black oaks). Changes in species composition and in increased density are a result of changes in fire regimes and fuel loading. Dense, closed canopies that have developed in the absence of frequent fire tend to favor shade tolerant white fir, incense cedar, and Douglas fir, and they tend to exclude shade intolerant ponderosa pines, oaks, and sugar pines that would otherwise occur along ridges and south-facing aspects in the project area. These shade tolerant species form dense understories that act as fuel ladders to the larger overstory trees, and they are generally more susceptible to mortality from fire.

On the landscape, a large decrease in area identified as ponderosa pine forest type, and an increase in the mixed conifer type over the last century, indicates a clear shift from more open, pine dominated stands to stands composed primarily of more shade tolerant species due to a lack of fire and altered disturbance regimes (Collins et. al., 2011). This shift has resulted in increases in fire intensity and severity, decreases in tree vigor and growth, and suppression of hardwoods, primarily black oaks, from shade tolerant conifers.

Desired Conditions:

- Improved composition of residual stands: strands composed of more fire and drought resilient tree species (i.e., ponderosa, sugar pine, and California black oak) (2004 SNFPA ROD, p. 52).
- Improved stand vigor, improved tree vigor, improved growth rates, and improved ability to combat insects and disease (2004 SNFPA ROD, p. 49).
- Increased regeneration of fire-resilient tree species (2004 SNFPA ROD, p. 52).
- Promoted hardwoods within stands (2004 SNFPA ROD, p. 52).
- Promoted stand heterogeneity (2004 SNFPA ROD, p. 41).

3. There is a need for protecting, increasing, and perpetuating old-forest ecosystem habitat components, and for conserving their wildlife species. This is a need because stands within the project area that currently support old-forest, ecosystem-associated wildlife species, such as the northern goshawk and the California spotted owl, are at risk of loss, which would result in further fragmenting old-forest ecosystem habitats; in addition, other areas are not developing sufficiently to expand habitats or to provide alternative habitats.

A purpose of this proposal is to reduce the risk of mortality and the loss of existing large, old trees and to reduce the loss of valuable wildlife structures, thereby maintaining the structure and function that they provide. The reason for this purpose is that the loss of these structures over a substantial portion of the landscape would reduce the quality and quantity of the habitat.

Desired Conditions:

- A canopy cover of 50-70% in California spotted owl home range core areas (HRCA) (2004 SNFPA ROD, p. 40).
- Stand structures that vary in size and tree species composition creating horizontal heterogeneity (2004 SNFPA ROD, p. 41).
- Multi-tiered canopies that create vertical heterogeneity by providing for a range of tree sizes from seedlings to large-diameter trees (2004 SNFPA ROD, p. 41).
- Improved continuity and distribution of old forest ecosystems and habitats (2004 SNFPA ROD, p. 41).
- Stands that provide a continuous supply of snags and live decadent trees suitable for cavity nesting wildlife across a landscape (2004 SNFPA ROD, p. 51).
- Retain four of the largest snags per acre of westside conifer and hardwood stands. Clump and irregularly distribute snags across treatment units (2004 SNFPA ROD, pp. 51-52).

4. There is a need for improving access and for reducing sediment from roads by improving the Forest Transportation System. This is a need because roads play a vital role in providing access for resource management needs and for public recreational use. However, both dispersed recreational use and past management activities in the project area have created poorly located or unmaintained routes that are contributing to reduced watershed health, increased sedimentation and soil loss, and impaired aquatic habitat.

A purpose of this proposal is to repair road surfaces to reduce the loss of existing native surface material; to replace inadequate drainage crossings; to cut or trim trees and brush for sight distance improvement; to eliminate ruts, to repair ditches, and to install waterbars and dips on roads with inadequate runoff control; to install gates to control seasonal use or replace existing, non-functional gates or barriers on roads designated as open to the public or designated for management activities; and to restrict use and to minimize resource damage where existing roads are not designated for public use. The reason for this purpose is that unneeded and poorly located roads can negatively impact forest resources, even though road access is needed to implement project activities. A fairly extensive network of roads exists in the project area, and many are in a suitable condition or need only minor maintenance in order to implement project activities.

Desired Conditions:

- Provided access for resource management and public for recreation purposes (USDA-FS 1988).
- Improved or acceptably maintained hydrologic connectivity, erosion and sediment delivery, and channel stability (2004 SNFPA ROD, p.43).
- Improved aquatic organism passage and enhanced aquatic habitat conditions (2004 SNFPA ROD, p. 43).
- Maintained soil productivity.

5. There is a need for designing and implementing cost-effective project activities. This is to ensure that sufficient treatments occur to meet project objectives during the planning time frame and to maintain future management options for efficient and effective management of National Forest System lands. Allocated funding and grant opportunities to accomplish project activities are limited, and with several other large-scale projects occurring on the Forest, it is unlikely that funding for this project will be prioritized over funding for other projects. A combination of reasonably expected appropriated funds and cost-offset opportunities allow for efficiently accomplishing all of the treatments identified in this project. Furthermore, the role of the Forest Service in providing a supply of wood products for local manufacturers sustains a part of the employment base in rural communities and helps to maintain infrastructure near National Forest System lands. The preservation of this infrastructure helps maintain future options for effectively and efficiently achieving objectives on National Forest System lands.

Desired Conditions:

- The contribution of the Forest Service toward a continuous flow of forest products, providing for commercial product removal that contributes both directly and indirectly to the local economy, promoting activities which maintain local infrastructure and management options for the future (USDA-FS 2004).
- Accepted treatments designed to be cost-effective to maximize the number of acres treated with a limited budget (USDA-FS 2004).

6. There is a need to implement restoration activities to reduce impacts to soil and watershed resources related to dispersed camping, roads, and trails. Riparian Conservation Objective #6 is the following: Identify and implement restoration actions to maintain, restore, or enhance water quality and maintain, restore, or enhance habitat for riparian and aquatic species (USDA-FS 2004).

Desired Conditions:

- Improved or acceptably maintained hydrologic connectivity, erosion and sediment delivery, and channel stability (USDA-FS 2004).
- Improved soils in regards to the soil's ability to absorb and filter precipitation and to sustain favorable conditions of stream flows (USDA-FS 2004).
- Maintained soil productivity.

Proposed Action

This is the action proposed by the Forest Service to meet the purpose and need:

The Proposed Action includes a combination of fuels reduction and forest health improvement actions on approximately 16,113 acres of National Forest System land, including thinning with the use of both ground based mechanical and skyline harvest systems, tractor piling, mastication, hand thinning, brush cutting, and prescribed burning. Road reconstruction to facilitate treatments and to improve water quality through installation of Best Management Practices (BMPs) is proposed on approximately 84

miles of existing roads. Restoration activities associated with dispersed camping, roads, and trails would occur at seventeen locations and would maintain sustainable recreational opportunities, while also reducing impacts to soils and watershed conditions. The proposed action is described in more detail in Chapter 2, under Alternative 2 on page 17.

Decision Framework

Given the purpose and need, the deciding official reviews the proposed action, the other alternatives, and their environmental consequences, in order to determine whether to implement the proposed action as described, to select a different alternative, or to take no action at this time.

Forest Plan Direction

The Proposed Action and alternatives are guided by the Eldorado Forest Land and Resource Management Plan (LRMP), as amended by the 2004 Sierra Nevada Forest Plan Amendment (SNFPA). The Forest is subdivided into land allocations (management areas) with established desired conditions and associated management direction (standards and guidelines). Land allocations that apply to this proposal include the following: Wildland Urban Intermix (WUI) – Defense and Threat Zone, General Forest, California Spotted Owl Protected Activity Center (PAC), Northern Goshawk (PAC), Great Gray Owl Protected Activity Center (PAC), California Spotted Owl Home Range Core Area (HRCA), and Riparian Conservation Areas (RCAs).

Public Involvement

A Notice of Intent (NOI) to prepare an Environmental Impact Statement (EIS) for the Trestle Forest Health Project was published in the Federal Register on March 3, 2013. The notice asked that input on the proposed action be received by April 8, 2013. In addition, as part of the public involvement process, the Forest Service has

- Had this project listed on the Schedule of Proposed Actions (SOPA) since 2011;
- Sent a project specific scoping notice in March 2013 to 45 individuals, organizations, and government agencies, including federally recognized tribal governments, tribal groups currently applying for federal recognition, and Native American organizations and non-profit groups that are interested in projects that are located on this portion of the Forest or that requested notification on the project; and
- Held collaborative meetings with members of the public, industry groups, and environmental organizations who have expressed an interest in the project. Meeting notes from collaborative meetings are available in the project record.

Eight comments on the proposed action were received.

Issues

Comments were used to formulate issues concerning the proposed action. The Forest Service separated the issues into two groups: significant and non-significant. Significant issues were defined as those directly or indirectly caused by implementing the proposed action. Non-significant issues were identified as those outside the scope of the proposed action; those already decided by law, regulation, Forest Plan, or other higher level decision; those irrelevant to the decision to be made; or those conjectural and not supported by scientific or factual evidence. The Council on Environmental Quality (CEQ) National Environmental Policy Act (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). A list of non-significant issues and reasons why they were found non-significant may be found at the scoping comment summary in the project record located at Placerville Ranger Station, Eldorado National Forest.

As for significant issues, the Forest Service identified the following issues during scoping and collaborative efforts:

Issue #1: The proposed action may have significant negative effects on the California spotted owl population due to treatment of high quality habitat coupled with declining population trends in the area.

Alternatives 4 and 5 were developed to address this issue.

Key indicators: the probability for loss of occupancy and for recolonization of individual territories and the impacts of loss of occupancy to population demography.

Issue #2: Project may not be operationally feasible due to economic considerations.

Key indicators: the appraisal value and the cost of treatments.

Chapter 2. Alternatives, Including the Proposed Action

Introduction

This chapter describes and compares the alternatives considered for the **Trestle Forest Health Project**. It describes both alternatives considered in detail and those eliminated from detailed study. The end of this chapter presents the alternatives in tabular format so that the alternatives and their environmental impacts can be readily compared.

Alternatives Considered in Detail

Based on the issues identified through public comment on the proposed action, the Forest Service developed two alternative proposals that achieve the purpose and need differently than the proposed action. In addition, the Forest Service is required to analyze a No Action alternative. The proposed action, alternatives to the proposed action, and no action alternative are described in detail below. Appendix A includes detailed maps each alternative analyzed.

Alternative 1

No Action

Under the No Action alternative, current management plans would continue to guide management of the project area. No commercial thinning, prescribed burning, watershed restoration activities, or other activities would be implemented under this project to accomplish the purpose and need.

Alternative 2

Proposed Action

Thinning

1. Use a combination of ground based and skyline logging systems to conduct mechanical thinning on approximately 4,887 acres (4,444 acres within natural stands and 443 acres within plantations). Thinning would include the cutting and removal of select commercial (trees 10" to 29.9" dbh) and non-commercial (trees 4" to 9.9" dbh) sized trees, using a combination of variable density thinning and thinning from below to maintain or increase within stand heterogeneity while reducing ladder fuels in strategic locations.

    a. On slopes generally less than 35%, ground-based mechanized equipment (low-impact feller-buncher, hand felling, and conventional skidding equipment) would be used to remove both commercial and non-commercial material on approximately 4,733 acres and non-commercial sized material only on 25 acres.

    b. A skyline system would be used to thin approximately 76 acres of treatment units with slopes generally greater than 35%. Units identified for thinning using skyline systems would include harvest on slopes generally less than 50% with mechanical equipment to

cut and bunch thinned trees. Hand felling would be used in areas with slopes generally steeper than 50%.

c. Within the mechanical thinning units, cutting of small trees (1" to 3.9" dbh) and brush would occur on approximately 1,575 acres.

d. Removal of hardwoods greater than 4" dbh and trees $\geq$ 30" dbh would not occur, except to allow for equipment operability or safety.

e. The removal of dead and unstable live trees (hazard trees) of all sizes would occur along utility lines, timber haul roads and landings to provide for safety of woods worker and public throughout project implementation, except where restrictions for removal apply.

f. Existing and operations generated slash and brush would be tractor piled or grapple piled after mechanical thinning operations. Tractor piling would occur as a follow-up treatment on approximately 1,597 acres in natural stands and 310 acres in plantations to reduce ground fuels and ladder fuels. Tractor piling would not occur on slopes generally greater than 35%. Grapple piling would occur on 15 acres in natural stands.

g. Biomass (non-commercial) material accumulated on landings would be disposed of or removed in a number of ways, including on-site burning, commercial and personal use firewood, or as co-generation fuel where feasible.

2. Conduct non-commercial mechanical thinning (trees less than 12 inches dbh) up to 100 feet on one or both sides of the Capps Crossing Road (9N30) and Grizzly-Caldor Road / Leoni Road (09N73) in 5 segments totaling approximately 3 miles (approximately 57 acres). Material would be moved to landings and treated as described for biomass from thinning units. Conduct brush cutting up to 100 feet of Capps Crossing Road (9N30) and Grizzly-Caldor Road / Leoni Road (09N73) in 3 segments totaling approximately 5 miles (approximately 88 acres).

Hand Thinning

1. Hand cut and pile understory vegetation (trees less than 9 inches dbh and brush) on approximately 1,492 acres. Approximately 1,044 acres of the treatments by hand occur in units that are located within 500 feet of private property boundaries in the Wildland Urban Interface (WUI) defense zones and threat zones.

2. Within plantations, conduct approximately 6 acres of hand thinning of non-commercial sized material, with some hand piling and some lop and scatter of thinned material.

Prescribed Burning

1. Prescribed fire is proposed on 15,812 acres within the project area. Pile burning and underburning are the two primary techniques of prescribed fire proposed in this project.

    a. Underburning is proposed as the initial or primary treatment for this project on approximately 9,583 acres, where land allocations, environmental constraints, or stand conditions makes prescribed fire the preferred tool to achieve treatment objectives. Of the approximately 9,583 acres of underburning as an initial treatment, 984 acres is

considered priority for prescribed fire only treatments and anticipated to be completed within the next 5 to 10 years.

b. All treatment units, except those specifically excluded from proposed burning, are proposed for follow-up prescribed burning. Multiple burn entries would occur in burn only stands with heavy fuel build up conditions to reach desired conditions described in the purpose and need for the project.

c. Pile burning is proposed as a follow-up treatment on 3,412 acres. Within thinning and piling units, underburning may be implemented concurrent with pile burning or separately.

d. Prescribed fire may be ignited using ground based firing techniques or through aerial firing techniques.

e. In preparation for prescribed burning, perimeter line construction would be needed where roads, trails, or natural barriers are absent. This may involve hand cutting of vegetation including trees up to 9-inch diameter, pruning, and scraping a bare soil line, or line construction with a D-6 or smaller dozer.

Transportation System

1. Road reconstruction to facilitate treatments and improve road conditions is proposed on approximately 84 miles. Reconstruction activities may include, repair or replacement of inadequate drainage culverts; elimination of ruts; roadside drainage maintenance; cattle guard cleaning and repair; installation of waterbars and dips with inadequate water runoff control; placement of erosion resistant and protective material (riprap), gate installation to control seasonal use or replacement of existing non-functional gates or barricades; cleaning and filling cracks and potholes on existing asphalt roads; and, cutting and removing roadside vegetation encroaching on all system roads.

2. Approximately 3 miles of temporary roads would be used for project operations. Once there is no longer a use for the road, the temporary roads would be obliterated using methods such as, earth barricades; ripped to alleviate soil compaction and restore infiltration; seeding, removing drainage structures; slashing; and, camouflaging road junction.

3. Obliterate approximately 3.1 miles of 3 roads not open to public use identified as causing negative watershed impacts and identified as not needed for administrative access (Routes 09N44B, 09N45D, and 09N65B). Obliteration would include: earth barricades; ripping to alleviate soil compaction and restore infiltration; removing drainage structures, mulching with native materials (slash); and seeding.

Water Hole Maintenance and Repair

1. To furnish an adequate water supply for fire or contract work, perform maintenance and repair work on eleven existing water supply facilities. Maintenance and repair work would include: clearing plugged pipes; installing temporary weirs or sandbags; placing erosion resistant and

protective material (riprap) on road surfaces accessing water supply facilities; and, cleaning pond areas of debris.

Restoration - Dispersed Recreation, Roads, Trails, and Abandoned Mines

1. Steely Fork Cosumnes River Site 1: Section 15, T09N R13E
    a. Reduce watershed damage from a denuded area eroding into Steely Fork Cosumnes River while continuing to allow for dispersed recreation use and water drafting activities.
        i. Block access to stream crossing with boulders and gate to stop creek crossing, but leave access to water hole; place aggregate base between the gate and stream; and re-establish existing lead-off ditches.
        ii. Place boulders along the border of the dispersed camping area to restrict site expansion. Break up the soil compaction (outside of the defined camping area) via sub-soiler, ripping shanks, or by hand. Avoid underground lines and sensitive sites.
2. Steely Fork Cosumnes River Site 2: Section 14, T09N R13E
    a. Reduce watershed damage from area eroding sediment into Steely Fork Cosumnes River and enhance the meadow in the area.
        i. Replace the gate blocking access to the 09N73A (road closed to public use); construct water bars on stream approaches; block access to non-system routes with boulders; break up the soil compaction (in the dispersed camping area and the spur road) via sub-soiler, ripping shanks, or by hand; and plant or seed vegetation as needed.
        ii. Meadow enhancement activities would include; removal of encroaching conifers by hand, block motorized vehicle access to the meadow using the felled trees, hand pull invasive plant species, remove barbed wire, and install nesting platform for great gray owl.
        iii. Identify designated hiking path by blocking and obscuring non-system trails with natural materials.
3. Steely Fork Cosumnes River Site 3: Sections 21-22, T09N R13E
    a. Reduce watershed damage from area eroding sediment into Steely Fork Cosumnes River.
        i. Block unauthorized route off of 09N65B using native materials; break up soil compaction in the dispersed site and non-system route via sub-soiler, ripping shanks, or by hand and mulch with straw or native vegetation; and reestablish vegetation through seeding and planting.

ii. Obliterate 9N65B (closed to public use). Break up soil compaction via sub-soiler or ripping shanks and cover with straw or native vegetation. Reestablish vegetation through seeding and planting.

4. Dogtown Creek Site 1: Section 30, T09N R14E

    a. Reduce watershed damage from camping area eroding sediment into Dogtown Creek.

        i. Obliterate camping area. Block access through placement of boulders; break up soil compaction via sub-soiler or ripping shanks and mulch with straw or native vegetation. Reestablish vegetation through seeding and planting.

5. Dogtown Creek Site 2: Section 28, T09N R14E

    a. Reduce watershed damage from area eroding sediment into Dogtown Creek while continuing to provide for dispersed recreation opportunities.

        i. Place boulders at border of the dispersed recreation use site to restrict site expansion; break up soil compaction via sub-soiler or ripping shanks and mulch with straw or native vegetation. Reestablish vegetation through seeding and planting. Plant riparian vegetation on stream banks with absent or suppressed vegetation.

6. Intersection of 9N34Y and 14E31: Section 25, T09N R13E.

    a. Reduce erosion and restore drainage by removing small diameter pipe with hand tools while maintaining existing water source upslope for wildlife.

7. Intersection of 14E31 trail and 10N83: Section 15, T09N R14E.

    a. Define the designated use area and reduce non-system vehicle use activities by installing barriers to define and narrow the trail, add cover to eroded areas, and place coarse woody material in open areas.

8. Intersection of 14E31 and 9N45 Site 1: Section 29 T09N R14E.

    a. Improve water control features and reduce sediment deposits on road and channels.

        i. Realign the system trail parallel to the contour.

        ii. Restore the landing by decompacting soil via sub-soiler or ripping shanks; install waterbars; and mulch with straw or native vegetation to provide soil cover.

9. Intersection of 14E31 and 9N45 Site 2: Section 30, T09N, R14E.

    a. Improve water control features and reduce sediment deposits on road and channels by aligning the system trail parallel to the contour; and obliterate, block, and restore abandoned trail.

10. 14E31 near Plummer Ridge Guard Station: Section 20, T09N R14E.

a. Reduce impacts to sensitive soils and plant habitat (shallow lava cap soil) by defining and restoring the trail intersection through the placement of boulders and native materials.

11. Unauthorized route associated with 14E13: Section 29, T09N R14E.

    a. Reduce erosion and sedimentation by unauthorized vehicle use on large road cut bank by installing barrier rocks along the road at cut slope; placing coarse, woody material on the slope; installing dips to change the drainage patterns; and blocking and disguising access to the area from 14E31 using natural materials (hand fall trees) or boulders.

12. Unauthorized route associated with 09N45: Section 28, T09N R14E.

    a. Reduce soil compaction and improve meadow hydrology by blocking, obliterating, and disguising the non-system route using native materials. Break up soil compaction in the meadow portion using hand tools.

13. Unauthorized route associated with 09N65B: Section 21, T09N R13E.

    a. Reduce impacts to riparian vegetation and soil compaction by blocking, obliterating, and disguising the non-system route by hand -falling small material across the trail.

14. Road 09N55: Section 32, T09N R14E.

    a. Reduce sediment contribution to Middle Dry Creek while providing for OHV recreation opportunity.

        i. Reclassify the last 1.1 miles of road 09N55 from a system road to a motorized trail, allowing only vehicles <50" in width.

        ii. Rehabilitate sides of existing road to narrow the trail corridor and accommodate vehicles <50" in width.

15. Meadow near Harrel Water Tank: Section 7, T09N R14E.

    a. Restore meadow vegetation by removing debris and blocking areas with native material to enable vegetation to recover.

16. 08N49 Road: Section 32, T09N, R14E.

    a. Reduce unauthorized vehicle use in sensitive plant populations by placing boulders along the edge of the road to barricade vehicular access.

17. Abandoned mine closure Site 1 and 2: Section 23, T09N R13E.

    a. Close the shaft to provide for human and wildlife safety while protecting applicable heritage features. If identified as bat habitat, use a bat friendly enclosure.

Alternative 4

This alternative was developed based on comments proposing that the thinning of California spotted owl habitats could negatively affect owl populations in the project area, given the reported population decline. When compared to the proposed action, Alternative 2, this alternative would commercially thin 2,140 fewer acres within natural stands and increase commercial thinning in 13 acres of plantation stand; non-commercially thin 53 additional acres; reduce hand thinning by 369 acres; increase prescribed burning as an initial treatment by 3,012 acres, including increasing priority initial prescribed fire treatments by 579 acres and decreasing follow-up prescribed fire by 699 acres; increase non-commercial mechanical roadside thinning by 2 acres; increase road brushing by 79 acres; reduce road reconstruction by approximately 20 miles, while changing some of the roads to be reconstructed; increase the proposed use of temporary roads by 0.6 miles; and increase road obliteration adding 0.8 miles of one road (09N49G).

This alternative would include the following actions:

1. Conduct mechanical thinning of 2,735 acres (2,304 acres within natural stands and 431 acres of plantations) of commercial and non-commercial sized trees using ground-based equipment, with follow-up surface fuels treatments as proposed in Alternative 2.
2. Conduct mechanical thinning of approximately 53 acres of non-commercial sized trees (trees less than 10 inches dbh) within natural stands and 25 acres within plantations.
3. Conduct the cutting of small trees (1" to 3.9" dbh) and brush within the mechanical thinning units on approximately 1,007 acres.
4. Conduct non-commercial mechanical thinning (trees less than 12 inches dbh) within 100 feet on one or both sides of Capps Crossing Road (9N30) and Grizzly-Caldor Road / Leoni Road (09N73) on 5 segments of the road that are outside of mechanical thin units (approximately 59 acres).
5. Conduct mechanical brush-cutting up to 100 feet of Capps Crossing Road (9N30) and Grizzly-Caldor Road / Leoni Road (09N73) on 4 segments of the road that are outside of mechanical thin units (approximately 167 acres).
6. Hand-thin and pile on approximately 1,123 acres, including 483 acres located within 500 feet of private property boundaries.
7. Conduct approximately 6 acres of hand thinning within conifer plantations.
8. Perform tractor piling on approximately 1,049 acres within natural stands and 312 acres within plantations, and perform grapple piling on approximately 15 acres within natural stands.
9. Conduct prescribed understory burning as the initial or primary treatment on approximately 11,032 acres, of which 1,563 acres is first-priority burning.
10. Perform pile burning as a follow-up treatment on 2,508 acres.
11. Conduct prescribed understory burning as a follow-up treatment on up to 15,113 acres.

12. Reconstruct approximately 66 miles of road.
13. Obliterate approximately 3.9 miles of roads not open to public use.
14. Perform the same restoration activities as proposed in Alternative 2.

Alternative 5

This alternative was developed based on comments proposing that the thinning of California spotted owl habitats could negatively affect owl populations in the project area, and on comments proposing that treatment should provide for effective fire modification strategy that can be implemented in a relative short timeframe to protect both the community and forest resources, both given the reported population decline. When compared to the proposed action, Alternative 2, this alternative would commercially thin 1,149 fewer acres within natural stands and 13 additional acres in plantation stands; reduce hand thinning by 380 acres; increase prescribed burning as an initial treatment on 1,519 acres, while reducing prescribed fire as a priority initial treatment on 14 acres; reduce prescribed fire as a follow-up treatment on 701 acres; increase non-commercial mechanical roadside thinning by 2 acres; increase roadside brushing by 55 acres; reduce road reconstruction by approximately 15 miles, changing some of the roads to be reconstructed; increase the use of temporary roads by 0.6 miles; and increase road obliteration by adding 0.8 miles of one road (09N49G).

This alternative would include the following actions:

1. Conduct mechanical thinning of 3,726 acres (3,295 acres within natural stands and 431 acres of plantations) of commercial and non-commercial sized trees using ground-based equipment, with follow up surface fuels treatments as proposed in Alternative 2.
2. Conduct non-commercial mechanical thinning (trees less than 10 inches dbh) of approximately 25 acres of within conifer plantations.
3. Conduct the cutting of small trees (1” to 3.9” dbh) and brush within the mechanical thinning units on approximately 1,190 acres.
4. Conduct non-commercial mechanical thinning (trees less than 12 inches dbh) within 100 feet on one or both sides of Capps Crossing Road (9N30) and Grizzly-Caldor Road / Leoni Road (09N73) on 5 segments of the road that are outside of mechanical thin units (approximately 59 acres).
5. Conduct mechanical brush-cutting within 100 feet of one or both sides of Capps Crossing Road (9N30) and Grizzly-Caldor Road / Leoni Road (09N73) on 4 segments of the road that are outside of mechanical thin units (approximately 167 acres).
6. Perform tractor piling on approximately 1,231 acres within natural stands and 312 acres within plantations, and perform grapple piling on approximately 15 acres within natural stands.
7. Hand-thin and pile on approximately 1,112 acres, including 470 acres located within 500 feet of private property boundaries.
8. Conduct approximately 6 acres of hand thinning within conifer plantations.

9. Conduct prescribed understory burning as the initial or primary treatment on approximately 10,132 acres, of which 970 acres is priority burning for initial prescribed fire treatment.
10. Perform pile burning as a follow-up treatment on 2,671 acres.
11. Conduct prescribed understory burning as a follow-up treatment on approximately 15,111 acres.
12. Reconstruct approximately 69.5 miles of road.
13. Obliterate approximately 3.9 miles of roads not open to public use.
14. Perform the same restoration activities as proposed under Alternative 2.

Design Criteria Common to All Action Alternatives

The Forest Service has developed the following design criteria to be used for all action alternatives. The purpose of these design criteria is to avoid, or to minimize, the potential for adverse effects to the resources discussed below.

Activities would be conducted so as to protect water quality by using BMPs, employed by the Forest Service and the State of California, to prevent water quality degradation and to meet State Water Quality Objectives relating to non-point sources of pollution. In addition, the Forest would use site-specific mitigation measures that relate directly to these BMPs to minimize erosion and resultant sedimentation.

Mechanical and Hand Thinning

1. Identify and protect rust-resistant sugar pine trees from all activities.
2. Retain pacific yew greater than 1" dbh during thinning activities, except where removal is needed for equipment operability.
3. Use water to abate dust from logging traffic with water selected from water drafting sites that have suitable stream flow and access. When water is scarce, use EPA-approved dust palliatives, such as magnesium chloride or lignin sulfonate, for dust abatement.
4. Re-contour divots, within the skyline thinning units (under Alternative 2 only) and greater than 2 feet in depth, caused by mechanical equipment where they have a potential to channel water.
5. Temporarily close roads that are identified as open for public use to protect reconstruction investments until those roads have been stabilized, in addition to performing the seasonal closure identified by the Wheeled Motorized Travel Management Final Environmental Impact Statement (FEIS) (2008). A Forest Order would be issued in these circumstances.
6. Protect infrastructure for Grizzly Flat, including Grizzly Flat Community Services District diversion dams, drafting stations, and pipelines, as well as electric lines, phone lines, and water pipes for private inholdings, during treatment activities.

7. Coordinate activities within 500 feet of residences so that operations do not begin before 6 a.m.
8. Near residences, stack in decks some material that would otherwise be put into landing piles to facilitate access for firewood collecting when feasible.

Prescribed Fire

1. Minimize smoke emissions by following Best Available Control Measures (BACM). A smoke permit administered by the local County Air Resource Agency would accompany burn plans.
2. Place piles away from the boles of residual trees to reduce damage to residual trees and snags.
3. Design prescribed burn prescriptions in plantations to maintain tree cover over the majority of the burn unit. All trees and brush killed by prescribed burning activities shall be left in place for wildlife purposes.
4. Cease lighting within 10 feet of yew tree species to minimize mortality loss to Pacific yew (*Taxus brevifolius*). Where ceasing ignitions is unfavorable or may increase risk of mortality, firing tactics to direct heat away from yew tree would be utilized, including ring and dot firing techniques.
5. Treat burn units with dense stands of Pacific yew with hand thinning and pile burning where necessary to meet fuel objectives. Place piles to avoid large concentrations of Pacific yew. Broadcast burning would not occur in dense stands of Pacific yews.
6. Assess prescribed burn units for potential mortality in legacy pine prior to implementation of prescribed burning to minimize mortality in legacy yellow pine (Ponderosa pine and Jeffrey pine) and sugar pine. In this project area, legacy pine is defined as sugar pine and yellow pine (pines with orange, smooth bark) trees of 42" dbh or greater. Prescribed burn methods will be designed to achieve no more than 30% mortality in legacy pine averaged across all burn units within the project area. Protection measures to reduce the potential for mortality in legacy pine, such as raking, using water/foam/hoselays, or using line construction (to exclude from burning), may be implemented. Use the following criteria if raking is the preferred protection measure:
    a. Rake legacy pines (sugar pine and yellow pine trees of 42" dbh or greater) with more than 4 inches duff accumulation or with pre-existing fire scars.
    b. Remove accumulated duff and litter from raked trees within 2 feet of the tree bole.
    c. Spread out raked material 2 feet from the tree bole so that mounds are not created. Rake trees with fire scars to bare mineral soil. Rake trees so they have no more than 2 to 3 inches of duff remaining.
    d. Perform raking in late season to allow at least one growing season for fine roots to recover prior to burning. At a minimum, perform raking at least 60 days before prescribed fire implementation to allow for fine root recovery and to reduce damage potential for residual trees.

Roads and OHV Trails

1. Provide for public safety by posting traffic control signs on any off-highway vehicle (OHV) trails within project area, warning visitors of potential hazards due to project activities (burning, mastication, felling). Post closure information on local information boards and on the Eldorado National Forest website.
2. Repair or replace damage to improvements caused during project implementation in coordination with the recreation staff. If trails are damaged during contract administration, the contractor would effectively repair/restore damaged trails prior to acceptance of work.
3. Barricade skid trails that intersect system roads open to the public with natural material so as to discourage unauthorized vehicle use.
4. Perform thinning activities along system OHV trails so that the trail experience and difficulty level is maintained where possible. Place a 15-foot no-treatment buffer adjacent to designated trails that are not co-located with roads reconstructed as part of this project.
5. Where road reconstruction is co-located with designated OHV trails, constrict trails post-treatment to accommodate a trail experience and to facilitate access to fire suppression crews should a wildfire start in the area. Have the trail location traverse across the entire road prism to provide curves for variety and challenge for the trail users. Where possible, locate the majority of the trail tread on the outer third of the road bed to facilitate drainage of the trail in the future. Incorporate trail location with the drainage features of the road, such as rolling dips, to provide drainage for the trail.
6. Utilize firing techniques to retain vegetation within the trail corridor to the extent feasible, where OHV trails are located within prescribed burn units. Where necessary to define the designated route and to discourage unauthorized travel, place barriers and native materials along these segments after prescribed burning operations have been completed.

Snags, Down Logs, and Hazard Trees

1. Designate hazard or "danger" trees following the direction prescribed in the *Hazard Tree Guidelines for Forest Service Facilities and Roads in the Pacific Southwest Region* (Report Number RO-12-01, 2012). Fell hazard trees within the RCAs toward the stream and leave in place below roads to provide for additional down wood in RCAs. Fell hazard trees within spotted owl, great gray owl, and northern goshawk PACs and leave on site unless reviewed by a wildlife biologist.
2. Do not fell or remove standing dead trees (snags) greater than 15 inches dbh that do not present a hazard for public and woods worker safety. Leave trees greater than 30 inches dbh impacted from harvest equipment that result in skin-ups on the landscape to serve as recruitment snags.

3. Where possible, leave large down logs (logs greater than 10 feet long and 16 inches in diameter at mid-point) in place and protect them to the extent practical during mechanical treatment and understory prescribed burning.

Hydrology and Aquatic Features

1. Limit equipment operation by exclusion zones identified in the table below. Alter protection measures as needed on the ground for a specific site based on recommendations by a Resource Specialist (Soil Scientist, Fisheries Biologist, Botanist, or Hydrologist).

Table 1
Equipment exclusion zones for aquatic features[1].

Aquatic Feature	Ground-based equipment exclusion zone (feet)			
	< 15 % slope	**15 – 25 % slope**	**25 – 35 % slope**	**> 35 % slope**
Perennial stream[2]	75	100	150	Requires recommendation from a resource specialist after an on-site visit.
Intermittent stream[2]	50	50	75	
Ephemeral stream[2]	25	25	50	
Draws[3]	10	25	25	
Special aquatic features[4]	75	100	150	
Sierra Nevada yellow-legged frog Habitat	100 feet for all perennial and intermittent streams above 4,500 feet in elevation. There would be no reach-in to remove vegetation within the equipment exclusion zone and no ignition for prescribed fire except to maintain control of the fire.			

[1] Exceptions to the general equipment exclusion buffers are identified for specific units.
[2] For streams, distances are as measured from the edge of the channel or riparian vegetation, whichever is greater.
[3] For draws, distances are as measured from the bottom of the draw. Draws have a poorly defined channel, and generally do not show evidence of recent flow.
[4] For special aquatic features, distances are as measured from edge of wet area or riparian vegetation, whichever is greater, Special aquatic features includes lakes, ponds, meadows, wetlands, springs, seeps, etc.

a. Exceptions to the general equipment exclusion buffers identified in the design criteria are these:
    i. Unit 623473 - 10 ft. equipment exclusion zone for ephemeral streams and draws.

ii. Unit 623474 - 10 ft. equipment exclusion zone for ephemeral streams and draws.

iii. Unit 623415 - 10 ft. equipment exclusion zone for ephemeral streams and draws.

iv. Unit 622100 (Alternative 2 only) - Equipment exclusion zones for all streams (perennial, intermittent, and ephemeral) would be the same as described for perennial streams.

b. Monitor at least one stream segment as described in Section 16.34 of the 2011 Water Quality Management Handbook for Region 5 of the Forest Service. This applies to watersheds that are currently at a very high risk of CWE (above the Threshold of Concern) and to watersheds that will be at very high risk of CWE as a result of the Trestle Forest Health Project.

c. Maintain ground cover within Riparian Conservation Areas (RCAs) at 70 percent or greater where the groundcover is currently 70 percent or greater.

d. Have a review completed by a Hydrologist, Fisheries Biologist, or Soil Scientist prior to activities within RCAs that involves the following:

i. Construction of new landings and/or modification and use of existing landings;

ii. Construction of permanent and/or temporary roads not identified in the project proposal;

iii. Use of ground-based equipment and/or removal of vegetation in inner gorges (i.e., areas with slopes greater than 70 percent adjacent to aquatic features); and

iv. Equipment crossings of perennial and intermittent streams or the placement of temporary stream crossing structures not identified in the project proposal.

v. Use of EPA-approved dust palliatives for dust abatement.

e. Fell and remove hazard trees next to haul routes with RCAs, which would include the following:

i. No endlining to remove trees;

ii. The recommendation of the Sale Administrator and Resource Specialist for the fate of the tree (e.g., repositioning of the tree, leaving a portion of the tree as felled, etc.) should a felled hazard tree enter a stream course; and

iii. The retention in place of hazard trees with no commercial value and of those outside the reach of skidding equipment, provided the felled trees would not interfere with the safe use of the road or adversely affect a stream course and associated culverts.

Aquatics

1. Survey existing waterholes and other aquatic sites including ponds, lakes, and streams used for water drafting for Aquatic TES species and take flow levels prior to use. In the event TES species are found to occur at drafting sites, sites would not be used and future surveys would be conducted by an aquatic specialist to determine presence of possible populations.

2. Construct drafting sites so that oil, diesel fuel and/or other spilled pollutants would not contaminate the stream. Maintain stream bank stability and minimize sedimentation by constructing and maintaining back down ramps using rocking, chipping, mulching or another effective method. Use a Forest Service-approved screen-covered drafting box, or other device to create low entry velocity, while drafting to minimize removal of aquatic species, including juvenile fish, amphibian egg masses, and tadpoles from aquatic habitats.

3. Avoid usage of dust abatement palliatives within 100 feet of all stream crossings (both perennial and seasonal).

Botany

1. Flag Pleasant Valley Mariposa lily (*Calochortus clavatus* var. *avius*) populations within the project area for avoidance. The project leader or burn boss would notify the project botanist prior to line construction in order to re-flag occurrences, due to the fact that prescribed burn implementation could occur several years after completion of thinning or other treatments. Exclude all ground-disturbing activities, burn piles, hazard tree removal, roadside brushing, mechanical equipment, line construction, and spring burning from sensitive plant protection areas, with the following exceptions:

    a. Consult the project botanist to mitigate impacts where it is necessary to remove trees from within site boundaries.
    b. Directionally fell all thinning of trees adjacent to site boundaries away from the site.
    c. At the recommendation of the project botanist, hand thinning and prescribed fire within sensitive plant protection areas may occur.
    d. Notify the project botanist prior to implementation of the prescribed burn in sensitive plant populations; if available have a botanist onsite to take part in, and/or to monitor burning and associated effects.
    e. At a minimum, the botanist will conduct a post-burn visit.
    f. If new sensitive plant occurrences are discovered during project implementation, notify the project botanist to develop necessary protection measures.

2. No application of EPA approved dust palliatives for dust abatement will occur within 100 feet of roadside occurrences of sensitive plant or watch-list species.

3. Protect lava caps, which support unique plant communities in the project area, from motorized equipment and vehicles. Avoid line construction through lava cap communities feasible. If necessary, complete line construction with hand tools only.

4. Flag Eldorado National Forest Priority 1 and 2 invasive plant infestations within the project area for avoidance and treat such plant infestations using integrated pest management

techniques as a part of the Trestle project for up to 3 years after implementation. Tier treatments under the project to the Eldorado National Forest Invasive Plant EA. This may include a combination of techniques including tarping, manual removal, string trimming, and targeted herbicide application. Currently known high-priority infestations within the project area include the following: tree of heaven, yellow starthistle, rush skeletonweed, and scotch broom. Develop new treatment strategies, under the Eldorado National Forest Invasive Plant EA and implement as part of the Trestle project, if new infestations develop as a result of project activities (i.e., within landings, areas of road reconstruction, or harvest units)

5. Before entering National Forest System lands, clean off road equipment vehicles to ensure they are free of soil, seeds, vegetative matter, or other debris to prevent the introduction or spread of invasive plants. Prior to the start of operations, the Forest Service will perform a visual inspection for such debris. Clean equipment prior to moving from weed-infested areas to weed-free areas.

6. Ensure all earth-moving equipment, gravel, fill or other materials are weed-free. Use onsite sand, gravel, rock, or organic matter where possible.

7. Use certified weed-free straw or mulch for erosion control. Require a certificate from the county of origin stating the material was inspected.

8. Obtain any seed used for restoration or erosion control from a locally collected source (ENF, Seed, Mulch and Fertilizer Prescription, 2000).

Wildlife

1. For California spotted owls, implement a limited operating period (LOP), prohibiting vegetation treatments within a quarter-mile of spotted owl activity centers during the breeding season (March 1 through August 15), unless surveys confirm that owls are not nesting.

    a. Based on the most recent survey data, LOPs would be implemented for all or portions of units 622078, 622079,622081, 622082, 622084, 622085, 622086, 622087, 622089, 622091, 622092, 622094, 622095, 622096, 622097, 622098, 622099, 622101, 622103, 623401, 623404, 623407, 623413, 623414, 623415, 623416, 623417, 623418, 623419, 623425, 623427, 623431, 623436, 623437, 623459, 623460, 623463, 623465, 623466, 623467, 623468, 623470, 623470, 623471, 623375, 623476, 623477, 624573, 624585, 624586, 624587, 624588, 624594, 624605, 624606, 624607, and 624608.

2. For northern goshawks, implement an LOP, prohibiting vegetation treatments within a quarter-mile of the northern goshawk nest site during the breeding season (February 15 through September 15), unless surveys confirm that goshawks are not nesting. When the nest stand within a protected activity center is unknown, apply LOP to a quarter-mile area surrounding the PAC.

    a. Based on the most recent survey data, LOPs would be implemented for all or portions of units 623438, 623439, 623440, 623407, 623416, 623418, 623419, 623427, 623439,

623440, 623441, 623442, 623459, 623460, 623469, 623470, 623471, 624576, and 624579.

3. For great gray owls, implement an LOP, prohibiting vegetation treatments within a quarter-mile of the PAC during the nesting period (March 1 to August 15), unless surveys confirm that great gray owls are not nesting.

    a. Based on the most recent survey data, the LOP for great gray owl would be implemented for all or portions of units 623413, 623414, and 623415.

4. For spotted owls, implement an LOP for road reconstruction activities, for specific portions of roads which occur within a quarter-mile of roost or nest stands from March 1 to August 15.

    a. Based on the most recent survey data, the LOP for road reconstruction would be implemented for a specific segment of units 09N47 and 09N49.

5. Because prescribed fire could occur several years after the mechanical harvest work is completed, implement an LOP for future prescribed understory burning within a quarter-mile of PACS for the California spotted owl, northern goshawk, and great gray owl, unless surveys determine that the birds are not nesting. Limited operating periods can be waived to allow for early season burning on up to 5 percent of California spotted owl and northern goshawk PACs per year, with up to 10 percent per decade across the bioregion.

6. Minimize the amount of smoke entering the mine shaft to the extent practical through firing techniques to minimize potential impacts to known roosting populations of bats at Arctic Mine.

Soils

1. To control the surface erosion, mechanical activities will maintain a minimum soil cover of 70% in units with potentially moderate or higher erosion risk, including units 623400, 623403, 623407, 623408, 623414, 623416, 623422, 623436, 623439, 623440, 623441, 623442, 623450, 623456, 623457, 623458, 623459, 623460, 623463, 623465, 623470, 623471, 623475, 624572, and all Riparian Conservation Areas. In all other units, maintain a minimum of 50% cover.

2. Following prescribed burning operations, maintain average soil cover for each treated unit at 70% or greater one year following burning activities. If soil cover does not meet this threshold value after treatment, implement measures, such as mulching with lop and scatter material or weed-free straw, until vegetation re-growth can provide cover.

3. Activities will not increase unacceptable soil conditions above 15 percent in the activity area. Units 322-084, 085, 086, 087, 623-404, 405, 449, 465 and 471 were identified as above or near 15% extent for soil compaction.

    a. In units where soil disturbance currently exceeds or is expected to exceed the 15% threshold from mechanical activities, rip decompaction with a sub-soiler or rip shanks

of main or secondary skid trails with detrimental compaction or displacement to the extent that detrimental soil disturbance is less than 15%.

i. Detrimental displacement is displacement that results in "divots" where equipment has turned on loose soils where more than half the natural topsoil depth is displaced over a 100-square-foot area.

ii. Detrimental compaction is compaction that extends to the 4- to 8-inch depth, soil structure that is clearly altered to massive or platy and does not break towards a natural structure with gentle handling, and roots and pores that are flattened.

4. Ensure further reviews by the soil scientist or designee of new disturbance on shallow soils and low site areas, such as new landings, skid roads, or temporary roads; use the review to recommend actions to minimize effects to soils.

5. Install two additional cross ditches for skid trails and fire lines terminating at roads or OHV trails; install one cross ditch at approximately 30 feet from the intersection on all slopes, and install a second cross ditch 100 feet from the intersection for slopes less than 10 percent and 60 feet for slopes greater than 10 percent.

Cultural Resources

1. Protect historic properties within the area of potential effects (APE) from adverse effect through the application of the Approved Standard Protection Measures detailed in Appendix E of the *"Programmatic Agreement among the U.S.D.A. Forest Service, Pacific Southwest Region (Region 5), the California State Historic Preservation Officer, the Nevada State Historic Preservation Officer, and the Advisory Council on Historic Preservation Regarding Processes for Compliance with Section 106 of the National Historic Preservation Act for Management of Historic Properties by the National Forest of the Pacific Southwest Region (Regional PA, 2013)."*

2. Identify all resources at risk (RAR) within the APE with flagging and/or on maps prior to initiating project activities (Klemic, R2012050360011). Consider as exclusion zones areas in which activities would occur within the APE and areas in which the archaeological survey has been deferred unless reviewed by the district archaeologist on a case-by-case basis.

3. Establish protection measures specific to prescribed burn activities, detailed in the Regional PA, 2013, Appendix E, Section 2.2, (b)(1)(A-K), for each RAR based on coordination between cultural resource managers and fuels specialists prior to implementation.

4. Should any previously unrecorded cultural resources be encountered during implementation of this project, immediately cease all work in that area and immediately notify the District Archaeologist. Resume work subsequent to approval by the District Archaeologist for implementation of additional protection measures, as necessary to meet provisions in the Regional PA (2013). Should any cultural resources become damaged in unanticipated ways by activities proposed in this project, follow the steps described in the Regional PA, 2013 for inadvertent effects.

Monitoring

Site-specific monitoring of project activities will be conducted if any of the action alternatives are implemented. This monitoring is designed to verify that the projects are implemented as designed, and that they are effective in meeting the project and Forest Plan objectives. The overarching purpose of monitoring is to provide feedback to the Forest that enables evaluation of the achievement of ecosystem health and sustainability and improvement of management to better meet the expectations of the public.

One aspect of monitoring looks at the degree to which project objectives, standards, and guidelines of the Forest Plan are being implemented. Another aspect is measuring the effectiveness of management practices used in site-specific projects. Monitoring is also used to verify the assumptions and models used in planning. Funding for monitoring may vary; this may lead to assessing priorities as needed to assure the integrity of Forest Plan monitoring and evaluation. When it is certain that regulations and standards are being met, monitoring of a particular element would cease. If monitoring evaluations show that regulations or standards are not being achieved at the desired level, management intervention would occur and monitoring would continue.

Project Level Implementation

Each active management unit would be visited at a frequency necessary to assure compliance. Monitoring of preparation and implementation would occur at regular intervals to ensure compliance with prescription intent and, where applicable, contract provisions. Minor contract changes or contract modifications would be enacted, when necessary, to meet objectives and standards on the ground.

Post-treatment monitoring within the project area may be conducted following project implementation to ensure that the design criteria are effective.

Invasive Plants

Locations of any new infestations of invasive plants would be mapped, reported to the project botanist, and documented for continued monitoring.

Monitoring for new and expanding invasive plant populations would be conducted at treatment sites known to have invasive plant occurrences throughout project implementation and after treatment for 2-3 years depending upon need.

Wildlife

California spotted owl, great gray owl, and northern goshawk nest stands or territories may be surveyed to determine occupancy where LOPs may be waived.

Water Quality and Soils

BMP monitoring would take place based on annual BMP-monitoring protocols. Onsite evaluation protocols are applied to both randomly and non-randomly selected project sites. The number of random evaluations to be completed each year is assigned by the Regional Office, based on the relative importance of the BMP in protecting water quality; and those management activities most common on

the individual Forest. Forests supplement these randomly selected sites with additional sites based on local monitoring needs, such as those prescribed in an environmental document, or as required under the Regional Water Quality Conditional Waiver for Timber Sale Activities on Federal Land. Onsite evaluation protocols are used to assess the implementation and effectiveness of individual BMPs or groups of closely related BMPs. Additional details can be found in Investigating Water Quality in the Pacific Southwest Region (USDA Forest Service 2002) and Water Quality Management for National Forest System Lands in California (USDA Forest Service 2011, Water Quality Management Handbook).

Monitoring of a least one stream segment would occur as described in Section 16.34 of the 2011 Water Quality Management Handbook for Region 5 of the Forest Service. This applies to watersheds that are currently at a very high risk of CWE (above the Threshold of Concern) and watersheds that will be at very high risk of CWE as result of the Trestle Forest Health Project.

Implementation, effectiveness, and forensic monitoring of the project would occur as defined in the Central Valley Timber Harvest Waiver Eldorado National Forest Monitoring Plan.

Cultural Resources

To the extent possible, based on improved ground visibility, additional survey would be conducted of up to 20% of areas previously not surveyed or where survey was deferred within one year following completion of associated project activities.

Comparison of Alternatives

This table provides a brief summary of the alternatives and their environmental impacts in comparative format.

Table 2
Comparison of Proposed Activities for Each Alternative

	Alternative 1 – No Action	Alternative 2 – Proposed Action	Alternative 4	Alternative 5
Project Activities				
Ground Based Mechanical Commercial Thinning (Natural Stands)	0	4,368	2,304	3,295
Skyline Commercial Thinning (Natural Stands)	0	76	0	0
Ground Based Mechanical Commercial Thinning (Plantations)	0	418	431	431

	Alternative 1 – No Action	Alternative 2 – Proposed Action	Alternative 4	Alternative 5
Non-Commercial Mechanical Thinning (Natural Stands)	0	0	53	0
Non-Commercial Mechanical Thinning (Plantations)	0	25	25	25
Hand Thinning and Pile (Natural Stands)	0	1,492	1,123	1,112
Hand Thinning and Rx Burn (Plantations)	0	6	6	6
Prescribed Burn as initial/primary treatment	0	9,583 (984 first priority; 8,599 opportunity)	12,595 (1,563 first priority; 11,032 opportunity)	11,102 (970 first priority; 10,132 opportunity)
Prescribed burning, both follow up and rx burn only	0	15,812	15,113	15,111
Non-Commercial Mechanical Roadside (Capps Crossing and Caldor-Grizzly/Leoni Road)	0	57	59	59
Roadside Brushing (Capps Crossing and Caldor-Grizzly/Leoni Road	0	88	167	143
Road Reconstruction (miles)	0	84.1	65.8	69.5
Road Obliteration (unauthorized routes)	0	3.1	3.9	3.9
Achievement of Purpose and Need				
Acres of Flame length less than 4 feet	4,429	10,826	9,494	9,771

	Alternative 1 – No Action	Alternative 2 – Proposed Action	Alternative 4	Alternative 5
Acres of Fireline Intensity less than 100 btu/ft/sec	4,197	8,734	7,119	7,489
Acres of Rate of Spread less than 10 chains per hour	6,770	11,671	10,316	10,659
Acres of Surface Fire type	4,863	11,057	9,660	9,950
Strategic placement of treatments (SPLAT) acres	0	3,564	2,873	2,967
Wildland Urban Intermix (WUI) treatment acres	0	7,858	6,229	6,397
Grizzly Flat CWPP treatment acres	0	3,682	3,504	3,295
Risk of mortality for residual trees and stands from competition for resources	Highest for all stands	Reduced	Reduced, but on fewer acres than Alternative 2	Reduced, but on fewer acres than Alternative 2 and more acres than Alternative 4
Changes to diameter distributions	Largest increase in the mid-sized diameter classes (10 to 11.9”) over the long term.	Slight increase in the largest diameter class and decreases in the small and mid-sized classes over the long term	Similar to Alternative 2, but on fewer acres	Similar to Alternative 2, but on fewer acres
Changes to species composition	No improvement. White fir and cedar would continue to be dominant tree species.	Increase in pine and oak and decrease in shade tolerant species over the short term and long term	Similar increase in pine and oak and decrease in shade tolerant species, but on fewer acres than Alternative 2.	Similar increase in pine and oak and decrease in shade tolerant species, but on fewer acres than Alternative 2 and more acres than Alternative 4.
Growth and maintenance of large pines	Not improved	Improved for some individual trees	Improved for some individual trees	Improved for some individual trees

	Alternative 1 – No Action	Alternative 2 – Proposed Action	Alternative 4	Alternative 5
Improved Aquatic and Riparian Habitat	None	Improvement due to road reconstruction and restoration of dispersed recreation sites	Similar to Alternative 2, except 20 fewer miles of road reconstruction occurring.	Similar to Alternative 2 except 15 fewer miles of road reconstruction occurring.
Erosion and sediment delivery	High in event of Wildfire	Low from activities. Lowered in event of wildfire.	Low from activities. Lowered in event of wildfire.	Low from activities. Lowered in event of wildfire.
Est. Volume Harvest in cubic feet	0	36,386	19,728	25,944
Appraised Value	0	$1,455,441	$789,098	$1,106,122
Cost of Treatments Directly Associated with Commercial Harvest Units	0	$1,605,409	$1,114,080	$1,249,860
Cost of Treatments Not Associated with Commercial Harvest Units	0	$5,353,830	$5,124,934	$4,900,530
Effects				
Effects to Plants	No effects, however restoration activities and prescribed burning would not occur to improve habitat for Pleasant Valley Mariposa lily.	Potential for impact to some individuals and habitat, however design criteria including "flag and avoid" minimize the potential for impacts to plants.	Similar to Alternative 2, except fewer sensitive plant occurrences occur within treatment areas.	Similar to Alternative 4.
Watershed Cumulative Effects	No Change.	Potential to increase the risk of CWE in six of the seven watersheds. Two watersheds would be at a "Very High" risk of CWE through 2026; one of which is currently at "Very High" risk.	Similar to Alternative 2, except one of the watersheds (Clear Creek-Steely Fork Cosumnes River) would be at "Very High" risk of CWE for shorter period of time.	Same as Alternative 4.
Effects to	No Effects.	Minimal potential	Same as	Same as

	Alternative 1 – No Action	Alternative 2 – Proposed Action	Alternative 4	Alternative 5
aquatic species	Greatest risk for mortality and habitat loss from wildfire.	affects to aquatic species, such as foothill yellow-legged frog or western pond turtle.	Alternative 2.	Alternative 2.
Acres of late seral (CWHR 4M/4D and 5M/5D) habitat affected by commercial thinning	0	4,450	2,432	3,402
Number of PAC HRCAs where >20% of available suitable habitat would be altered by commercial thinning	0	5	3	7
California Spotted Owl Findings (MCF Habitat within HRCAs)	No immediate impacts.	Commercial thinning increase the probability of territory loss for 12 territories. Likelihood of territory abandonment would increase steeply for 3 territories.	Commercial thinning increase the probability of territory loss for 7 territories.	Commercial thinning increase the probability of territory loss for 6 territories.

Chapter 3. Affected Environment and Environmental Consequences

This chapter describes aspects of the environment likely to be affected by the proposed action and alternatives. Also described are the environmental effects (direct, indirect, and cumulative) that would result from undertaking the proposed action or the alternatives. Together, these descriptions form the scientific and analytical basis for the comparison of effects in Chapter 2.

Past, Present, and Reasonably Foreseeable Actions

According to the Council on Environmental Quality (CEQ) NEPA regulations, "cumulative impact" is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions (40 CFR 1508.7). 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.

In determining cumulative effects, the effects of past and present and future actions were added to the direct and indirect effects of the proposed action and alternatives. Past, present, and reasonably foreseeable activities for the planning area are displayed in Appendix C of this document. It is important to keep in mind that the cumulative-effects analysis areas for the various resources are not always identical. For instance, an aquatic environmental analysis might be based on a watershed boundary, while the sensitive plants analysis is tied to a particular set of habitat types and topographic features.

Forest Vegetation

Effects on forest vegetation are summarized from the Silviculture Report for the Trestle Forest Health Project (Howard and Walsh 2014).

Affected Environment

The principle forest cover types found in the project area are Sierra Nevada Mixed Conifer and Ponderosa Pine. The major species mixed in this forest cover type are white fir, Douglas fir, ponderosa pine, Jeffrey pine, sugar pine, incense cedar, and oaks. In a large proportion of the project area, stands are dominated by an understory that is dominated by dense, shade tolerant white fir and incense cedar saplings and small trees. Some areas have been thinned in the past and understories are less dense, but maintenance of the stand understory and overstory is needed to continue to achieve desired fuels and density conditions. Within the project area, there are also areas of brush species including choke cherry, green leaf manzanita, deer brush, bear clover, and white thorn. The average age of the dominant trees within the natural stands in the project area is generally around 130 years,

and an understory which is about 30-80 years of age. Scattered across the project area are large conifers, primarily Douglas fir, sugar pine, and ponderosa pine, that exceed 300-400 years of age.

The existing plantations within the Trestle project area were planted primarily with ponderosa pine. Plantations established during the early 1960s, 1980s, and 1990s have a low to high component of competing brush species (white leaf manzanita, bitter cherry, deer brush, white thorn, and natural regeneration of shade tolerant conifers, including incense cedar and white fir. Based upon existing stocking levels and stand densities of conifer plantations within the project area, inter-tree competition is extremely high with a relatively moderate risk of insect epidemics coupled with low growth rates of individual trees.

Historically, at the lowest elevations or higher up on the drier south or west aspects and ridges within the project area, fires were generally frequent, ranging from fire return intervals of 5 to 15 years, with individual sites sometimes burning two years in succession. Current vegetative conditions in the Trestle project area differ markedly from the historic condition and most of the current stands exceed the historical range of variability in terms of ecosystem structure and process. Multiple decades of fire exclusion, grazing by domestic livestock, and logging have altered fire regimes, fuel loadings, and vegetation composition and structure (Miller et al., 2009; Bouldin, 1999; Beesly, 1996; and McKelvey & Johnston, 1992). Unhealthy conditions are indicated by increased densities of trees, resulting in elevated levels of insect-related tree mortality and an accumulation of ground and ladder fuels within the project area.

Dense, closed canopied forests tend to favor shade tolerant white fir and incense cedar and exclude shade intolerant ponderosa pine, oak, and sugar pine. The shade tolerant species generally are more susceptible to mortality from fire, and form dense understory thickets, which act as fuel ladders to the larger overstory trees. Dense stands demand more water and other limited resources and, as a result, overly dense stands are less resistant to insect and disease-related attack, especially during periods of extended drought. The structure of the current forested landscape represents an unstable, unsustainable, and therefore, undesirable departure from the historic landscape for this area.

Key observations regarding insect and disease in the project area are: 1) Throughout the project area, white fir of all age classes were found to have moderate levels of white fir dwarf mistletoe (*Arceuthobium abietium*) infection in association with Cytospora cankers (*Cytospora abietis*); 2) overstocking, vegetation density, and pole-sized (10 inch d.b.h. and larger) trees within Jeffrey pine and ponderosa pine plantations combine to increase the risk of Jeffrey pine beetle (*Dendroctonus jeffreyi*), western pine beetle (*Dendroctonus brevicomis*), and pine engraver beetle (*Ips* species) related mortality; and 3) the pathogen, *Heterobasidion occidentale (*aka *H. annosum* "S" type*)* is present, but only in a nominal amount. *Heterobasidion irregular* (aka *H. annosum* "P" type) has not been discovered in ponderosa pines in the Trestle project area.

Snags and Down Logs

Stand exams in 2012 and 2013 showed natural stands proposed for commercial thinning containing approximately 3 dead trees per acre greater than 15 inches dbh, and an average diameter of 25 inches

dbh and about 60 feet tall. Snags range in size from 15 - 88 inches dbh with heights ranging from about 50 feet to 170 feet. Dead trees are mostly white fir and nominal amounts of sugar pine and ponderosa pine snags in various stages of decomposition, from recent dead to buckskin hard snags. More numerous snag numbers were observed in drainages and lower slopes outside of the proposed thinning units, which are primarily located on ridge top and south slopes. Additional mortality from insects, likely associated with the prolonged drought has been observed to increase in 2014 in these stands and in areas adjacent to stands to the extent that there are likely few areas with less than 4 snags per acre greater than 15 inches dbh. Within the stands, exams show that there is an average of 42 logs (>12 inches and 10 feet long) per acre with an average diameter of diameter of 22 inches and an average length of 32 feet.

Environmental Consequences

Alternative 1 – No Action

Direct and Indirect Effects

No activities would be undertaken with this alternative. Direct impacts from project related activities would not occur to vegetation resources in the project area. There would be no thinning of suppressed, intermediate, and co-dominant conifers with the project. There would be no reduction of competing brush cover or reduction of tree density. The continued susceptibility of the area to adverse wildfire effects from high fire hazard potential and insect and disease mortality endangers the long-term sustainability of the stands. No Action is still a management decision and would have indirect consequences to forest vegetation resources. This alternative is not expected to result in achievement of desired future conditions in many of the stands in the project area over time, to the extent that they remain at risk for high severity wildfire, high levels of insect mortality, and a species composition that is trending away from the desired future conditions.

Short-term effects of the No Action Alternative would be continued moderate levels of tree mortality in all size classes and all species. A great number of understory trees would continue to survive, although their growth rates would be extremely slow. There would be no major shifts in tree species or stand growth. Some individual trees that are in dominant crown positions would continue to grow well. However, insect and disease mortality would continue to take tolls on the trees with low vigor and experiencing inter-tree competition, even if they are in dominant or co-dominant positions. Canopy bulk densities and canopy base heights would not change significantly.

Long-term effects of this alternative would be evidenced by stands wherein the number of suppressed shade intolerant trees have diminished substantially because of natural mortality caused by inter-tree competition of light demanding ponderosa pine and sugar pine trees and limited soil moisture. The number of shade tolerant trees (incense cedar, white fir and Douglas-fir) in the understory is expected to continue to increase into the future. The over-story and mid-story would experience substantial amounts of natural thinning in all species, while the ingrowth of cedar and fir move to dominate the main canopy. The forest floor would generally be absent of natural regeneration because of heavy

fuels and a deep duff layer, except in those areas where wind-throw or insect or diseased-caused tree mortality had sufficiently opened the stand to allow for regeneration of conifer and hardwoods species.

Diameter and height growth would vary greatly in the stand and be largely dependent upon crown position of the tree. The understory trees would experience a substantial decrease in diameter and height growth due to competition for natural resources by the over-story and mid-storied trees. The over-story and mid-storied trees would experience only nominal change is diameter and height growth.

Stand Density and Basal Area

The number of trees per acre would fluctuate over time as trees establish and die within the stands. Basal area and average diameter are expected to increase as existing trees within the stand grow until mortality from wildfire, insects, and disease causes a large proportion of large trees within the stands to die. While some large trees within the stand would continue to grow, growth is expected to be slower for these trees than it would be with the Proposed Action (Alternative 2) due to reduced availability for resources such as water and nutrients. Higher basal area modeled in untreated stands is a factor of more trees per acre rather than larger trees within these stands.

In the absence of disturbance, the proportion of trees in the smaller diameter classes is expected to decrease over time while trees in the upper diameter classes are expected to increase. Increases in the largest diameter class are expected to be reduced from Alternative 2, while trees per acre in the medium sized classes are expected to retain more trees per acre.

Species Composition

Incense cedar and white fir (shade tolerant species) would continue to dominate the understory layer, while oaks, ponderosa pine, and sugar pine would continue to be displaced. This is because these shade tolerant species are more successful at regenerating in the absence of canopy openings created by fire or timber harvest. Release of California black oak from overtopping conifers would not occur and in denser stands, oaks are expected to continue to be overtopped and crowded out by competing conifer species. The number and proportion of shade tolerant trees is expected to increase over time and the proportion of ponderosa pine, sugar pine and hardwoods, as measured in both trees per acre and basal area per acre are expected to decrease.

Canopy Cover

Canopy cover in treatment units would not decrease as a result of the No Action Alternative. In both the short-term and long-term, the No Action Alternative would result in only nominal changes in the percent canopy cover.

Snags and Down Logs

The number of snags and down logs is expected to slightly increase over the long-term, primarily due to mortality caused by insect and disease. Down logs 12 inches and larger would only slightly increase due to normal snag fall. The recruitment rate of snags and down logs would continue to be dependent upon the interplay of precipitation levels, stand density and other natural elements, such as the incidence of insect attack, natural mortality, and amounts of wind-throw. The general upward trend expected in snags and down logs would continue until conditions suitable for tree growth improve.

Should a wildfire occur it could potentially create a tremendous number of new snags and down logs while consuming existing snags and down logs.

Plantations

Within the approximately 450 acres of plantations, composition and structure would remain unaltered, except by the processes of succession. Tree growth and vigor objectives for the project would not be achieved. If a wildland fire occurred, fire behavior would be such that mortality would be expected to be extensive and the attainment of old forest conditions would be curtailed. As trees increase in diameter and height, their susceptibility to insect attack also significantly increases without decreasing competing vegetation.

Cumulative Effects

Because no direct impacts would result from project related activities, no cumulative effects to forest vegetation are expected from implementation of the No Action Alternative, other than the continuation of the effects of fire suppression and historical management practices. Under Alternative 1, it is assumed that fires would continue to be suppressed. As previously stated, the fire interval in the project area has already been altered, with fires all but eliminated in the area since the early 1900s, except for the fires that have escaped control and burned with higher severity results. Since fire is the primary mechanism that controlled forest structure and composition, it is safe to assume that other components of the ecosystem have likewise been altered and would remain altered into the future.

Alternative 2 – Proposed Action

Direct and Indirect Effects

The implementation of Alternative 2 would substantially reduce the likelihood of tree mortality caused by insect attack or stand replacement wildfires within the planning area. The effects of this reduced risk would be substantial in terms of vegetation management implications. Some of these effects would include the following:

- The substantial reduction in the likelihood of an insect epidemic and/or wildfire would increase forest resilience and provide better assurance that the existing stands could be carried through to maturity.
- By reducing the risk of a major fire, the loss of investments associated with the destruction of high value large trees and plantations would be curtailed.
- The planning area would be managed in more of a mosaic, without large blocks of contiguous, even-aged stands dominating the landscape. This would allow greater variation in stand age, species composition, structure and function, thus providing additional resilience against insect or disease problems.
- A more constant flow of forest products would be assured, thus facilitating long-term timber management.

Stand Density and Basal Area

As a direct result of harvest, the number of trees per acre and basal area per acre would be immediately reduced in mechanically thinned stands. Because the majority of trees proposed for thinning are in the smaller diameter classes, average quadratic mean diameter (QMD) would immediately increase. Because establishment and ingrowth is expected to continue, the number of trees per acre and QMD are expected to fluctuate over the timeframe of treatments, while basal area is expected to increase as more growth is concentrated on larger trees in the stands. Prescribed burning is expected to further reduce the number of trees per acre and basal area, although the exact changes are subjective in terms of the modeled outcomes. Basal area removals average 39 square feet or 17% of the existing basal area.

Compared to current stand conditions, a reduction in smaller diameter classes would be evident in the years immediately after treatment. In both the short-term and long-term, the numbers of trees per acre in the larger diameter classes are expected to increase. Trees per acre in the smaller diameter classes are expected to decrease as a result of follow-up burn treatments and the faster movement of trees from smaller to larger diameter classes.

Long-term effects of decreased tree density would be a corresponding decrease in inter-tree competition. Reduced competition would permit individual trees greater access to light, water and nutrients. The result would be displayed by increased rates of diameter and height growth with observable growth responses 2-10 years after harvest, particularly in the smaller diameter classes that have been released from competing brush species and conifers. Height growth and corresponding crown development in large trees (generally trees greater than 36 inches dbh and larger) would be nominal because height and crowns have reached their biological potential. Since the treatment areas would have improved growing conditions, the overall resistance of the timber stands to environmental stress, including insect attack, drought, or disease would improve.

The body of forestry research shows how thinning stands helps reduces the incidence of pest damage to the stand (Cochran & Barrett, 1995). Less competition increases the health and vigor of the remaining trees, leading to a reduction of risk to bark beetle attack. As trees grow, spatially trees become crowded and fewer resources are available for each individual tree leading to a decrease in tree and overall stand vigor. Reductions in stand density increase resources available to residual trees. Increased resource availability leads to increased tree growth rates thereby enhancing the development of large trees, adding to the vigor of residual trees (greater crown mass for photosynthesis), which results in a proportional increase in overall stand health. The increase in stand health reduces the susceptibility of the stand to insects, drought, and disease. Studies have found that growth in large older trees increases significantly when high densities of adjacent small stems are removed (Latham & Tappeiner, 2002). The lower the basal area, the faster individual trees will grow. In stands with lower basal area, individual trees generally have larger diameter and larger crowns indicating a higher level of vigor compared to stands with high basal area. However it should be noted that increases in vigor and growth are not expected to result immediately after reductions in density occur as residual trees in overstocked stands may need to grow additional roots and leaves to capture newly available resources.

It is expected that it will take approximately 3 to 5 years after thinning before increases in growth and vigor are fully realized.

Species Composition

Proposed treatments would immediately decrease the number and proportion of shade tolerant incense-cedar, white fir, and Douglas-fir, and increase the relative proportion of ponderosa pine, sugar pine and hardwoods, as measured in both trees per acre and basal area per acre. Over time the proportion of the stand occupied by shade tolerant species is expected to increase as growth on existing trees and re-establishment occurs. Zald et al. (2008) found that thinning and burning treatments produced resource conditions generally favoring pine recruitment, however persistence of micro-sites favorable to shade-tolerant species and heavy natural seeding by these shade-tolerant species worked against shifting future forest composition to pine. These authors found that prescribed burning alone in wetter controllable conditions failed to significantly reduce fuels or change stand composition, having little impact on canopy cover and understory light conditions. However, thinning combined with prescribed fire did significantly affect stand conditions and the type of tree regeneration. Therefore, some shade intolerant pine and oak is expected to establish within open areas created through thinning, however establishment will be patchy. Release of advanced oak and pine regeneration will also occur through proposed treatments.

Release of California black oak from overtopping conifers is expected to increase the vigor of individual oak trees. Oak species and other hardwoods greater than 4-inches are not designated for treatment; however, some minor damage may occur to individual trees during treatment activities. Some hardwoods may be removed to facilitate skid trail and landing location, while others may be damaged during the removal of neighboring conifers. It is expected that there will be some loss of individual oak trees through machine piling and burning. Immature oak species may be severely damaged by relatively hot prescribed fires. Fire may weaken the stem and make the oak more susceptible to pathogens. However, burning also provides a beneficial effect by removing pests that infest the acorn crop and by removing competing vegetation. In addition, root crown sprouting of hardwoods is expected to occur.

Canopy Cover

Canopy cover in mechanical thinning units would decrease as a result of management actions in the short-term. In the long-term, canopy cover is expected to gradually increase and move towards or above pre-treatment with the growth of residual trees. Changes in the percentage of canopy cover would vary within mechanical thinning units. Since most of the trees that are removed are in the understory and smaller diameter classes, the overall reduction in canopy cover would not be proportionate to the reduction in the number of trees or basal area.

For some stands, canopy cover would be virtually unchanged, while for others, particularly those areas dominated by trees less than 20 inches dbh, the decrease would be greater. Average canopy cover is expected to decrease approximately 18%. Prescribed burn activities are expected to further reduce canopy cover by about 5%. In the vast majority of stands monitored for canopy cover following thinning treatments on the Eldorado National Forest, we have found that canopy cover has consistently

been about 10% higher following thinning than projected with FVS modeling. Therefore, it is likely that average canopy would be higher after treatment than depicted. Canopy cover is not expected to be uniform after treatment. Averages for differing variable density management areas post thinning show a range of average canopy conditions that are expected to result.

Decreases in canopy cover over time can primarily be seen in the 10-20 inch diameter size class, as this is where the majority of removal affects average stand canopy cover. The 4-10 inch class, which represents a larger portion of the trees per acre removed, rarely contributes much to canopy cover. Canopy cover in the largest diameter class is expected to increase over time, indicating that a higher proportion of stands would be moving toward a CWHR classification of 5.

Only minor reductions to canopy cover from prescribed burning and pre-commercial thinning are likely to occur, because these treatments do not target overstory trees. Pre-commercial thinning and prescribed fire only treatments are also expected to have very limited effects on CWHR type.

Snags and Down Logs

Short term direct effects upon snags and down logs would occur. This alternative would involve the felling of snags that are adjacent to roads and some trails open to the public and that pose a safety concern for operations. Additional direct effects on snag and down logs numbers are likely to occur as part of the prescribed fire, machine piling, and pile burning activities.

The specific number of created or lost snags and down logs is impossible to predict because of variations in tree age, size, fuel moisture levels, duff depth, location of snags and down logs within the treatment areas. It is anticipated that those snags and down logs consumed by prescribed fire and pile burning would be replaced by newly created snags and existing snags falling after the burn is complete. These newly created snags and down logs would be in a variety of diameter classes and would have different ecological functions. However, it can be presumed that in the long term, location of individual snags and down logs remaining within the planning area would closely approximate the natural range that existed prior to the time of fire exclusion. Reduction in future fire intensity would reduce snag and down log recruitment.

Reduction in tree numbers and stand densities through harvest would reduce the competition between trees and the development of future snags. There would be a dramatic decrease in the number of new snags formed, once stand density is reestablished within the normal range compared to Alternative 1.

Plantations

There are 449 acres of pine plantations that would receive some form of fuels/vegetation treatments. Natural conifer and hardwood regeneration would be retained where appropriate to attain the desired densities, species composition, vertical and horizontal structure. Treatment activities would directly decrease the susceptibility of the plantations to drought, insects and diseases, and generally promote the health and growth of trees within the plantations.

Indirect benefits to old forest conditions would also be achieved because of the decreased time to reach these conditions and the reduced likelihood of widespread tree mortality that would be expected to

occur from a wildland fire. Tree diameter, height, and volume growth and vigor are expected to be increased with the treatments proposed under Alternative 2.

Cumulative Effects

Alternative 2, in addition to other projects in the area would improve forest health by moving stands toward a condition that is closer to that of a forest with an active fire regime. This project in conjunction with other planned and ongoing projects in the area would enable the forest to better meet desired conditions for this landscape. With this and other projects in the area, the project area landscape would be managed as more of a mosaic. This would allow greater variation in stand age, species composition, structure and function, thus providing additional resilience against insect or disease, and resilience of the stands following fire.

Treatment with Alternative 2 is not expected to change the CWHR vegetation typing or size class measure over a majority of the project area. Mechanical thinning activities would reduce the trend of treated stands toward species dominance by shade tolerant white fir, Douglas-fir and incense cedar. Some ponderosa pine stands that have been classified as Sierra Mixed Conifer as a result of in-growth of shade tolerant species may be converted back to ponderosa pine type. In the long-term it is expected some of the plantation stands identified as ponderosa pine would be converted to Sierra Mixed Conifer as a result of silvicultural practices. Additionally, benefits to oaks from treatment are expected to decrease the trend of declining oak within the project area. However, the majority of stands in this landscape managed as part of the National Forest System would not be modified through this project.

It is expected that this project would not contribute to the trend of declining large trees (greater than 30 inches dbh) within the project area that has resulted from past harvest practices and mortality of larger trees removed in salvage operations. It is anticipated that this project may increase the longevity of some of these trees.

This project is expected to alter some snag and down log location and distribution within the project area, however, this project is not expected to contribute to a decrease in these structures that resulted mainly from past treatment practices.

Alternative 4

Direct and Indirect Effects

The emphasis of this alternative is to take a more conservative approach to treatment activities to minimize impacts to California spotted owl habitat. The selection of treatment areas under this alternative is a reflection of the effort to balance the desirability of late-seral wildlife habitat improvement, forest health and stand density, and fuels reduction. Treatment areas would be prioritized and selected based on wildlife and fuels objectives, stand conditions, and locations.

Treated stands would become more resilient to fire, disease and insect infestation through the removal of dense, competing, young-growth trees, and would achieve a greater percentage of large trees in a shorter timeframe than Alternative 1. However, fewer stands would be treated under this alternative than either Alternative 2 or 5.

Because of the reduced thinning intensity in some stands and the treatment of some stands proposed for thinning in other alternatives with prescribed fire only, several hundred acres within the project area would continue to maintain higher densities and inter-tree competition compared with Alternative 2. Therefore this alternative would not achieve the same benefits of improving species composition and residual tree vigor across the landscape as compared to Alternative 2 or Alternative 5.

Increased tree density and competition for resources would be expected to result in more snags and down logs in the short and long-term as compared to Alternative 2 or 5.Cumulative Effects

Treatment with Alternative 4 is not expected to change the CWHR vegetation typing or size class measure over a majority of the project area. Benefits to oaks from treatment are not expected to decrease the trend of declining oak within the project area. It is expected that this project would not measurably contribute to the trend of declining large trees (greater than 30 inches dbh) within the project area, that has resulted from past harvest practices and mortality of larger trees removed in salvage operations. This project is expected to alter some snag and down log location and distribution within the project area, however, this project is not expected to contribute to a decrease in these structures that resulted mainly from past treatment practices.

Alternative 5

Direct and Indirect Effects

The emphasis of this alternative is to take a more conservative approach to treatment activities to minimize impacts to California spotted owl habitat while still providing for a more effective treatment near the community and in key locations across the landscape to provide for increased implementation feasibility. The selection of treatment areas under this alternative is a reflection of the effort to balance the desirability of late-seral wildlife habitat improvement, forest health and stand density, and fuels reduction.

Treated stands would become more resilient to fire, disease and insect infestation through the removal of dense, competing, young-growth trees, and would achieve a greater percentage of large trees in a shorter time frame than Alternative 1. However, fewer stands would be treated under this alternative than Alternative 2.

Because of the reduced thinning intensity in some stands and the treatment of some stands proposed for thinning in other alternatives with prescribed fire only, some areas within the project area would continue to maintain higher densities and inter-tree competition compared with Alternative 2. Therefore this alternative would not achieve the same benefits of improving species composition and residual tree vigor across the landscape as compared to Alternative 2. However, more areas would have reduced inter-tree competition compared to Alternative 4, resulting in improved species composition over time compared to that alternative.

Increased tree density and competition for resources would be expected to result in more snags and down logs in the short and long-term as compared to Alternative 2, but less than Alternative 4.

Cumulative Effects

Treatment with Alternative 5 is not expected to change the CWHR vegetation typing or size class measure over a majority of the project area. Benefits to oaks from treatment are not expected to decrease the trend of declining oak within the project area. It is expected that this project would not measurably contribute to the trend of declining large trees (greater than 30 inches dbh) within the project area, that has resulted from past harvest practices and mortality of larger trees removed in salvage operations. This project is expected to alter some snag and down log location and distribution within the project area, however, this project is not expected to contribute to a decrease in these structures that resulted mainly from past treatment practices.

Fire/Fuels

The Fuels and Fire Analysis Trestle Forest Health Project (Riesenhuber 2014) summarizes the effects to fire behavior. This analysis reviews the fire's role within the project area, the fire history, and the current fire hazard and risk of ignition within the project area. The methodology in the analysis provides information on the type of fire modeling and on the specific measurements used to assess the effects of each alternative. A combination of professional fire management assessment and fire modeling is used to provide a meaningful analysis of potential effects of fire behavior related to the spread, intensity, fire type, and strategies of fire managers to contain a wildland fire within the Trestle Project Area.

Affected Environment

Fire Hazard and Risk

Fire risk is the chance (probability) that a wildfire will start, either from natural or human causes, based on recent fire history. Fire hazard is determined by the characteristics of fuels combined with the influences of topography and weather. The fuels' characteristics apply to both dead and live fuels, and include loading (tonnage), size and shape, compactness, horizontal continuity, vertical arrangement, fuel moisture content, and chemical properties. Topographic and weather influences, combined with fuels' characteristics, determine the rate of forward spread of a fire and the intensity at which a fire will burn. Table 3 displays the predicted fire hazard and probable fire risk by 7th field watersheds.

Table 3
Fire Hazard and Risk by 7th Field Watershed

Watershed Name	Hazard	Risk
Big Canyon Creek	Moderate	High
Clear Creek-Steely Fork Cosumnes River	Moderate	High

Watershed Name	Hazard	Risk
Dogtown Creek	Very High	Moderate
Lower Steely Fork Cosumnes River	Very High	High
McKinney Creek	Extreme	Moderate
Middle Dry Creek	Moderate	Moderate
Middle Fork Cosumnes River – Five Corners	Very High	Moderate
Middle Fork Cosumnes River – Pi Pi Creek	Very High	Moderate
North Fork Cosumnes River – Bear Meadow Creek	Very High	High
North Fork Cosumnes River – Van Horn Creek	Extreme	High
Upper Steely Fork Cosumnes River	High	High

Fuels

Within the project area, vegetation type varies, creating a mosaic on the landscape. With the absence of fire, due to fire suppression and other management activities, an accumulation of dead fuels, shrub, and small-tree understory connect the surface to the overstory fuels. +52 displays the amount and type of fuels within the planning area.

Table 4
Vegetation Classes within the Trestle Project Area

Vegetation Category	Acres	Primary Carrier of Fire
Non-Burnable	17	Barren Land, Rock, and Water
Grass	5	Grass
Grass/Shrub	364	Grass with small shrub influence
Shrub – Low/Moderate Load	479	Shrubs less than 4 foot tall
Shrub - High/Very High Load	930	Shrubs greater than 4 foot tall
Timber Shrub Understory – Low Load	814	Bear Clover, small shrubs less than 2 feet

Vegetation Category	Acres	Primary Carrier of Fire
Timber Shrub Understory – High Load	7,979	Bear Clover with ladder fuels such as small trees and shrubs
Conifer/Hardwood – Low/Moderate Load	2,409	Needle Cast and small dead and downed fuels typically 10 hour fuels
High Conifer/Hardwood – High/Very High Load	6,758	Needle Cast with heavy component of dead and down fuels
Activity Slash/Blowdown	697	Areas with natural blowdown and heavy fuel loadings; mastication

Fire Behavior Synopsis

The area presents difficult and remote access to fire starts due to topographic features and to travel time for initial-attack fire resources. Current strategies on initial fire starts is to utilize aircraft, such as air tankers and helicopters, to keep fires small and to allow ground forces the time to get to the location.

Containing large fires is difficult due to several steep drainages in the project area. The current management strategy in these areas is to utilize ridgelines and road systems to contain a large fire. The difficult task is finding a ridgeline which can be utilized to construct fireline down into these steep drainages to contain the flank of a fire. Terrain influences the ability to safely access a flank and to construct line down a usable slope.

Greater than 78% of the planning area has fuel conditions exhibiting high fuel loadings, which are capable of producing surface flame lengths greater than 4 feet, and approximately 71% of the planning area could have flame lengths in excess of 11 feet under 90th percentile weather conditions. There are enough ladder fuels in the mid-story canopy connecting to the over-story dominant and co-dominant trees to initiate crown fire activity. The current fuel conditions, in combination with topographic features, create the potential for high-severity fire on 70% of the 20,453-acre planning area exists under 90th percentile weather conditions. The amount, type, size, and arrangement of fuels result in fire intensity being extremely high on the majority of the landscape. Intensities greater than 500 btu/feet/second, which represent potential areas where crown fire and spot fires become a concern in the control of a wildland fire, represent greater than 70% of the planning area. Across the landscape, 76% of the planning area, both passive (71%) and active (5%) combined, has the potential to exhibit crown fire activity. While 71% of the landscape is modeled to have the potential to exhibit passive crown fire activity, if a large fire were to develop in the planning area, it would be expected that these areas also would have the potential to exhibit more active crown fire than shown through modeling. This is because FlamMap analyzes potential fire behavior that does not account for the convective energy of a large fire along with increased winds and preheated fuels.

Both Flame Length and Fireline Intensity are factors in determining crown fire initiation into the canopy and crown fire type given fuel and weather conditions. At 90th percentile conditions, all fuels with a canopy over-story would present some type of crown fire activity dependent on canopy base

heights. Low canopy base heights require less direct flame lengths and heating to torch and reach canopies due to their connectivity to the surface fuels below. Under current conditions, 76% of the area would currently exhibit active crown and passive crown fire activity, with 53% experiencing a rate of spread greater than 20 chains per hour. Rates of fire spread less than 10 chains per hour is ideal for firefighters to use direct attack suppression tactics. Rates of fire spread greater than 20 chains per hour requires firefighters to back off to ridge tops and to implement indirect suppression tactics. This would require a significant use of heavy equipment and aircraft with large fire growth and high severity fire effects.

Environmental Consequences

Alternative 1

Direct and Indirect Effects

Under Alternative 1, there would be no direct or indirect effects since no project-related activities would occur; fuels would continue to remain at their current levels and are expected to increase as surface fuels continue to accumulate. Small diameter trees and shrubs would continue to grow in the understory, increasing both the horizontal and vertical arrangement of fuels. These ladder fuels would continue to extend into the over-story. Natural decomposition of fuels would continue to occur, but not at a rate to outpace new accumulations of dead fuels.

Potential would continue to exist for high-severity fire to occur over much of the planning area. Since current fuel loadings are high, increased residence time of heat in the soil, along with increased heat transfer from surrounding fuels burning at the surface and ground level, would be expected.

In addition, ground fuels contribute to large tree mortality from excessive heating of the cambium and roots, where current fuel loading and fuel structure are such that crown fire propagation is probable; injury to the tree crowns also affects potential mortality and susceptibility to disease due to the trees' weakened state. Utilizing the Behave Plus Fire Modeling Program, tree mortality, predicted by species under 90th percentile weather conditions, shows that as tree size and dbh decrease, mortality increases for all surface fuel conditions (see Table 5 for Ponderosa Pine tree species). Under current conditions, more than two thirds of the project area consists of high to very high fuel load timber shrub and mixed conifer vegetation types. Higher mortality rates would be expected with Sugar Pine and White Fir trees in the planning area.

Table 5
Probability of Mortality of Ponderosa Pine 90th Percentile Weather Conditions, Average Tree Height100 feet, 30 inches dbh

Vegetation Type	**Tree Crown Fraction (proportion of crown to tree height in ft.)**			
	0.3	**0.5**	**0.8**	**1**
Timber Shrub Understory – High/Very High Load	32%	62%	74%	76%

Vegetation Type	Tree Crown Fraction (proportion of crown to tree height in ft.)			
	0.3	0.5	0.8	1
Mixed Conifer – High/Very High Load	0	0	3%	10%
Timber Shrub Understory – Low/Moderate Load	0	0	0	6%
Mixed Conifer – Low/Moderate Load	0	0	0	6%

Plantations within the Trestle project area are an additional concern for fuels. These areas consist of pine trees spaced closely together with interconnected crowns. Manzanita brush, needle drape, and grass are the predominant surface fuels. A fire in these stands would be difficult to control, and a high mortality of plantation stands, due to the relative small tree size and interconnectivity to the surface fuels could be expected. Plantations could burn in a similar way as a brush field, exhibiting high rates of spread and high mortality.

Cumulative Effects

No cumulative effects from treatments would occur in the Trestle project under Alternative 1. Current potential fire behavior within the project area would continue to exist. Some private landowners are active in forest management activities, including timber harvesting, pre-commercial thinning, mastication, burning of activity slash, and tree planting. While some areas (such as clear-cuts) are a benefit to fire spread and intensity, other areas (such as plantations where pre-commercial thinning leaves cut trees within the plantation units) exacerbate fire behavior, increasing fuel loading and heights.

Within the project area, a full-suppression response would be implemented in this area due to the proximity and due to the intermixing of National Forest System Lands and private land. Under Alternative 1, should a large fire occur in the project area, only a few opportunities, specifically along Plummer Ridge and Big Mountain Ridge where previous fuel reduction treatments have occurred, exist to minimize fire size, intensity, and severity.

To provide a comparison to the action alternatives, fire modeling software was utilized to simulate fire growth on the landscape (see Figures 2 and 3 below). Landscape fire modeling of fire spread shows expected fire growth for select, random ignition points. Fire perimeter contours close together represent slow rates of fire spread, and the converse represent rapid rates of fire spread. Simulated fire in Long Canyon and Big Canyon would reach Bear Meadow and the North Fork Cosumnes River within the first burn period during 90th percentile weather and fuel conditions and no suppression actions. North Fork Cosumnes River is a steep and mostly inaccessible drainage at the northern boundary of the Trestle project area.

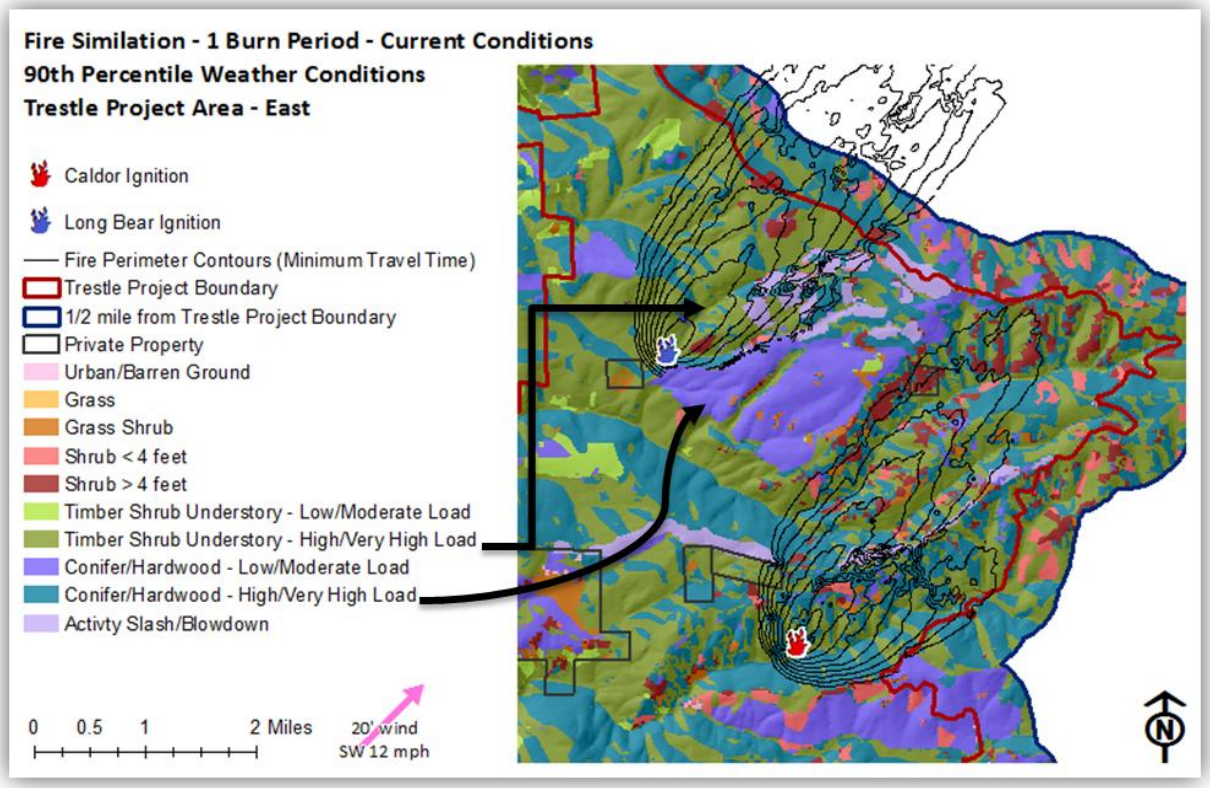

Figure 2. East Trestle Project Area, landscape fire growth modeling for Caldor and Long Bear Ignitions with No Action

Bear Meadow is located on top of a prominent ridgeline running in a southeast to northwest direction, eventually ending in the steep canyon of the North Fork Cosumnes River. A fast spreading fire under current conditions would easily spread to this ridge top and continue spreading beyond. This ridge top would be an ideal location for fire managers to contain a large fire. Under current conditions, it would be difficult to contain a fire such as the one modeled above since there would be insufficient time to prepare road systems and ridgelines for burnout operations. Fire managers witnessed this exact problem when attempting to contain the 2014 King Fire in the Eldorado National Forest.

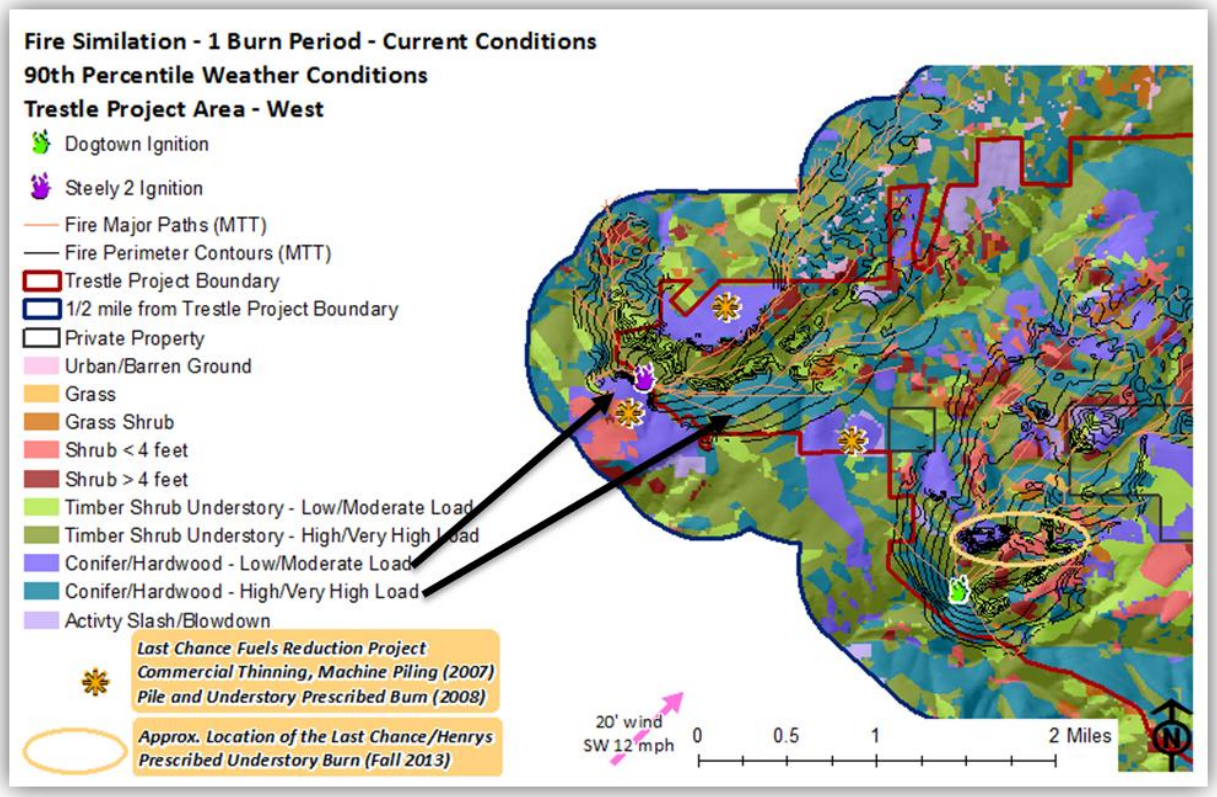

Figure 3. Trestle Project Area - West, landscape fire growth modeling for Dogtown and Steely 2 Ignitions with No Action

In Figure 2, high load fuel models reveal high rates of fire spread where the fire perimeter contour lines are widely spaced. The Last Chance Fuels Reduction Project altered surface fuel loading, increasing canopy base heights of remaining trees and reducing ladder fuels in the treatment units. This results in reduction of fire spread as shown by fire growth of the fire perimeter contour lines. Also, note how both fires slow down or stall out in the low load fuel models while a faster moving fire with several major paths are formed in the high load fuel models.

Alternative 2

Direct and Indirect Effects

Proposed thinning with follow-up pile burning and prescribed fire activities would reduce surface fuels, remove small diameter trees, reduce ladder fuels, increase canopy base heights, and reduce crown bulk density of over-story dominant and co-dominant trees within units proposed for commercial thinning. The change in surface and over-story fuels correlates to a reduction in fire behavior within the treatment units. A change in surface fuels affects flame length, rate of spread, fireline intensity, and crown fire activity. A change in surface fuels, in conjunction with removal of the ladder fuels and some over-story trees, would reduce crown fire activity and type.

Direct effects of prescribed burning are the consumption and subsequent reduction in ground and surface fuels. Typically 70% of dead surface fuel is consumed within the 1 and 10 hour dead fuel category (0- to 1-inch diameter fuels). Dependent on seasonality, 100 and 1,000 hour fuels (1- to 3-inch diameter fuels) can be partially and/or fully consumed. Ground fuels are reduced as portions of the duff layer are consumed.

Prescribed fire would naturally prune the lower branches of trees by burning the live and dead needles, effectively increasing the canopy base heights. Overall, canopy bulk density would be expected to compare to current conditions since mid-story and over-story canopies would remain intact. Isolated torching of single trees is expected where enough surface fuels exist to perpetuate activity, even at cooler weather conditions when prescribed burning is planned.

Units proposed for prescribed burn only may take up to three entries to achieve desired fuel treatment objectives. Units where prescribed burning would be the initial treatment would reduce surface fuel loads initially; however, overtime dead fuels would expect to increase as dead material from the initial burn entry fall to the ground and accumulate. A second entry utilizing hand treatments (such as hand-cutting, or pile burning) or another prescribed understory burn would then reduce those fuels and the process would once again occur. A third entry may be required depending on the remaining fuels after the second entry. Overall, it is expected that the area would have increased canopy base heights enough that additional dead over-story fuels resulting from prescribed fire activities would be minimal. Nonetheless, after each prescribed burn, surface fuel loadings, and resulting fire behavior from a wildfire during 90th percentile weather fuel conditions, would decrease compared to the current condition. Many areas previously thinned and/or burned during previous projects are ready for re-entry burning. Depending on the date of the last treatment and the conditions surrounding the recent prescribed burn, these units may take one or two prescribed burn entries to reach the desired fuel conditions.

Hand thinning within prescribed fire-only units and selected units for hand thinning would be utilized to reduce ladder fuels and to reduce fire effects surrounding large trees or other areas of concern in regards to selected resources, such as heritage sites. Proposed hand thinning with follow-up pile burning and/or prescribed understory burning would reduce surface fuels; removing small diameter trees would thereby reduce ladder fuels and increase canopy base heights.

The opportunity for prescribed burning within masticated units from previous projects, such as the Last Chance Fuels Reduction project, could be implemented with caution taken to limit mortality due to increased surface fuel loadings. The "Red Mountain Mastication Study" (Vaillant et al., 2010) on the Sequoia National Forest provides information on the effects of mastication alone and of mastication with follow-up prescribed burning. While mastication alone lessened the likelihood of crown fire, mastication followed by prescribed burning not only reduced crown fire potential, but it also reduced flame lengths and rates of spread. These results are due to the reduction of surface fuel loadings; however, caution should be applied when burning within mastication as the potential for unacceptable mortality of trees may occur due to residence time of heat during post-fire combustion.

At least seven years of decomposing should occur prior to burning in masticated units. Last Chance Fuels Reduction project was the last entry within the Trestle project area. All masticated units from previous forest activities are older than seven years.

Mechanical treatments are important because there is a high probability these treatments will be accomplished with minimal limitations to implementation. Prescribed fire can be difficult to implement for numerous reasons, including weather conditions, fuel conditions, air quality issues, and resource availability. California has some of the most restrictive air quality regulations in the country, a relatively high density of rural homes surrounded by flammable vegetation, extremely dry conditions during periods when prescribed fire could be used, and rugged topography that challenges containment efforts (North et al., 2012). The units proposed for thinning have the ability to be implemented and to meet the proposed action in a timely manner without the many restrictions of prescribed burning; mechanical thinning can take place during the extended dry conditions of summer and when air quality restricts the use of prescribed fire. Within the proposed action, prescribed burn units are intermixed between mechanical treatments to expand the effectiveness of the mechanical thinning units. Additionally, there are stand-alone prescribed burn units located throughout the Trestle project area. These prescribed burn areas would take advantage of the previous fuel reduction activities on ridge tops to use as holding lines when applying prescribed fire to steeper, untreated slopes.

The benefit in the end is mechanical treatments meet the fuels objective of reducing problematic and extreme fire behavior, with the added benefit of expanding some windows for implementing prescribed burning. Within mechanical thinning units, the change in forest structure decreases surface fuel loadings and increases canopy base heights, which reduce fireline intensities, flame lengths, rates of spread, and crown fire activity. With this reduction, the range of weather conditions where prescribed burning may occur may increase. In addition, with the change in fuel conditions, the resources required to implement and to hold the prescribed burn would be less as well, due to the decreased risk associated with burning in open stands with decreased fuel loadings. Air quality issues would lessen with the amount of fuel available to burn diminished, which leads to fewer smoke emissions. Finer fuels produce fewer smoke emissions and emissions of shorter duration when compared to larger fuels, which would be expected to produce emissions for a longer duration as these fuels continue to consume.

The longevity of fuel treatments varies by vegetation type. However, field observations from previous projects on the Eldorado National Forest indicate that mechanical fuels treatments, in-conjunction with prescribed fire, last a minimum of 10 years or more. Incorporating the use of prescribed fire as a maintenance tool can increase their longevity an additional 10 years. Stephens et al. (2012) highlight the effectiveness of fuels treatments and potential longevity. They found in their study that prescribed fire-only treatments begin to diminish in effectiveness at 10 years. Follow-up burning can increase their effectiveness by an additional 5 to 10 years. Mechanical thinning, followed by prescribed fire, has a longer effectiveness of approximately 15 to 20 years due to the consumption of surface fuels from fire.

Fire Behavior

Tables 6 - 9 provide a comparison of fire behavior characteristics between the proposed action and current conditions. Thinning, piling, and prescribed fire treatments reduce rate of spread, fireline intensity, flame length, and crown fire activity.

Table 6
Rates of Spread

Rate of Spread (chains/hour)	Alternative 2		Current Conditions		% Change
	Acres	% Project Area	Acres	% Project Area	
< 10*	11,671	57.1%	6,770	33.1%	24.0%
10-20	1,842	9.0%	2,653	13.0%	-4.0%
20-40	5,047	24.7%	8,424	41.2%	-16.5%
>40	1,892	9.2%	2,605	12.7%	-3.5%

* Desired Condition

Alternative 2 would reduce rate of spread to less than 10 chains per hour on 11,671 acres (57%) of the project immediately post-treatment. Currently, 6,770 acres (33%) would have rates of spread less than 10 chains per hour.

Table 7
Fireline Intensity

Rate of Spread (btu/ft/sec)	Alternative 2		Current Conditions		% Change
	Acres	% Project Area	Acres	% Project Area	
< 100*	8,734	42.7%	3,080	15.1%	27.6%
100-500	2,037	10.0%	2,631	12.9%	-2.9%
500-1,000	533	2.6%	483	2.4%	0.2%
>1,000	9,148	44.7%	14,258	69.7%	-25.0%

* Desired Condition

Table 8
Flame Length

Flame Length (Feet)	Alternative 2		Current Conditions		% Change
	Acres	% Project Area	Acres	% Project Area	
< 4*	10,826	52.9%	5,753	28.1%	24.8%
4-8	615	3.0%	559	2.7%	0.3%
8–11	272	1.3%	380	1.9%	-0.6%
>11	8,737	42.7%	13,760	67.3%	-24.6%

* Desired Condition

Table 9
Crown Fire Activity

Crown Fire (Type)	Alternative 2		Current Conditions		% Change
	Acres	% Project Area	Acres	% Project Area	
Surface*	11,057	54.1%	5,688	27.8%	26.3%
Passive	8,706	42.6%	13,791	67.4%	-24.8%
Active	688	3.4%	976	4.8%	-1.4%

* Desired Condition

A reduction in fireline intensities and flame length creates a reduction in crown fire potential as both surface fuels and canopy fuels are changed. In the advent of a large fire, it would be expected that, as fire enters the treated area, the fire front would slow, reducing the spread and intensity as it moves through the treated stands. Research has determined that the reduction of surface fuels is the most important component of reducing forest fire hazards since this leads to lower fireline intensity and to increased ability to manage fire when needed (Stephens et al., 2012; Stephens et al., 2009). Breaking the continuity of the overstory trees, in conjunction with the ladder fuels, would reduce crown fire activity. The second most important fuel stratum in terms of fire hazard reduction is commonly ladder fuels, which can provide vertical continuity to move fire from the surface to the forest overstory (Ibid). The potential for passive crown fires is reduced most efficiently by the reduction of surface fuels followed by a reduction of ladder fuels (Stephens et al., 2012). The potential for active crown fires is reduced most effectively by a combination of mechanical and prescribed-fire treatments, because these treatments target ladder and surface fuels and intermediated-size trees. However, prescribed fire alone can greatly increase the wind speed needed to initiate a passive crown fire, which effectively reduces

stand vulnerability to torching and its ability to transition to active crown fire (Stephens et al., 2012; Stephens et al., 2009). Both modeling and empirical studies of wildfires burned through treated stands support this result (Stephens et al., 2012; Ritchie et al., 2007).

Stephens et al. (2009) discuss treatment effectiveness of using mechanical only, prescribed fire only, and a combination of mechanical and prescribed fire. These results highlight the effectiveness of reducing surface fuels, thinning from below, and retaining the larger dominant and co-dominant trees in residual stands for reducing fire severity and increasing forest resilience (Agee & Skinner, 2005). The essence of Alternative 2 (Proposed Action), meets the purpose and need of the Trestle Forest Health Project. In particular, fire behavior is altered, trees are more resilient, and the potential survival of remaining trees on site to perpetuate old forest ecosystem habitat components is increased.

Cumulative Effects

Alternative 2 has an overall effect to the landscape in the advent of a large fire. Figures 4 and 5 provide a one-day fire simulation of a free-burning wildfire within the Trestle project area. The overall cumulative result is that fire spread and size is reduced and intensity of the fire is changed adjacent to the treatment units as fire slowly moves through the treated units and the flanks around them. Treating fuels within and adjacent to Protected Activity Centers (PACs) for the California spotted owl, northern goshawk, and great gray owl would assist in reducing negative fire effects inside PACs where treatments may not occur. The more fuels that can be treated adjacent to and within these areas, the greater the fire behavior is decreased and the greater large tree survival would be expected, as a flanking fire around the treated units would lessen fire effects on those areas immediately adjacent to such units.

From a fire suppression standpoint, the majority of thinning treatments are located on strategic ridgelines that would be used to contain a large fire in the project area. Having these treatment areas in place allows fire managers to concentrate forces on other sections of a fire where line construction is needed. Fire resources can make a stand in these units either by containing the fire directly in the treatment units or by utilizing the treatment units as a place to initiate the burn. The overall effect regarding suppression strategy is that suppression damage would typically be less than the current condition since post-treatment fuel conditions would be such that either handline construction or a single blade dozer line could be utilized. For example, during the Ralston fire (2006), a minimum six-blade dozer line was utilized to control the fire (Sandoval per com, 2013). A D-8 Dozer blade is approximately 10 feet wide. Suppression damage to these areas includes approximately 40 to 60 feet of line that is constructed to mineral soil; trees shrubs and other vegetation are removed and pushed into large berms.

While Alternative 2 decreases fire behavior potential inside and immediately adjacent to the proposed treatment units, the Trestle project area still contains, and will contain, areas post-treatment that exhibit potential for high-severity fire. The current potential crown fire activity in the Trestle project area is 76%. Alternative 2 reduces that potential by at least 26%. This results in approximately 50% of the

project area which still has an opportunity to experience crown fire activity and high-severity fire effects.

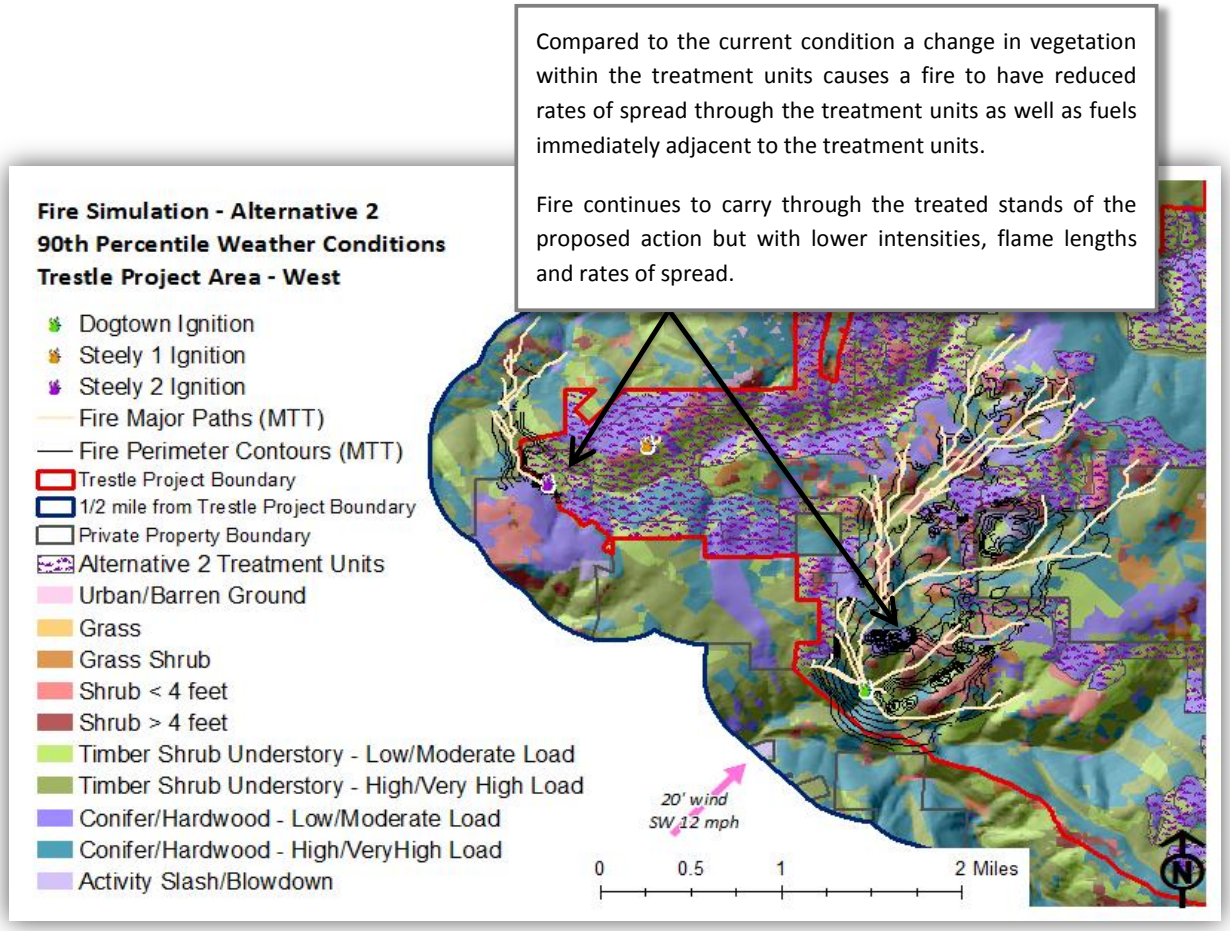

Figure 4. Trestle Project Area – West, Potential landscape fire growth under Alternative 2

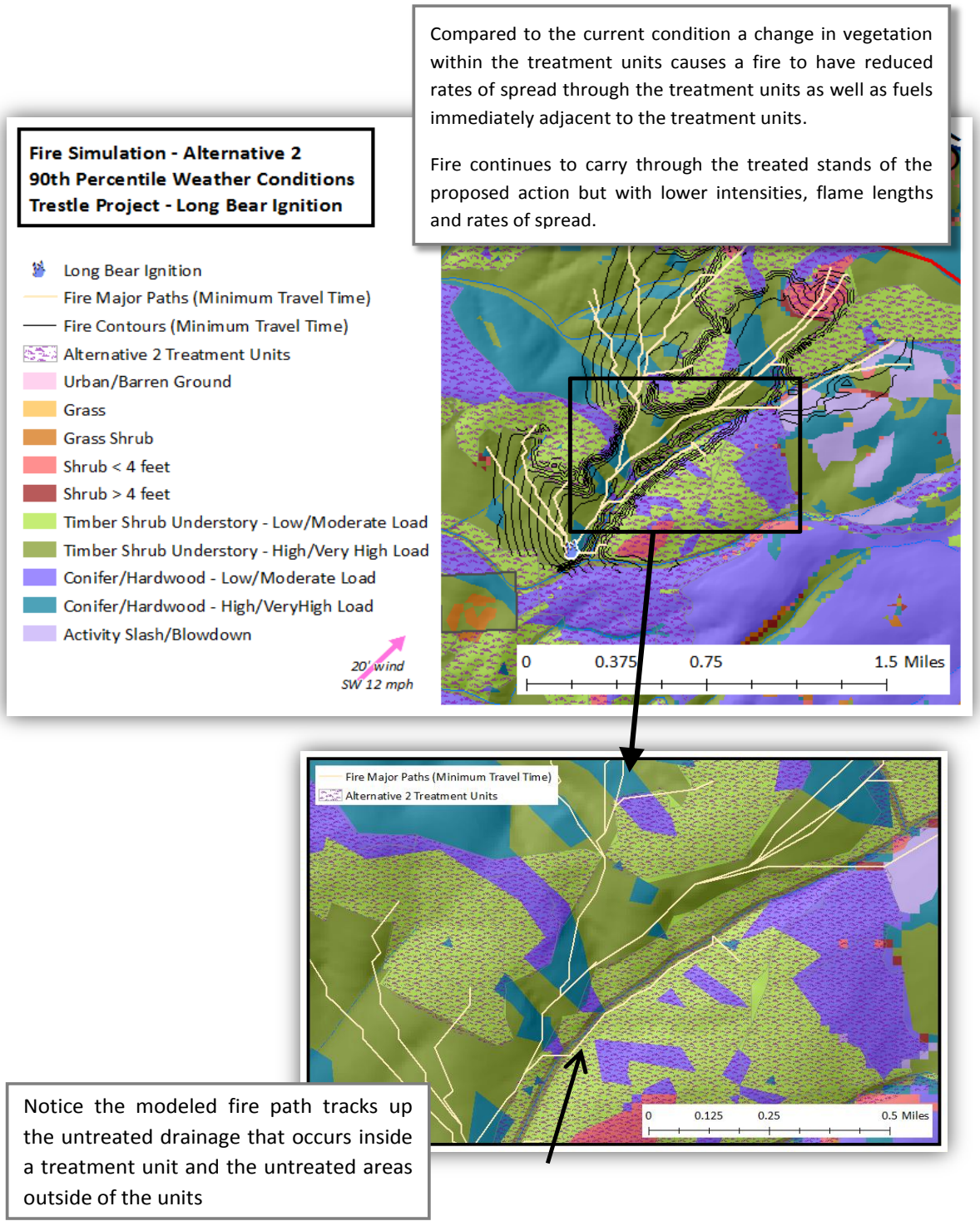

Figure 5. Trestle Project Area – East, Landscape fire growth modeling with Long Bear ignition for Alternative 2

Figure 5 displays the result of untreated drainages adjacent to and within the treatment units. These untreated drainages would act as a wick, channeling fire quickly up the drainage, especially when wind is in alignment with the drainages. However, the fire would drop to the ground and move slower in the treatment units due to the lack of receptive fuel bed. The trees and vegetation within the treatment

units and adjacent to the untreated drainages would sustain increased fire behavior effects from the more intense fire burning below and adjacent to the treatment unit. This type of "edge effect" was observed in the Hey Joe project area after the King Fire moved through the area. Much of the increased mortality and high-severity fire effects within the treatment units were immediately adjacent to the untreated drainages. Dense fuel loading and surface-to-crown ladder fuels caused these drainages to burn with high-severity fire effects and, in many locations, experienced greater than 90% mortality of all vegetation classes.

Alternative 2 treats 3,564 acres of strategically placed landscape area treatments (SPLATs), 7,858 acres of the Wildland-Urban Intermix (WUI), and 3,682 acres within the Grizzly Flat Community Wildfire Protection Plan (CWPP). Overall, Alternative 2 of the Trestle project compliments the Last Chance Fuels Reduction Project. The Last Chance project treated fuels within SPLATs and along ridgelines just south of Grizzly Flat. The Last Chance project under the current condition continues to be effective at reducing fire spread. During fire behavior modeling many of the Last Chance units still exhibit lower rates of fire spread and intensities.

Alternative 4

Direct and Indirect Effects

Within the units proposed for treatment under Alternative 4, similar effects to fuels conditions would occur as discussed above in Alternative 2; however, the treatments would occur on approximately 3,005 fewer acres than Alternative 2. The treatment units proposed in Alternative 4, at which similar activities are planned, would result in breaking the continuity and vertical arrangement of fuels to decrease the threat of crown fire activity within the treated areas. Fewer acres would be mechanically treated for fuels reduction purposes with a reliance on prescribed understory burning to obtain fuels reduction objectives. Table 10 displays the fuel models and where the changes occur after implementation of Alternative 4 treatments and after the implementation of Alternative 2 treatments.

Table 10
Vegetation Post Treatment – Alternative 4 as compared to the Proposed Action

Vegetation Category	Alternative 4		Alternative 2		% Change
	Acres	% Project Area	Acres	% Project Area	
Urban/Barren Ground	17	<1%	17	<1%	0%
Grass	5	<1%	5	<1%	0%
Grass Shrub	364	1.8%	364	1.8%	0%
Shrub – Low/Moderate Load	641	3.1%	717	3.5%	-0.4%

Vegetation Category	Alternative 4		Alternative 2		% Change
	Acres	% Project Area	Acres	% Project Area	
Shrub – High/Very High Load	744	3.6%	668	3.3%	0.3%
Timber Shrub Understory – Low Load	2,995	14.6%	3,716	18.2%	-3.6%
Timber Shrub Understory – High Load	5,736	28.0%	4,981	24.4%	3.6%
Conifer/Hardwood – Low/Moderate Load	3,588	17.5%	4,896	23.9%	-6.4%
Conifer/Hardwood – High/Very High Load	5,886	28.8%	5,315	26.0%	2.8%
Activity Slash/Blowdown	476	2.3%	341	1.7%	0.6%

When compared with Alternative 2, changes in surface fuel loadings and increase in canopy base heights in mechanical treatment units result in similar fire behavior modifications of flame length, fireline intensity, rate of spread, and crown fire activity. Tables 11-14 display the change in fire behavior characteristics with Alternative 4 when compared to Alternative 2.

Table 11
Potential Rate of Spread compared to Alternative 2

Rate of Spread (chains/hour)	Alternative 4		Alternative 2		% Change
	Acres	% Project Area	Acres	% Project Area	
< 10*	10,316	50.7%	11,671	57.1%	-1355 ac. (-6.4%)
10-20	1,996	9.8%	1,842	9.0%	154 ac. (0.8%)
20-40	5,939	29.2%	5,047	24.7%	892 ac. (4.5%)
>40	2,113	10.4%	1,892	9.2%	221 ac. (1.2%)

* Desired Condition

Table 12
Potential Fireline Intensity as compared to Alternative 2

Rate of Spread (btu/ft/sec)	Alternative 4		Alternative 2		% Change
	Acres	% Project Area	Acres	% Project Area	
< 100*	7,119	20.4%	8,734	42.7%	-1,615 (-22.3%)

Rate of Spread (btu/ft/sec)	Alternative 4		Alternative 2		% Change
	Acres	% Project Area	Acres	% Project Area	
100-500	2,312	13.0%	2,037	10.0%	275 ac. (3.0%)
500-1,000	504	3.0%	533	2.6%	-29 ac. (0.4%)
>1,000	10,516	63.6%	9,148	44.7%	1,368 ac. (18.9%)

* Desired Condition

Table 13
Flame Length as compared to Alternative 2

Flame Length (Feet)	Alternative 4		Alternative 2		% Change
	Acres	% Project Area	Acres	% Project Area	
< 4*	9,494	46.4%	10,826	52.9%	-1,332 (-6.5%)
4-8	572	2.8%	615	3.0%	-43 (-0.2%)
8–11	291	1.4%	272	1.3%	19 (0.1%)
>11	10,094	49.4%	8,737	42.7%	1,357 (6.7%)

* Desired Condition

Table 14
Crown Fire Activity as compared to Alternative 2

Crown Fire (Type)	Alternative 4		Alternative 2		% Change
	Acres	% Project Area	Acres	% Project Area	
Surface*	9,660	47.2%	11,057	54.1%	-1,397 (-6.9%)
Passive	10,060	49.2%	8,706	42.6%	1,354 (6.6%)
Active	732	3.6%	688	3.4%	44 (0.2%)

* Desired Condition

Areas that still exhibit extreme fire behavior potential are predominately located within landscapes not being considered for treatment at all. Localized negative effects may potentially occur in those areas proposed for prescribed understory burning but not completed, due to funding or environmental constraints. These areas of no treatment would retain their current fuel loading and structure. In this situation, fuels would continue to promote problematic and extreme fire behavior conditions for fire suppression resources. Areas left untreated would allow a large fire to travel easily through the

untreated areas when compared to a unit that has been treated, reducing the fuel loading and minimizing the effects of problematic and extreme fire behavior.

It is anticipated that a prescribed burn would not burn uniformly; therefore, there would still be pockets of unburned fuels with heavy fuel loading and ladder fuels. Units which were previously treated within the past fifteen years or so would expect to meet resource and fuels reduction objectives within one understory prescribed burn. Meeting fuels reduction objectives in previously untreated units scheduled for prescribed burning only under Alternative 4 would take approximately two to three entries, utilizing a combination of prescribed burning and hand treatments. Prescribed burn-only units and areas left for wildlife hiding cover would still be susceptible to crown fire activity and high-severity fire effects during a wildland fire event.

Cumulative Effects

At the landscape level, Alternative 4 is less effective at modifying fire growth within the Trestle project area. Due to the elimination of strategically placed mechanical thinning units, fire is more prone to move through and into the canopy easily when compared to Alternatives 2 and 5.

Similar fire growth is expected in Caldor and both of the Steely ignition points, as units proposed for treatment are similar to Alternatives 2 and 5. The Long Bear ignition point saw the most significant change in fire growth as treatment units were eliminated along the ridge separating Bear Meadow and Long Canyon (Figure 6).

An area of concern for high fire hazard is located in the northern portion of the Trestle project area (see Figure 6). Under Alternative 4, this general location has little fuels reduction activities planned when compared to Alternative 2. Treatment areas are disconnected, providing little to no options for firefighting resources to make a stance against a wildfire burning at 90th percentile conditions. Fire behavior modeling shows extreme and problematic fire behavior subsequently causing high-severity fire effects.

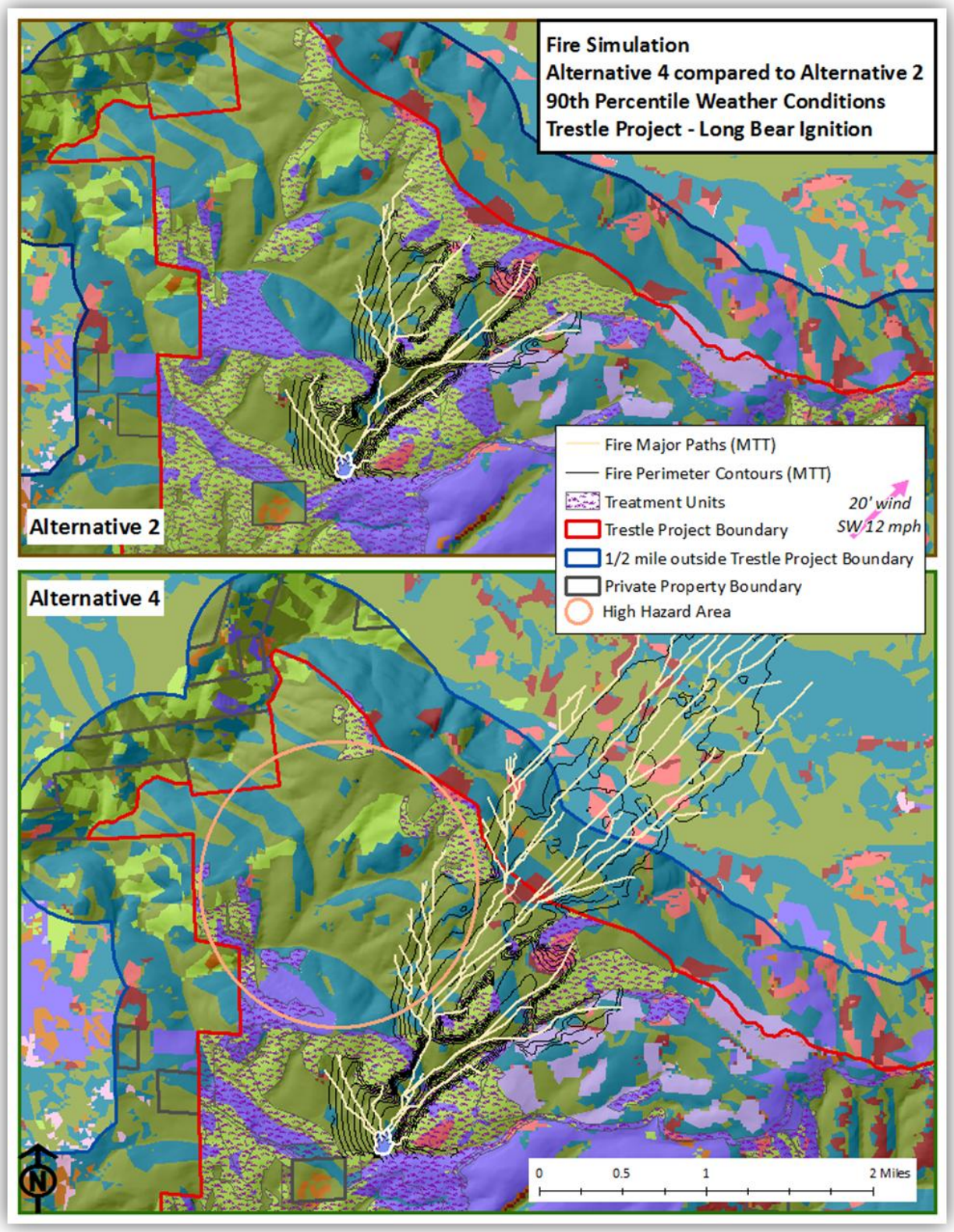

Figure 6. Landscape fire modeling for Long Bear Ignition with Alternative 4

Figure 7 displays fireline intensity comparisons for Alternatives 2 and 4 in the northern portion of the Trestle project. Note the area of High Hazard and the disconnected fuel treatments along several ridges. Under Alternative 4, firefighting resources would have little to no opportunities to implement direct fire suppression tactics on a wildfire burning at 90th percentile in this area.

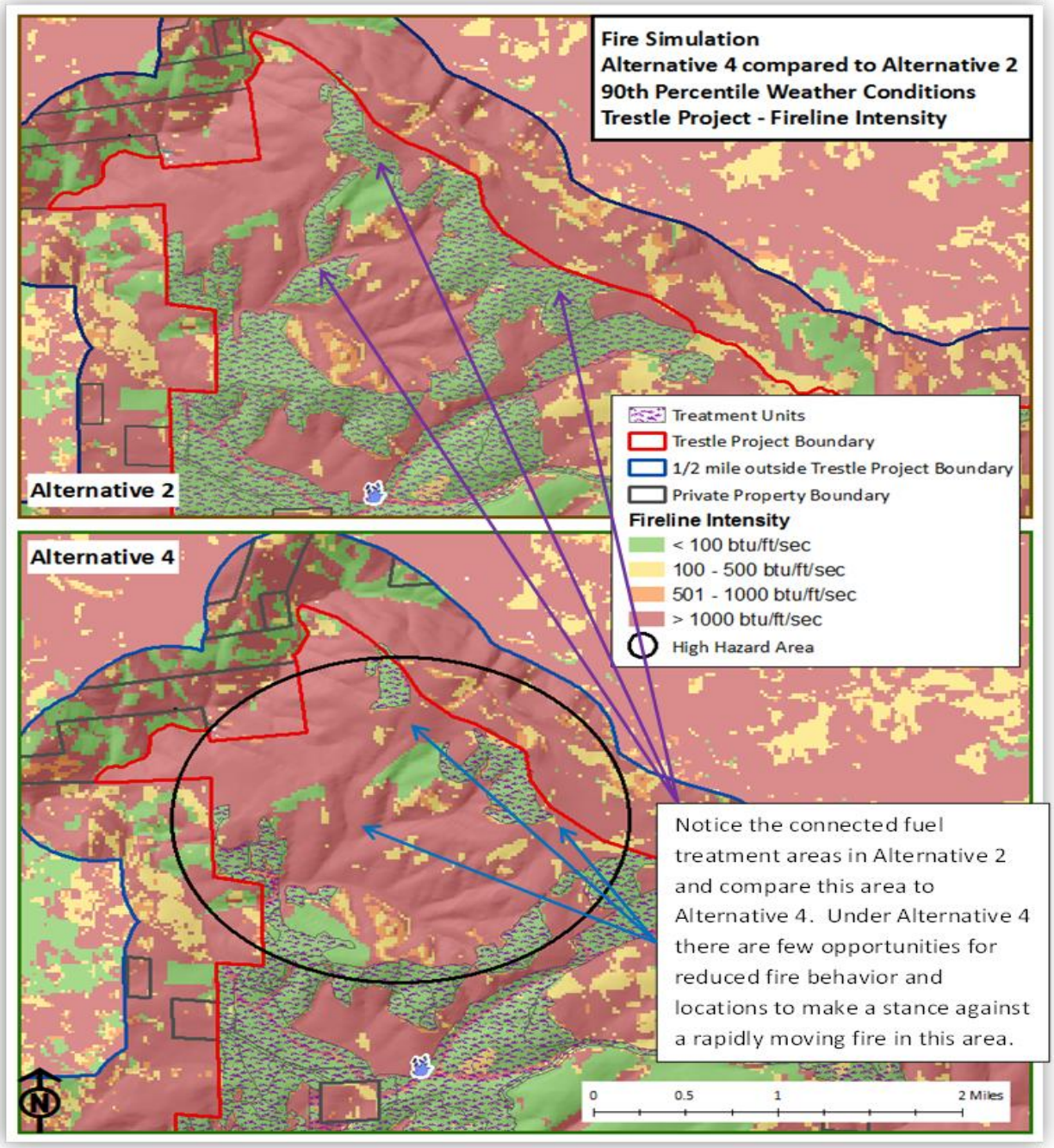

Figure 7. Landscape fire growth modeling for the northern portion of the Trestle Project area; Alternative 4 compared to Alternative 2

Under Alternative 4, there would be an increase of approximately 3,012 acres of prescribed burning as the initial treatment. Due to the backlog of understory burning across the entire Eldorado National Forest, it would be difficult to rely on prescribed burning alone to meet fuels reduction objectives. Considering the many constraints associated with prescribed burning (weather, fuels, air quality, funding, resource availability, limited operating periods, etc.), it is highly unlikely that the entire project area would meet fuels reduction objective within the same five-year time period.

In the WUI, there is a reduction of approximately 1,600 acres (8%) in Alternative 4 treatments when compared to Alternative 2 treatments. Under Alternative 4, the reduction of fuel treatments occurring in the Grizzly Flat CWPP is reduced by nearly 700 acres when compared to Alternative 2. Treatments in SPLATs are reduced by about 178 acres.

Alternative 5

Direct and Indirect Effects

Within the units proposed for treatment, similar effects to fuel conditions would compare as discussed above in Alternative 2; however, approximately 1,328 fewer acres would receive mechanical treatments when compared to Alternative 2. To decrease the threat of crown fire activity within the treated areas, similar activities are planned that would result in breaking the continuity and vertical arrangement of fuels. The activity-generated slash from removal of such trees, in combination with reducing surface fuels with use of piling slash to burn, would produce similar effects as Alternative 2 in terms of reducing fireline intensities, flame length, rates of spread, and crown fire potential during a wildfire. Treating the surface fuels and increasing the canopy base heights reduces crown fire initiation (potential for ignition).

Table 15
Vegetation Post-treatment – Alternative 5 as compared to the Proposed Action

Vegetation Category	Alternative 5		Alternative 2		% Change
	Acres	% Project Area	Acres	% Project Area	
Urban/Barren Ground	17	<1%	17	<1%	0%
Grass	5	<1%	5	<1%	0%
Grass Shrub	364	1.8%	364	1.8%	0%
Shrub – Low/Moderate Load	672	3.3%	717	3.5%	-0.2%
Shrub – High/Very High Load	713	3.5%	668	3.3%	0.2%

Vegetation Category	Alternative 5		Alternative 2		% Change
	Acres	% Project Area	Acres	% Project Area	
Timber Shrub Understory – Low Load	3,227	15.8%	3,716	18.2%	-2.4%
Timber Shrub Understory – High Load	5,503	26.9%	4,981	24.4%	2.5%
Conifer/Hardwood – Low/Moderate Load	3,809	18.6%	4,896	23.9%	-5.3%
Conifer/Hardwood – High/Very High Load	5,671	27.7%	5,315	26.0%	1.7%
Activity Slash/Blowdown	471	2.3%	341	1.7%	-0.6%

Table 16
Potential Rate of Spread compared to Alternative 2

Rate of Spread (chains/hour)	Alternative 5		Alternative 2		% Change
	Acres	% Project Area	Acres	% Project Area	
< 10*	10,659	52.1%	11,671	57.1%	-1,012 ac. (-5.0%)
10-20	2,031	9.9%	1,842	9.0%	189 ac. (0.9%)
20-40	5,674	27.7%	5,047	24.7%	627 ac. (3.0%)
>40	2,087	10.2%	1,892	9.2%	195 (1.0%)

* Desired Condition

Table 17
Potential Fireline Intensity as compared to Alternative 2

Rate of Spread (btu/ft/sec)	Alternative 5		Alternative 2		% Change
	Acres	% Project Area	Acres	% Project Area	
< 100*	7,489	21.4%	8,734	42.7%	-1,245 ac. (-21.3%)
100-500	2,223	12.7%	2,037	10.0%	186 ac. (2.7%)

Rate of Spread (btu/ft/sec)	Alternative 5		Alternative 2		% Change
	Acres	% Project Area	Acres	% Project Area	
500-1,000	530	3.2%	533	2.6%	-3 ac. (0.6%)
>1,000	10,209	62.7%	9,148	44.7%	1,061 ac. (18.0%)

* Desired Condition

Table 18
Flame Length

Flame Length (Feet)	Alternative 5		Alternative 2		% Change
	Acres	% Project Area	Acres	% Project Area	
< 4*	9,771	47.8%	10,826	52.9%	-1,055 ac. (-5.1%)
4-8	603	2.9%	615	3.0%	-12 ac. (-0.1%)
8–11	294	1.4%	272	1.3%	22 ac. (0.1%)
>11	9,784	47.8%	8,737	42.7%	1,047 ac. (5.1%)

* Desired Condition

Table 19
Crown Fire Activity

Crown Fire (Type)	Alternative 5		Alternative 2		% Change
	Acres	% Project Area	Acres	% Project Area	
Surface*	9,950	48.7%	11,057	54.1%	-1,107 ac. (-5.4%)
Passive	9,779	47.8%	8,706	42.6%	1,073 ac. (5.2%)
Active	723	3.5%	688	3.4%	35 ac. (0.1%)

* Desired Condition

Cumulative Effects

At the landscape level, Alternative 5 is comparable to Alternative 2. While approximately 1,328 fewer acres of mechanical and hand treatments would occur, the location of the reduced acreage is in proximity to the large areas where mechanical understory treatments and prescribed fire activities are still planned. Therefore, at the landscape level, Alternative 5 would efficiently reduce the spread and intensity of a wildfire within the project area. Figure 8 displays the Long Bear ignition as an example of effective fuel treatments under Alternative 5 when compared to Alternative 2. Under both alternatives, fuel treatments have the same effect in slowing or stopping a wildfire under 90th

percentile conditions. As described in Alternative 4, there is still an area of concern for problematic wildfire in the northern portion of the Trestle project area, just north of the Long Bear fire paths and contours. Alternative 5 is more effective than Alternative 4 at reducing the fire effects of a wildland fire on the landscape and reducing chances of problematic fire behavior. Under Alternative 4, few mechanical treatments are scheduled for this area. The treatments in Alternative 5 are islands of treatments which would still slow an advancing fire as it flanked around the treatment units, creating a scenario similar to that of the SPLAT strategy.

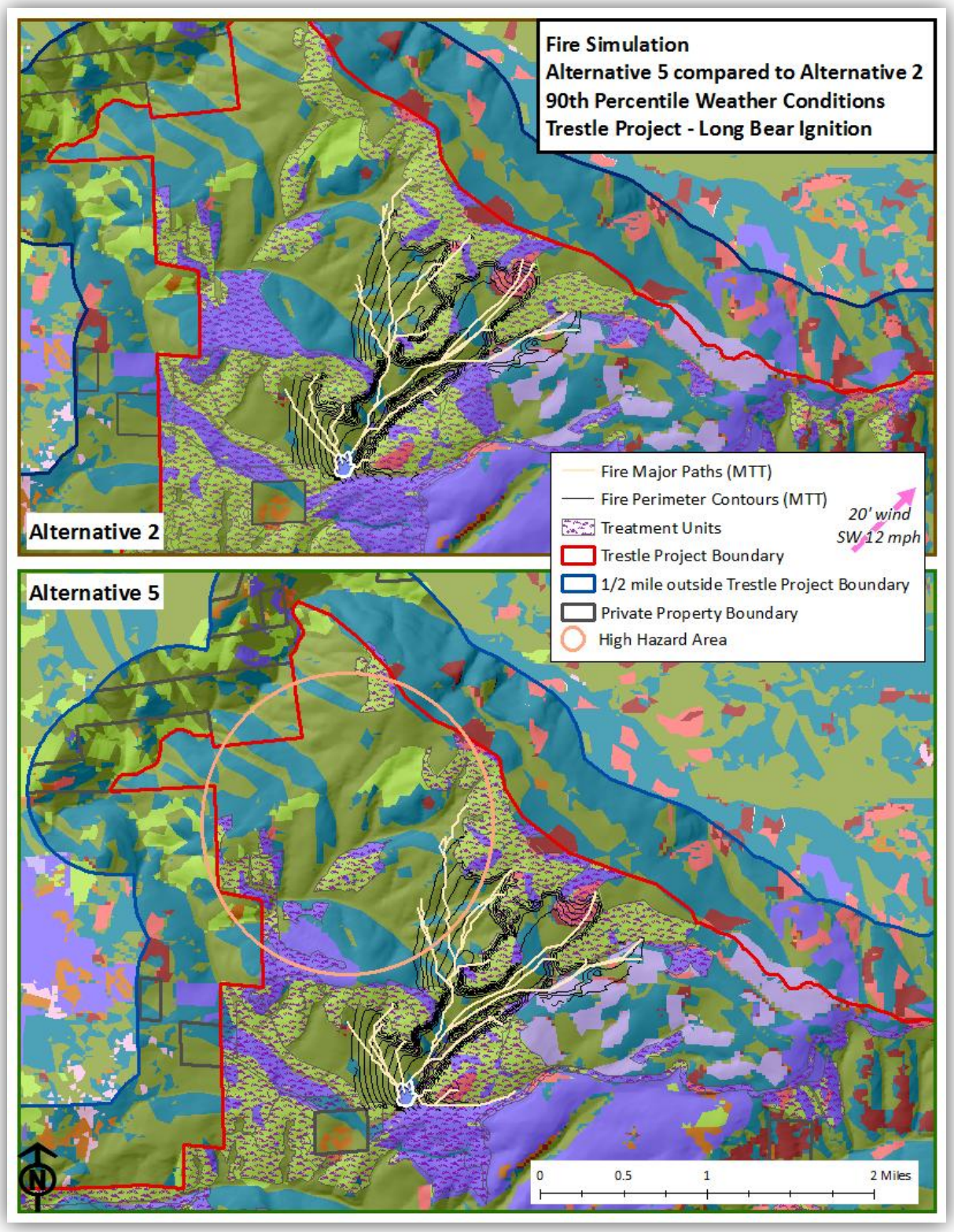

Figure 8. Landscape fire modeling for Long Bear Ignition with Alternative 5 compared to Alternative 2

Within the WUI, approximately 1,400 fewer acres are treated in Alternative 5 treatments than in Alternative 2 treatments. Under Alternative 5, the reduction of fuel treatments occurring in the Grizzly Flat CWPP is reduced by nearly 600 acres when compared to Alternative 2. Treatments in SPLATs are reduced by nearly 400 acres.

Botany

Effects to Threatened and Endangered, Sensitive, Special Interest Species (watchlist), and risk for invasive plants are summarized from Brown (2014). The Trestle project area was surveyed for sensitive and invasive plant species in 2012 and 2013. Surveys were intuitive controlled, targeting potential habitat (lava cap, riparian areas, etc.) and areas commonly infested with invasive species throughout the project area. A majority of existing sensitive plant occurrences in the project area were also monitored in 2012 and 2013.

Affected Environment

Federally Listed Plant Species

No Proposed, Threatened or Endangered plant species are documented in the project area.

Forest Service Sensitive Plant Species

One Sensitive plant species, Pleasant Valley mariposa lily (*Calochortus clavatus var. avius*) is known to occur in the Trestle project area, with 31 documented occurrences within the project area. No other occurrences of Sensitive plant species were located during surveys, although potential habitat is present for thirteen Sensitive plant species, including: *Allium tribracteatum, Botrychium ascendens, Botrychium crenulatum, Botrychium montanum, Botrychium paradoxum, Botrychium pendunculosum, Cypripedium montanum, Lewisia kelloggii ssp. kelloggii and ssp. hutchisonii, Meesia uliginosa, Ophioglossum pusillum, and Peltigera hydothyria.*

Pleasant Valley Mariposa lily (*Calochortus clavatus var. avius*)

Mariposa lily is known to grow on the Eldorado National Forest and adjoining private lands in the area between Union Valley Reservoir and the North Fork of the Mokelumne River. The elevation of known occurrences ranges from 900 to 5,400 feet. *Calochortus clavatus* var. *avius* is most often found on rocky, south-facing slopes in sparse stands of conifers, oaks, and manzanita and/or bear clover, at elevations of 2,800 to 5,700 feet. With a single exception in Calaveras County, Pleasant Valley mariposa lily is endemic to the Eldorado National Forest and adjoining private lands in the area between Union Valley Reservoir and the North Fork of the Mokelumne River and is currently known to occur at 142 locations within this roughly 420 square-mile area (FS Sensitive Plant records 2014, CNDDB). Population size ranges from a few plants into the thousands.

Potential habitat for Pleasant Valley Mariposa lily is found throughout the project area. Surface cobbles are almost universally present, though the rocks may be partly obscured by bear clover and shallow soils. The cobbles and soils are residual materials formed from andesitic lahars. The presence of *C. clavatus* var. *avius* in open stands of conifers may indicate an intolerance of deep shade and/or

thick duff. Fire is a key habitat component, as evidence of past fires occurs at nearly all occurrences on the Eldorado NF. Pocket gophers may also influence the local distribution of *C. clavatus* var. *avius* by eating the bulbs. Rocky substrates may provide refugia from such herbivory as well as providing a sunny site with few competitors. The soils, though rocky, often contain considerable clay.

Within the project area, the existing condition of Pleasant Valley Mariposa lily has been influenced by past logging and OHV activity (Elkins OHV Trail System). Early logging activities in the area likely impacted past occurrences directly by trampling plants, disturbing ground, and altering overstory conditions. OHV activity can also threaten populations when vehicles travel through populations, crushing and uprooting plants, and potentially introducing invasive species. Fire suppression has also impacted habitat quality throughout the species range by limiting the role of wildfire in maintaining suitable habitat conditions for Pleasant Valley Mariposa lily.

Of the 31 known populations within the Trestle project area, seven sites are at risk for impacts from ongoing OHV or dispersed recreation activity along designated roads and trails. Recent monitoring also suggests that eleven sites have become overgrown with competing vegetation since being discovered in the mid-1990's.

Special Interest Plant Species (watchlist) and Communities

Pacific Yew (*Taxus brevifolia*) is the only ENF watchlist species known from the Trestle Project area. Pacific yew is an uncommon tree found below 5,000 feet in elevation, generally in moist sites on lower slopes of dense mixed evergreen forest, frequently growing in drainages and shady steep canyons. Pacific Yew is common throughout portions of the Trestle project area especially in the vicinity of Shingle Gulch, Big Canyon, Dogtown Creek and the Steely Fork of the Cosumnes River.

Lava Cap: There are lava cap plant communities within the project area, which are recognized by CNPS as a sensitive plant community type. These plant communities are generally dominated by high diversity of herbs and shrubs adapted to growing on rocky and volcanic soils eroded from Mehrten formation mudflow. Early each spring, these rocky areas give rise to a rich and varied ephemeral plant community. During the rest of the year, lava cap communities often have a sparse barren appearance. Threats to these unique plant communities include OHV activity, fuels reduction activities, landing construction and invasive plant introduction. Because of the lava cap physical situation, on fairly level ridgetops, much of this habitat has been impacted by the construction of roads, trails, and landings across the Eldorado NF and within the Trestle project area. During botany surveys, both pristine and impacted lava cap plant communities were noted throughout the project area.

Invasive Plant Species

Existing noxious weed records were reviewed for the Trestle project area. Generally the project area is relatively free of invasive species but there are a few small high priority infestations (ENF priority 1 and 2) scattered throughout the project area. These include yellow starthistle (*Centaurea solstitialis*), Rush skeleton weed (*Chondrilla juncea*), and Scotch Broom (*Cytisus scoparius*). All infestations occur along roads and trails, although a few have expanded away from existing roadways.

Environmental Consequences

Alternative 1

Direct and Indirect Effects

Under the No Action Alternative, a number of activities identified in the proposed action that directly benefit sensitive plant populations will not occur in the near future. Pleasant Valley Mariposa lily occurrences along roads proposed for closure would continue to be vulnerable to incursion by motor vehicles. Pleasant Valley Mariposa lily site #39 would not be blocked with physical barricades to prevent further vehicle incursion. Prescribed burning within the 10 overgrown Pleasant Valley Mariposa lily populations would not occur in the near future.

Under the No Action Alternative, some potential effects to sensitive plants described in the action alternatives would be reduced. Most obviously any potential direct effects to any undiscovered occurrences within the proposed project area would be eliminated without the proposed activities. The risk of noxious weed introduction would also be much lower under the No Action Alternative compared to the action alternatives since potential vectors and ground disturbance associated with the project would not occur.

Cumulative Effects

Current and future management activities expected within the proposed project area include hazard tree removal and some minor road maintenance. It is also expected that fire suppression activities would occur in the event of a wildfire in the project area.

The cumulative effects of past activities (logging and fire suppression), current and future management, and the No Action Alternative are potentially adverse for known or any undiscovered sensitive plants within the project area. Past fire suppression and continued increases in fuels and stand density under the No Action Alternative may increase the probability of high severity wildfire occurring within the proposed project area. Both fire suppression activities and large tracks of bare-ground after high severity wildfire are extremely susceptible to invasive plants (Zouhar et al., 2008). The potential introduction and proliferation of invasive species as well as potential sedimentation and altered hydrologic processes (Neary et al., 2005) after an uncontrolled wildfire could adversely impact potential habitat for some sensitive plants. However, large wildfires have also benefited Pleasant Valley Mariposa lily populations on the Eldorado National Forest by removing competing brush and conifers so the potential effects will vary for sensitive species in the project area.

Alternative 2

Direct and Indirect Effects

Thinning units: The proposed project would conduct mechanical thinning activities on approximately 4,887 acres within the project area to reduce stand density. Adverse impacts to sensitive terrestrial plants could occur if mechanical equipment damages or uproots sensitive plants, compact soils, or alter overstory condition. Within the Trestle project area there are 16 occurrences within 500 feet of proposed thinning units, 5 of which are within proposed units. Adverse direct impacts to known

occurrences within thinning units are not expected since occurrences and associated potential habitat will be flagged for avoidance prior to project implementation.

All known terrestrial sensitive plant occurrences within 500 feet of proposed thinning units are not expected to be directly impacted by proposed thinning activities. To insure that occurrences are not inadvertently impacted by additional activities associated with thinning projects (landing construction, skid trails, piling, road improvements, danger tree removal, etc.) all sensitive plant occurrences would be flagged and included on project area maps prior to project implementation. All activities would be excluded from these sensitive plant occurrences unless reviewed and recommended by the project botanist in advance of implementation.

Thinning adjacent to known sensitive plant sites can indirectly impact populations by reducing screening surrounding known sites thereby creating opportunities for new non-designated OHV trails to develop into known populations. This is of particular concern in the project area because of the OHV activity on the Elkins Trail system. Of the known sites within the Trestle project area, the greatest concern for potential impacts from non-designated OHV activity near sensitive plant occurrences could occur at CACLA-049, CACLA-056, and CACLA-069. To address this concern, sites within 500 feet of proposed thinning units would be monitored following project implementation. If any evidence of non-designated trail use near sensitive plants is observed, management actions would occur to obscure the trail using various methods such as the installation of barriers and signs.

Lava caps: Impacts to lava cap communities from equipment staging, thinning activities, landing construction, and intensive fire line construction would be avoided during project implementation.

Activities associated with prescribed fire (line construction, pile burning, broadcast burning): Within the Trestle Forest Health project area, approximately 15,812 acres of prescribed burning would be conducted. In general, the actual prescribed fire has limited impacts on understory terrestrial plant communities and sensitive plant species since these species are adapted to growing on a landscape where wildfire was historically an integral component of shaping and maintaining the plant communities. Prescribed burning activities proposed for the Trestle project includes creepy pile, jackpot, and general understory burning. While the actual burning activities are relatively benign, the prep work associated with burning does involve some risk to terrestrial sensitive plants.

Fire-line construction can directly impact terrestrial sensitive plant occurrences by potentially uprooting, crushing, or altering habitat condition (canopy closure, microsite hydrology, covering plants, etc.) if fire-line is constructed through an occurrence. Of the known sensitive plant population in the project area, 23 occur within proposed burn units, some of which may be impacted by future fire line construction which may occur were roads, trails, or natural barriers are absent. Since fire-line construction can occur several years after completion of thinning and other treatments, the project botanist would be consulted prior to line construction to reflag any sensitive plant occurrence that may need to be updated and to insure line construction within the project area does not affect known sensitive plant occurrences. When laying out future burn units, fire-line construction would be developed to avoid direct impacts to sensitive plant occurrences. Other activities that may impact

sensitive plants include creating handpiles prior to burning or felling hazard trees into sensitive plant occurrences. Since sensitive plant occurrences would be flagged for avoidance, this is not expected to be a concern within the project area.

Prescribed understory burning may improve habitat for Pleasant Valley Mariposa lily (*Calochortus clavatus var. avius*). Pleasant Valley Mariposa lily tends to be found in open stands of conifers and is intolerant of deep shade and/or thick duff. Fire was likely a key component in maintaining open habitat on the Eldorado NF prior to widespread fire suppression activities. The proposed prescribed burning in the Trestle project area could indirectly benefit known occurrences and any undiscovered individuals by reducing duff and cover of competing vegetation and opening the overstory. Fall burns are generally conducted on the Eldorado NF which would be favorable for any undiscovered occurrences within the project area. Of the 31 known occurrences in the project area, 25 occurrences are within proposed prescribed burn areas. Of these occurrences, 11 were identified in 2012 as being overgrown by young conifer and shrub species. To minimize the potential for undesired effects from prescribed burning to sensitive plants, the project botanist would be consulted prior to burning within sensitive plant sites and would be onsite during burning operations if available.

Pacific yew: Pacific yew tends to grow in cool protected drainages that generally experienced infrequent fires on the Eldorado NF. Yews often occur in the understory of mature forests, and are sensitive to drastic reductions in overstory canopy cover (increase heat and light exposure). Disturbance from fire will often result in mortality of adult plants and seedlings because Pacific yew lack a thick protective bark common on other conifer species occurring in the Sierras. Following disturbance from fire, recruitment of yews will generally occur from remaining offsite populations (bird dispersed seeds), although the recovery can be quite slow.

While thinning and prescribed fire would impact individual plants within the project area, a number of protective measures have been included in the project to minimize potential impacts to Pacific yew including altering lighting techniques within 10 feet of yew species, limiting removal of large yew during thinning activities, and avoiding broadcast burning in dense stands of yew. Additionally, restrictions on thinning and prescribed fire lighting within Riparian Conservation Areas are expected to further limit impacts to Pacific yew species, which is predominantly found near drainages.

Roadwork in the project area: Proposed road work for the Trestle project includes 84 miles of reconstruction. Potential threats for terrestrial sensitive plants during road construction are primarily the physical disturbance to roadside occurrences. There are eight known occurrences of Pleasant Valley Mariposa lily adjacent to or bisected by designated roadways in the project area. Impacts to these known occurrences are not expected since all occurrences would be flagged for avoidance. If road maintenance, reconstruction or brushing is required adjacent to sensitive plant species, the project botanist would be consulted prior to initiating roadwork to insure impacts to sensitive plants are avoided.

Under the proposed action, approximately 53 miles of system roads would be closed using physical barricades or gates, with an additional 3.1 miles on non-system routes being obliterated. A number of

these identified routes currently bisect or are adjacent to existing populations of Pleasant Valley Mariposa lily. The proposed gating and blocking of these route segments would benefit known populations by limiting potential vehicle traffic near and within known occurrences.

Under the proposed Trestle project, Pleasant Valley Mariposa lily occurrence #39 would be protected from non-designated vehicle travel currently occurring between 8N49 and 14E36. The proposed action includes installation of barricade rock around the sensitive plant site to discourage vehicle travel that currently threatens to trample plants and compact potential habitat.

Dust abatement*:* The application of EPA approved dust palliatives such as magnesium chloride for dust abatement may directly impact sensitive plant species if magnesium chloride is applied to roadside sensitive plant populations or is transported to sensitive plant species downslope of the application site. This is of particular concern for Pleasant Valley Mariposa lily occurrences on shallow soils along existing roads in the project area. Magnesium and chloride are both essential nutrients for normal plant growth but at application rates used for dust abatement can become toxic causing leaf necrosis, or even death for some species. There are currently 27 occurrences of Pleasant Valley Mariposa lily within 100 feet of existing road ways in the Trestle project area. These occurrences will be flagged for avoidance prior to application of dust palliatives, limiting the potential for direct and indirect effects.

Hazard trees and roadside brushing: Roadside brushing could impact sensitive plant populations by crushing or disturbing plants. Additionally, chipping brush could introduce a thick layer of mulch atypical for sensitive plant populations in the project area, potentially impacting recruitment of new seedlings for Pleasant Valley Mariposa lily. Piling materials could also crush individual plants. For all alternatives, the only sensitive plant occurrence where roadside brushing is being proposed is a single occurrence of Pleasant Valley Mariposa lily (CACLA-007) along Grizzly Caldor Rd (9N73). This occurrence would be flagged for avoidance during roadside brushing activities limiting the potential for effects from project activities. Hazard tree removal in sensitive plant populations could result in individual plants being crushed during felling operation. If hazard trees are identified in sensitive plant populations, the project botanist would be consulted to mitigate impacts. If hazard trees are identified on the perimeter of an occurrence, trees would be directionally felled away from the occurrence.

Restoration activities: The Trestle Project includes 18 restoration actions addressing dispersed recreation, roads, trails, and an abandoned mine. Of the 18 proposed restoration sites 17 do not occur in the vicinity of sensitive plant populations so negative effects are not expected. The one proposed restoration item in close proximity to a sensitive plant occurrence is the proposed barricading along 08N49 to protect Pleasant Valley Mariposa lily occurrence #39 from OHV impacts. This proposed restoration activity would benefit Pleasant Valley Mariposa lily by preventing further OHV incursion into the sensitive plant population.

Invasive plant introduction: Soil disturbances can provide opportunities for the introduction and proliferation of invasive species. These species have the potential to quickly outcompete native plants

including sensitive plants for sunlight, water, and nutrients. These species can also form dense monocultures which can alter habitat for sensitive plant species. Seeds of these species can be carried into sensitive plant areas on prescribed burning equipment, vehicles, and on workers boots and clothing. The magnitude of this impact is difficult to predict since it is contingent on the introduction of a noxious weed species into an area, an event which may or may not occur.

Generally the Trestle project area is free of invasive plant species, but there are a number of priority isolated infestations along access routes, adjacent to thinning units, and within the proposed prescribed burn areas. These infestations could easily be spread during project activities including into Pleasant Valley Mariposa lily populations. Additionally the proposed thinning and fuels work in the Trestle project area would increase the susceptibility of treated units to future invasions. To limit the potential for spread, known priority infestations would be monitored and treated during Trestle project implementation using methods described in the Eldorado Forest Invasive Plant Environmental Assessment. This would reduce existing seed sources throughout the project area which is an important preventive measure when using mechanical equipment and prescribed fire to manipulate forest structure. Additional standard measures included in the proposed Trestle project such as excluding vehicle traffic from known infestations, equipment cleaning, and use of weed free material would further limit the risk of invasive species spreading into the project area and impacting sensitive plant occurrences. While the risk of invasion cannot be completely eliminated, these measures are expected to greatly limit the potential introduction and spread of invasive species in the project area, thereby reducing the risk of invasive plants resulting in long-term habitat alteration or impacting known sensitive plant occurrences.

Cumulative Effects

Adverse impacts to sensitive plants from recent (1989-2011) activities have largely been minimized by the use of mitigation measures, mainly the use of avoidance. Ongoing and future management activities in the Trestle project area would likely include trail maintenance, hazard tree removal and implementation of ongoing FS projects in the area including Raintree. It is anticipated that future impacts to sensitive plants would continue to be minimized through the use of avoidance for the above foreseeable actions.

The establishment of noxious weeds in sensitive plant habitat can impact species by competing with native species for resources. Historic logging, grazing, and OHV travel have already introduced noxious weeds, primarily nonnative annual grasses, into portions of the project area and into sensitive plant populations. These annual grasses likely became established early in the project area during the Euro American settlement of the Sierras, probably as a result of grazing, logging, and mining activities. These grasses are common in both natural and developed openings such as lava caps, landings, and roadways throughout the Eldorado NF. The proposed Trestle project is not expected to result in a detectable increase in the spread or proliferation of these non-native species above existing levels. Proposed design criteria for the project, including eradication of known priority infestations is

expected to reduce the risk of introducing and spreading high priority noxious weeds in the project area.

The threat of noxious weeds (current and future) introduction cannot be completely eliminated for the proposed Trestle project or other expected activities in the area. Therefore, it is necessary to continue to monitor and control high priority infestations that already occur or may develop in the project area. The Eldorado NF noxious weed program is expected to continue monitoring and managing noxious weeds and would take necessary actions to address new infestations if they are discovered in the project area. Continued surveys for noxious weeds are expected to occur during future projects in the project area.

Alternative 4

Direct and Indirect Effects

Direct and indirect effects for Alternative 4 are expected to be similar to the proposed action, since all the action alternatives will include ground disturbing activities and prescribed fire over largely similar areas in the Trestle project area. Specific differences between the proposed action and Alternative 4 largely result from differences in proposed units for the two alternatives. Effects described for Alternative 2 also apply to Alternative 4 except for the following specific differences.

Thinning units: Alternative 4 has six fewer sensitive plant occurrences within and adjacent to proposed thinning units compared to Alternative 2. Pleasant Valley Mariposa lily occurrences: CACLA-091, CACLA-130, CACLA-087, CACLA-095, and CACLA-130 all dropped from Alternative 4.

Activities associated with prescribe fire (line construction, pile burning, understory burning): One hand cut, pile burn unit with Pleasant Valley Mariposa lily (CACLA-038) under Alternative 2 was dropped from Alternative 4.

Roadwork in the project area: Five Sensitive plant occurrences (CACLA-070, CACLA-022, CACLA-087, CACLA-130, and CACLA-131) are not within 200 feet of proposed road work under alternative 4, but were within 200 feet of roadwork under Alternative 2. One additional occurrence of Pleasant Valley Mariposa lily (CACLA-095) is near proposed roadwork under Alternative 4, but is not a concern for Alternative 2.

Cumulative Effects

Cumulative effects for Alternative 4 would be similar to those described for Alternative 2.

Alternative 5

Direct and Indirect Effects

Direct effects for Alternative 5 are expected to be similar to the proposed action, since all the action alternatives would include ground disturbing activities and prescribed fire over largely similar areas in the Trestle project area. Specific differences between Alternative 2 and Alternative 5 largely result

from differences in proposed units for the two alternatives. Effects described for Alternative 2 also apply to Alternative 5, except for the following specific differences.

Thinning units: Alternative 5 has six fewer sensitive plant occurrences within and adjacent to proposed thinning units compared to Alternative 2. Pleasant Valley Mariposa lily occurrences: CACLA-091, CACLA-130, CACLA-087, CACLA-095, and CACLA-130 all dropped from Alternative 5.

Activities associated with prescribed fire (line construction, pile burning, understory burning): One hand cut, pile burn unit with Pleasant Valley Mariposa lily (CACLA-038) included in Alternative 2 was dropped from Alternative 5.

Roadwork in the project area: Three sensitive plant occurrences (CACLA-070, CACLA-022, CACLA-087) are not within 200 feet of proposed road work under Alternative 5, but were within 200 feet of roadwork proposed under Alternative 2. One additional occurrence of Pleasant Valley Mariposa lily (CACLA-095) is near proposed roadwork under Alternative 5 but is not a concern for Alternative 2.

Cumulative Effects

Cumulative effects for Alternative 5 will be similar to those described for Alternative 2.

Water Quality / Hydrology

Effects to the hydrology resource that are likely to result from the Trestle Forest Health Project are summarized from the Hydrology Report (Markman 2014). The analysis area for the hydrology resource includes a portion of seven HUC 7 watersheds. HUC 7 is the finest scale for which the Eldorado National Forest has current watershed data and is the scale at which the forest calculates cumulative watershed affects.

A Riparian Conservation Objective analysis (Markman 2014a) further evaluates whether activities proposed with the Trestle Forest Health Project would be consistent with Riparian Conservation Objectives (RCOs) specified in the Final Supplemental Environmental Impact Statement, Sierra Nevada Forest Plan Amendment (USDA Forest Service 2004).

Affected Environment

The landscape of the Trestle Forest Health Project is mountainous and forested in the headwaters of the Cosumnes River drainage basin. There are over 44 miles of named perennial streams in the seven HUC 7 watersheds. These streams include: North Fork Cosumnes River, Big Canyon Creek, North Canyon Creek, Steely Fork Cosumnes River, Salt Rock Creek, South Fork Steely Creek, North Steely Creek, Clear Creek, Dogtown Creek, and Middle Dry Creek. Most of these streams flow west/northwest and directly or ultimately into the North Fork Cosumnes River or Middle Fork Cosumnes River, which in turn flows to the west and into the Cosumnes River.

Beneficial uses include: municipal water supplies for domestic use; hydropower generation; contact and non-contact recreation; canoeing and rafting; cold freshwater habitat; spawning habitat; and wildlife habitat.

The condition of perennial streams is variable by stream and stream segment, ranging from good to somewhat degraded. The water quality during low flows is good.

Environmental Consequences

Alternative 1

Direct and Indirect Effects

Under Alternative 1, the potential for impacts from project related activities would not occur, however the potential for wildfire would be increased as described in the Fire and Fuels Analysis for the project (Riesenhuber 2014). There would be a greater risk of adverse effects to aquatic resources as a result of a large, high severity wildfire. The hydrologic response to a high severity wildfire is well documented in the literature. Runoff and erosion rates increase by two or more magnitudes for several years after a high severity fire, and frequently decline to near pre-wildfire levels within four or five years. Since the Trestle Project includes portions of seven watersheds (HUC 7 scale), there is the potential for a high-severity fire to affect all of the streams in those watersheds. The potential effects within and downstream of the project area include: 1) an increase in the suspended sediment and turbidity levels of streams during and immediately after rainfall events and periods of rapid snowmelt; 2) deposition of fine-grained sediment in stream channels; 3) deposition of ash in streams, which can increase nutrient levels for several years; and 4) increases in runoff during rainfall events tend to result in an increase in peak flows of streams, which can cause stream channel erosion and degradation of aquatic habitat.

Long-term improvement (greater than 5 years) to water quality and aquatic habitat may occur at a slower rate since road reconstruction and restoration activities would not occur under the No Action Alternative.

Cumulative Effects

Cumulative effects would not occur under this alternative.

Alternatives 2, 4, and 5

Direct and Indirect Effects

Direct and indirect effects to water quality and aquatic habitat in the Trestle project area and downstream of the project area are expected to be minor or negligible, with the implementation of Regional and National BMP guidance and the design criteria. Therefore adverse impacts to beneficial uses of water in the watersheds are not expected. In the long-term (greater than five years), there may be an improvement in water quality and aquatic habitat of several perennial streams, primarily due to the result of restoration activities proposed under the action alternatives. As a result, the Trestle Project is expected to meet the Riparian Conservation Objectives (RCOs) in the 2004 Sierra Nevada Forest Plan Amendment, Record of Decision (Markman 2014a).

Sediment and Turbidity: A minor, short-term (less than five years) increase in the suspended sediment concentrations and turbidity levels of the streams that flow through or adjacent to treatment units may occur during and immediately after large rainfall events. This increase, should it occur, should not exceed state water quality standards for turbidity or sediment. This is due to the following:

- A number of design features would minimize the amount of sediment delivered to the streams and other aquatic features, including no ground disturbing activities adjacent to streams and other aquatic features. All aquatic features in the project area have ground-based equipment exclusion zones, ranging from 10 feet for draws to 150 feet next to some segments of perennial streams.
- Ground-disturbing activities would occur in a relatively small percentage of the Riparian Conservation Areas (RCAs) next to streams. The RCA is 300 feet on each side of perennial streams and 150 feet on each side of intermittent and ephemeral streams.
    a. Ground disturbing activities would occur in less than 5 percent of the RCA of 12 perennial streams when the entire length of the stream within a watershed is considered.
    b. Ground disturbing activities would occur in approximately 0 to 22.5 percent of the RCA of 12 perennial streams when only the RCA within thinning units is considered. For eight of the 12 perennial streams, less than 10 percent of the RCA would have ground-disturbing activities.
- Best management practices (BMPs) would be implemented during project operations that are designed to protect water quality, soils, and vegetation. Implementation of BMPs, which include established riparian buffers, have generally been shown to decrease the negative effects of timber harvest activities on water quality (USDA 2010).
- Nearly all of the roads located near streams in the project area would receive treatments that are likely to reduce the amount of road-related sediment that is delivered to these streams in the long-term. Road reconstruction would occur on approximately 84 miles of system roads and would include the replacement of inadequate drainage crossings, elimination of ruts, ditch repair, installation of waterbars and dips with inadequate water runoff control, gate installation to control seasonal use or replacement of existing non-functional gates or barricades, and removal of brush and small trees encroaching on roads.

Water Quality: The effects to the water quality of streams (outside of suspended sediment and turbidity discussed above) should be negligible or minor.

- Temperature: According to a stream temperature model, the maximum potential stream temperature increase would range between 0.0 and 3.8 degrees Fahrenheit (F) for 12 perennial stream segments in the project area. For six of the streams, the maximum potential stream temperature increase would be less than 2.0 degrees F. This is in large part due to the design criteria that would limit the removal of vegetation near perennial streams, which in turn would

result in a small decrease in the amount of shade on the surface of streams. For small streams in a forested setting, the research indicates that elevated water temperatures usually decrease to pre-disturbance levels within 500 feet downstream of the zone of vegetation removal (USDA 2010). Streams that flow seasonally (intermittent and ephemeral streams) have no surface flows during the time of year (early summer to early fall) when an increase in stream temperatures are most likely to occur.

- Nutrients: Two recent studies have shown that partial timber harvest near streams resulted in limited effects to nutrients (Jones 2013; Gravelle 2009). With regard to prescribed fire and the burning of slash piles, the bulk of the published research has shown that increases in the nutrient levels of streams are minor or negligible and short-term.

Flows: Changes to water yield, peak flow, and timing of flow of all streams in the project area and downstream of the project would likely be negligible and not measurable. Research indicates that, *"…fuels reduction treatments in forested watersheds have little detectable impact on water yields either on-site or downstream. Most prescriptions are not likely to remove the 20 percent of the basal area that is needed in most areas to generate a detectable change in flow"* (USDA 2010). Alternative 2 would decrease the basal area in commercial thinning units by approximately 17 percent and would decrease canopy cover approximately 15 percent between 2013 and 2026 (Howard and Walsh 2014). Reductions in forest basal area and canopy cover would be similar for Alternative 4 and 5.

Cumulative effects

The analysis of cumulative watershed effects (CWE) considers all past, present, and likely future land effects in a given drainage area. In the Eldorado National Forest, the risk of the occurrence of CWE is based on a quantitative evaluation of the land disturbances in the watershed using the method of Equivalent Roaded Acres (ERA). Based on the ERA and threshold of concern (TOC), a given watershed is assigned a relative risk – *low, moderate, high,* or *very high* – of CWE. A *very high risk* is merely a warning that cumulative impacts – such as an increase in sediment delivery to streams – might occur.

Table 20
Cumulative Watershed Effects in terms of percent ERA by 7th Field Watershed for the Trestle Forest Health Project, Proposed Action (Alternative 2)

Watershed	Acres	Current % ERA (% TOC)	Alternative	Projected % ERA (% TOC) (2018[1] / 2026)	Current Risk of CWE	Projected Risk of CWE (2018[1] / 2026)
Big Canyon Creek	3,535	7.0 (43.8)	Proposed Action	11.3 (70.6) / 9.9 (61.9)	Low	Moderate
			Alt. 4	10.0 (62.5) / 8.8 (55.0)		
			Alt. 5	10.8 (67.5) / 9.5 (59.4)		
Lower	6,966	10.1	Proposed	11.4 (114) /	Very High	Very High

Watershed	Acres	Current % ERA (% TOC)	Alternative	Projected % ERA (% TOC) (2018[1] / 2026)	Current Risk of CWE	Projected Risk of CWE (2018[1] / 2026)
Steely Fork Cosumnes River		(101)	Action	11.0 (110)		
			Alt. 4	11.2 (112) / 10.8 (108)		
			Alt. 5	11.2 (112) / 10.8 (108)		
Upper Steely Fork Cosumnes River	6,831	8.1 (57.9)	Proposed Action	13.7 (97.9)/ 12.5 (89.3)	Moderate	High / High
			Alt. 4	11.3 (80.7) / 10.8 (72.1)		High / Moderate
			Alt. 5	12.3 (87.9) / 11.0 (78.6)		High / Moderate
Dogtown Creek	6,849	7.5 (62.5)	Proposed Action	10.3 (85.8) / 9.1 (75.8)	Moderate	High / Moderate
			Alt. 4	9.3 (77.5) / 8.1 (67.5)		Moderate
			Alt. 5	9.3 (77.5) / 8.3 (69.2)		Moderate
Clear Creek – Steely Fork Cosumnes River	2,891	12.0 (75)	Proposed Action	18.8 (117.5) / 17.7 (110.6)	Moderate	Very High
			Alt. 4	16.5 (103.1) / 14.3 (89.4)		Very High / High
			Alt. 5	17.1 (106.9) / 14.9 (93.1)		Very High / High
Middle Dry Creek	3,414	11.0 (68.8)	Proposed Action	13.2 (82.5) / 11.4 (71.3)	Moderate	High / Moderate
			Alt. 4	12.8 (80) / 11.1 (69.4)		
			Alt. 5	13 (80) / 11.2 (70)		
North Fork Cosumnes River – Bear Meadow Creek	6,278	6.4 (64)	Proposed Action	7.2 (72) / 6.4 (64)	Moderate	Moderate
			Alt. 4	7 (70) / 6.1 (61)		
			Alt. 5	7.2 (72) / 6.3 (63)		

[1] The year 2018 represents the maximum ERA between 2016 and 2026, assuming implementation will begin in 2016.

The risk of cumulative watershed effects (CWE) is currently low or moderate in six of the seven watersheds, and one watershed is currently at a very high risk of CWE. The Lower Steely Fork Cosumnes River watershed is currently at a very high risk of CWE, which is largely the result of residential development and past timber harvest on private lands. Alternatives 2, 4, and 5 would increase the risk of CWE in six of the seven watersheds for at least several years. Alternative 2 would result in two watersheds (Lower Steely Fork Cosumnes River and Clear Creek-Steely Fork Cosumnes River) at a very high risk of CWE for a longer period of time as compared to Alternatives 4 and 5.

Aquatic Wildlife

Direction to maintain the viability of Region 5 endangered, threatened, and sensitive species is provided by the National Forest Management Act, the Code of Federal Regulations (CFR 219.19), the Forest Service Manual (FSM 2672), and the Sierra Nevada Forest Plan Amendment Final Supplemental Environmental Impact Statement (EIS) (USDA Forest Service 2004). Potential effects by this project are summarized from Chow (2014).

Threatened and Endangered Species

California Red-legged Frog

Affected Environment

California red-legged frog (CRLF) has not been documented within the project area boundary following extensive protocol-level surveys in suitable habitats (1997-2013). Habitat suitability for CRLF was deemed low within the project boundary in habitats below 4,000 feet due to high spring flows, lack of backwater and deep pooling areas, and the presence of rainbow trout. Designated Critical Habitat does not exist within the project area or the affected watersheds. The Cosumnes River Watershed is listed as Core Recovery Habitat for CRLF.

Environmental Consequences

All Alternatives

Direct, indirect, and cumulative effects to CRLF, its designated Critical Habitat or Core Recovery Habitat, are not expected under any of the alternatives. This conclusion is based on the following assumptions:

1. The nearest known breeding population (Spivey Pond) is approximately 12 air miles northwest of project area boundary in a different river drainage system (American River);
2. Extensive protocol-level surveys (2 day-2 night and 8-day) have occurred (1997-2013) in the most optimal habitats at the most optimal times for detection within the Trestle project and failed to detect CRLF;
3. Habitat suitability within the Trestle project has been deemed low due to the presence of high spring flows, lack of deep pools (0.5 m) in low gradient reaches, and the presence of rainbow trout in all perennial stream habitats; and,

4. Effects to aquatic resources (water quality, stream condition, and aquatic habitat) will be negligible due to project-level design criteria and the Riparian Conservation Objectives and associated guidelines being met.

Sierra Nevada Yellow-legged Frog

Affected Environment

Sierra Nevada yellow-legged frog (SNYLF) has not been documented and is not known to be found within the project area boundary. However, the nearest sighting occurred 0.6 miles east of the project boundary on the North Fork Cosumnes River in 2003. SNYLF are highly aquatic and do not venture far from water; therefore, only activities occurring within, or immediately adjacent to, Riparian Conservation Areas (RCAs) are likely to impact this species or their preferred habitat. No extensive protocol surveys in potential habitat have been conducted since the species has been officially listed as endangered in April 2014. The elevation range for this species ranges from 4,500 ft. to over 12,000 ft. as designated from the federal listing on June 30, 2014. Habitat suitability for SNYLF is deemed low within the project boundary since elevation is at the lower limit for the species. SNYLF detections have never occurred nor been documented on the Eldorado National Forest (ENF) below 5,000 feet in elevation. Designated Critical Habitat does not exist within the project area or the affected watersheds. Based on habitat suitability, no prior detections, and elevation, SNYLF are not likely to occur within the Trestle Project boundary.

Environmental Consequences

All Alternatives

Direct, indirect, and cumulative effects to SNYLF, and its proposed Critical Habitat, are not expected to be impacted under any of the alternatives. This conclusion is based on the following assumptions:

1. The nearest known breeding population (Tragedy Creek) is approximately 15.2 air miles northwest of project area boundary in a different river drainage system;
2. The proposed critical habitat is 20.3 and 12.2 air miles northeast and southeast of the project boundary in Desolation and Mokelumne wildernesses;
3. Protocol-level surveys have occurred (1997-2013) in some potential habitats for detection within the Trestle project area and failed to detect SNYLF;
4. The exclusion buffers of 100 feet enforced for all project activities would avoid effects to SNYLF;
5. Habitat suitability within the Trestle project area has been deemed low due to the elevation range limits and lack of prior detections;
6. The presence of rainbow trout in all perennial stream habitats reduces habitat suitability; and

7. Effects to aquatic resources (water quality, stream condition, and aquatic habitat) would be negligible due to project-level design criteria and the Riparian Conservation Objectives and associated guidelines being met.

Forest Service Sensitive Species

Foothill Yellow-legged Frog

Affected Environment

Foothill yellow-legged frog (FYLF) is found in, or adjacent to, rocky streams in a diversity of habitats, such as valley-foothill hardwood, valley-foothill hardwood-conifer, valley-foothill riparian, ponderosa pine, mixed conifer, coastal scrub, mixed chaparral, and various wetland types. In California, they are found west of the Cascades and are distributed along the length of the western flank of the Sierra Nevada Mountains to Kern Co. The maximum upper elevation extent of known occurrences of foothill yellow-legged frog on the Eldorado National Forest is believed to be closer to 4,500 feet.

Foothill yellow-legged frog has only been documented in one location (Sopiago Creek – Amador RD) adjacent (approx. 1.0 mile south) to the project-area boundary, but it was likely historically widespread in many streams and tributaries of the project-area based on suitable habitat present. Foothill yellow-legged frog is highly aquatic and does not venture far from water; therefore, only activities occurring within, or immediately adjacent to, RCAs are likely to impact this species or its preferred habitat. Introduced rainbow trout and stream alteration from past mining, timber harvest, grazing, road construction, and resulting effects may preclude this species from recolonization.

Extensive surveys for California red-legged frog (1997-2013) have been conducted in the major perennial streams of the project area and associated watersheds (HUC 14) in favorable stream habitats below 5,000 feet. If present, FYLF would have likely been detected during these surveys since they occupy similar habitat types, specifically suitable breeding areas (deep pools). However, a nearby occurrence of FYLF (Sopiago Creek, Amador RD) is known. An adult FYLF was observed approximately 1 air mile and only 2 stream miles, via the confluence of the Middle Fork Cosumnes River, away from the project area boundary on August 30, 1999 by an Eldorado National Forest fisheries survey crew. Given the proximity of this sighting, along with the lack of targeted surveys outside of low gradient reaches and given that FYLF may still occur in higher gradient reaches, FYLF has a higher potential to be present within the project-area boundary than California red-legged frog.

Environmental Consequences

Alternative 1

Direct and Indirect Effects

Under this alternative, fuels would not be reduced, but would continue to accumulate. The risk for high-severity wildfire, along with the possibility of stand replacement mortality, would remain or increase for much of the project area. No action could lead to a greater risk of erosional effects to

aquatic features during periods of increased run-off and snowmelt in the years following a high-severity wildfire than would be experienced by Alternatives 2, 4, and 5.

The hydrologic response of erosion rates after a high-severity wildfire is increased by two or more magnitudes for several years post-fire and returns to near pre-wildfire levels within four or five years. However, the effects to aquatic features and the beneficial uses of water, both within and downstream of a high severity wildfire, are difficult to predict in fire-suppressed landscapes and depend on many factors. The single most important factor is often the size of the rainfall events that occur during the first several years after the wildfire when the ground is most vulnerable to accelerated runoff and erosion. Tree mortality (snags) in riparian zones, as a result of wildfire, may contribute to large, woody debris recruitment that is lacking in most drainages and may remain elevated for the next 10 – 15 years post-wildfire (Gresswell, 1999). There would be no direct or indirect effects to FYLF or its habitat as the result of project activities not being implemented under Alternative 1. However, effects to FYLF from potential wildfire under Alternative 1 from the lack of fuels reduction-related activities could negatively affect FYLF aquatic habitat by increasing sediment deposition to streams where it occurs or by suppressing recolonization in unoccupied but suitable habitats.

Cumulative Effects

Cumulative effects would not be expected with this alternative.

Alternatives 2, 4, and 5

Direct and Indirect Effects

Foothill yellow-legged frogs were detected within one mile of the Trestle project area boundary project during past project surveys in the area (1999), and suitable breeding and non-breeding habitat exists in most of the tributary and main stream reaches below 4,500 feet. Since FYLFs have been detected adjacent to the project area (Sopiago Creek), this species has the potential to be affected by project activities under Alternative 2. Also under Alternative 2, effects from timber harvest, road related activities, fuels reduction, prescribed burning, and restoration activities are possible. However, since FYLF is highly associated with water within stream channels, meadows, and ponded areas, in conjunction with project design features, any direct or indirect effects to FYLF or aquatic habitat are expected to be minimal and limited to treatment areas within RCAs. The greatest threat to FYLF would most likely be from prescribed fire-related mortality or injury, or from post-fire related sediment deposition in response to precipitation events in, or near, riparian zones, in which the outcome of prescribed fire and post-fire effects can be difficult to predict.

Direct and indirect effects to FYLF could also occur from the use of dust palliatives, such as Magnesium Chloride ($MgCl_2$) (dust suppressant) for dust abatement, on logging roads under the design criteria for thinning treatments. Limited studies have occurred on the effects of road salts on amphibians; however, some conclusions can be drawn from present research and studies. In a study conducted in Nova Scotia, field surveys were conducted on roadside aquatic habitats to determine affects from road salts and chloride concentrations on amphibian species. Acute toxicity tests (LC50) were performed on five locally common amphibian species using a range of environmentally

significant NaCl concentrations. Field surveys indicated that spotted salamanders (*Ambystoma maculatum*) and wood frogs (*Rana sylvatica*) did not occupy high-chloride ponds. American toads (*Bufo americanus*) showed no pond preference based on chloride concentration. Acute toxicity tests showed spotted salamanders and wood frogs were most sensitive to chloride, and American toads were the least sensitive. Spring peepers (*Pseudacris crucifer*) and green frogs (*Rana clamitans*) showed intermediate sensitivities. The study concluded that chloride concentrations in aquatic ponds, due to application of salts, influenced community structure by excluding salt-intolerant species (Collins & Russell, 2008). A similar study on the wood frog was conducted in Ohio and it indicated that wood frog survival decreased from salinization of freshwater habitat brought about by road salt run-off (Langhans et al., 2011).

The effect to aquatic life and habitat can vary based upon species and is dependent on concentrations of suppressants used and proximity (Lewis, 1999). Impacts are also dependent on whether the suppressant is used as a diluted liquid or a dry palliative. For the Trestle project, it will be used as dry palliative and, in this state, is less likely to be carried off by water runoff into drainages when compared to a liquid application. However, since the suppressant is water soluble and moves laterally, movement will depend on concentrations and amount of rainfall. Application of the suppressant will occur in the summer months where rainfall is minimal (approximately July 1) which increases the likelihood of the suppressant not moving into drainages and effecting water quality and aquatic life.

The Colorado Department of Transportation (Colorado Department of Transportation (CDOT) 1998) conducted extensive research on the environmental impacts of magnesium chloride as a de-icer on state roads. While this research focuses on a different activity than dust abatement, the results in terms of the chemicals' environmental impact are relevant. Chloride concentration from two separate sources, magnesium chloride and sand with chloride, increased background chloride concentrations by 50 to 100 mg/L during winter application. These concentrations are below levels considered potentially harmful to the most sensitive aquatic organisms (CDOT 1998). The conclusions of the CDOT report stated that magnesium chloride is “highly unlikely to cause or contribute to environmental damage at distances greater than 20 yards. Even very close to the roadway, the potential for magnesium chloride to cause environmental damage is probably much smaller than other factors related to road maintenance.”

Magnesium Chloride concentrations and additions in streams could directly affect larval stages of FYLF. From various studies and research, an increase in salinity concentrations would decrease dissolved oxygen content which can lead to embryonic and larval mortality. Increased salinization could also deter amphibians from aquatic sites and make them less likely to utilize areas for breeding. Indirect effects would include decreased water quality and elevated chloride concentrations, which decrease biological oxygen demand for aquatic life. Osmotic pressure of soils could possibly increase and negatively impact hardwood and tree growth. These effects are likely and are dependent on the movement of the suppressant. The Colorado research above concludes minimal impacts will occur based on time of application and precipitation.

Cumulative Effects

When considered with past, present, and reasonably foreseeable future activities, any cumulative impacts to FYLF or its preferred habitat as a result of implementing Alternative 2, are expected to be minor for the following reasons: there are no treatments within, or adjacent to, known occupied or suitable breeding areas; the expected duration of project-level effects is short; stream buffer exclusion zones were established to minimize potential effects to suitable habitat; the project provides an overall reduction in wildfire risk; and the project restores of dispersed recreational sites in riparian habitat.

Overall, the actions of Alternative 2 will ultimately benefit FYLF because they will reduce wildfire risk, promote riparian habitat through prescribed fire, reduce sediment delivery to streams from road reconstruction and maintenance, and restore dispersed recreational sites. Since response of amphibians depends on the type and magnitude of disturbance, the amount and configuration of remaining habitat, as well as their life-history characteristics, project activities may still impact this species even when the outcome is positive.

Western Pond Turtle

Affected Environment

The western pond turtle (WPT), one of only two species of freshwater turtle native to the west coast of the United States, can be found anywhere from at sea level to approximately 5,000 feet in elevation. Western pond turtles are habitat generalists, occurring in a wide variety of permanent and intermittent aquatic habitats, and found in a variety of habitat types, including ponds, lakes, streams, irrigation ditches, and semi-permanent pools of intermittent streams. Most populations in the Sierra Nevada are restricted to smaller stream habitats.

There is only one WPT sighting within the project area boundary in Leoni Meadow (private) observed in 1995 by forest fisheries crew (with permission). Western pond turtles were not detected within the project area boundary during project-level surveys (2012 and 2013) or during other past project surveys in the area. Habitat suitability was not established for every stream in the project, but it is reasonable to assume that suitable WPT habitat exists in the same reaches identified as suitable for CRLF and FYLF, since these species are commonly found occupying the same habitats below 5,000 feet. A GIS analysis within the project boundary identified 46 treatment units with a total of 830 acres of potentially suitable western pond turtle nesting habitat on south-facing slopes. A total of approximately 2,883 acres of suitable nesting habitat occurs within the project area boundary where prescribed fire activities could affect WPT.

Environmental Consequences

Alternative 1

Direct and Indirect Effects

Under this alternative, fuels would not be reduced, but would continue to accumulate. The risk for high-severity wildfire, along with the possibility of stand replacement mortality, would remain or

increase for much of the project area. No action could lead to a greater risk of erosional effects to aquatic features during periods of increased run-off and snowmelt in the years following a high-severity wildfire than would be experienced by Alternatives 2, 4 and 5.

The hydrologic response of erosion rates after a high-severity wildfire is increased by two or more magnitudes for several years post-fire and returns to near pre-wildfire levels within four or five years. However, the effects to aquatic features and the beneficial uses of water, both within and downstream of a high-severity wildfire, are difficult to predict in fire-suppressed landscapes and depend on many factors. The single most important factor is often the size of the rainfall events that occur during the first several years after the wildfire when the ground is most vulnerable to accelerated runoff and erosion. Tree mortality (snags) in riparian zones, as a result of wildfire, may contribute to large, woody debris recruitment that is lacking in most drainages and may remain elevated for the next 10 – 15 years post-wildfire (Gresswell, 1999). There would be no direct or indirect effects to WPT, its habitat, or its nesting habitat as the result of project activities not being implemented under Alternative 1. However, effects to WPT from potential wildfire under Alternative 1 from lack of fuels reduction-related activities could negatively affect WPT aquatic habitat by increasing sediment deposition, by increasing nutrient loading to streams where they may occur, or by suppressing recolonization in unoccupied but suitable habitats.

Cumulative Effects

No cumulative effects are expected with this alternative.

Alternatives 2, 4, and 5

Direct and Indirect Effects

Effects from timber harvest, road-related activities, fuels reduction, prescribed burning, and restoration activities under Alternative 2 are possible, since WPT is highly associated both with water within stream channels and with adjacent riparian zones, meadows, and ponded areas. In conjunction with project design features, any direct or indirect effects to WPT or aquatic habitat are expected to be marginal. The greatest threat to WPT would most likely be from prescribed fire-related mortality or injury, or from post-fire-related sediment deposition in response to precipitation events in, or near, riparian zones, in which the outcome of prescribed fire and post-fire effects can be difficult to predict. Equipment-related mortality to nesting female turtles, nests, and emerging hatchling turtles in upland habitats are the greatest risks in the upland, non-aquatic habitats.

Individual WPTs (usually males) may have large home ranges and may wander within a given watercourse for several kilometers on a regular basis (Reese, 1996). Western pond turtle nests have been found as far as a quarter-mile from water (Reese & Welsh, 1997) in open, sunny areas on hillslopes, generally with south- to southwest-facing aspects. Threats to nests and hatchlings would occur from May through March since the incubation period for WPTs is approximately eight months, and they may remain in the nest for a week or more. Western pond turtles also move into upland slopes while overwintering. Overwintering movements are poorly understood; however, in Trinity County California, WPTs left the study-area river in September and began return movements in February,

ending them in June; the only lull in activity occurred between December and January (Reese & Welsh, 1997). In the Sierra Nevada, the most likely time for western pond turtle overwintering movements is during the fall/late fall and early spring and would represent movements to and from upland overwintering sites. If WPTs were overwintering within the proposed project area, crushing of individuals could occur during these timeframes; however, the majority of mechanical project activities are expected to occur within the standard operating period (May through October). Therefore, risk to overwintering turtles in the project area is low.

Direct and indirect effects to WPT could also occur from the use of dust palliatives, such as Magnesium Chloride (MgCl2) (dust suppressant) for dust abatements, on logging roads under the design criteria for thinning treatments. Even fewer studies have been conducted on the effects of road pollutants to reptilian species than on the effects to amphibian species. Impacts to aquatic sites would be similar for all aquatic species. The effect to aquatic life and habitat can vary based upon species and is dependent on concentrations of suppressants used and proximity (Lewis, 1999). Impacts are also dependent on whether the suppressant is used as a diluted liquid or a dry palliative. For the Trestle project, it will be used as a dry palliative and, in this state, is less likely to be carried off by water runoff into drainages when compared to a liquid application. However, since the suppressant is water-soluble and moves laterally, movement will depend on concentrations and amount of rainfall. Application of the suppressant will occur in the summer months when rainfall is minimal (approximately July 1), which increases the likelihood of the suppressant not moving into drainages and affecting water quality and aquatic life.

Direct physiological effects from magnesium chloride for WPT may not be known; however, it is reasonable that similar issues exist with the uptake (ingestion) of the pollutant directly from the environment) or from prey items (Andrews et al., 2008). Indirect effects would include alterations in water quality and negative impacts on growth of vegetation due to osmotic pressure in soils. Chloride levels may be elevated from runoff after precipitation events, which can cause a decrease in biological, oxygen-demand influences on the aquatic site.

The Colorado Department of Transportation (CDOT, 1998) conducted extensive research on the environmental impacts of magnesium chloride as a de-icer on state roads. While this research focuses on a different activity than dust abatement, the results in terms of the chemicals' environmental impact are relevant. Chloride concentration from two separate sources, magnesium chloride and sand with chloride, increased background chloride concentrations by 50 to 100 mg/L during winter application. These concentrations are below levels considered potentially harmful to the most sensitive aquatic organisms (CDOT 1998). The conclusions of the CDOT report stated that magnesium chloride is "highly unlikely to cause or contribute to environmental damage at distances greater than 20 yards. Even very close to the roadway, the potential for magnesium chloride to cause environmental damage is probably much smaller than other factors related to road maintenance."

Cumulative Effects

When considered with past, present, and reasonably foreseeable future activities, any cumulative impacts to WPT, its preferred habitat, or its nesting habitat, as a result of implementing Alternative 2, 4 or 5, are expected to be minor for the following reasons: there are no treatments within or adjacent to known occupied streams; the expected duration of project-level effects is short (less than 5 years); stream buffer exclusion zones were established to minimize potential effects to suitable habitat; the project provides an overall reduction in wildfire risk; and the project provides for the restoration of dispersed recreational sites in riparian habitat.

Overall, the actions of Alternative 2, 4 and 5 are most likely to benefit WPT because they will reduce wildfire risk, promote riparian habitat through prescribed fire, reduce sediment delivery to streams from road reconstruction and maintenance, and restore dispersed recreational sites, and a decrease in canopy cover. However, project activities may still impact this species even when the outcome is positive. Response of WPT likely depends on the type and magnitude of disturbance, the amount and configuration of remaining habitat, as well as nesting habitat, and the timing of activities as they relate to life-history characteristics.

Pacific Lamprey

Affected Environment

The Pacific lamprey (PALA) is an anadromous fish that has been documented within two miles of the western forest boundary (near Fairplay, CA) by the California Department of Fish and Wildlife (1994) in the Middle Fork Cosumnes River (an undammed river). There are no PALA sightings within the project area boundary, but targeted PALA surveys in the rivers and streams within the project have not been conducted. The PALA was not observed within the project area boundary during project-level surveys (2012 or 2013) or during past project surveys in the area. Lamprey are not restricted by natural barriers that otherwise might inhibit fish migration. Adult lamprey can migrate over natural barriers (using their sucking disk); consequently, lamprey might be selecting spawning habitats without high fish-predator density; thus, the introduction of nonnative trout in many foothill streams may play a role in lamprey success.

Environmental Consequences

Alternative 1

Direct and Indirect Effects

Under this alternative, fuels would not be reduced, but would continue to accumulate. The risk for high-severity wildfire, along with the possibility of stand replacement mortality, would remain or increase for much of the project area. No action could lead to a greater risk of erosional effects to aquatic features during periods of increased run-off and snowmelt in the years following a high-severity wildfire than would be experienced by Alternatives 2, 4 and 5.

The hydrologic response of erosion rates after a high severity wildfire is increased by two or more magnitudes for several years post-fire and returns to near pre-wildfire levels within four or five years. However, the effects to aquatic features and the beneficial uses of water, both within and downstream of a high-severity wildfire, are difficult to predict in fire-suppressed landscapes and depend on many factors. The single most important factor is often the size of the rainfall events that occurs during the first several years after the wildfire when the ground is most vulnerable to accelerated runoff and erosion. Tree mortality (snags) in riparian zones, as a result of wildfire, may contribute to large, woody debris recruitment that is lacking in most drainages and may remain elevated for the next 10 – 15 years post-wildfire (Gresswell, 1999). There would be no direct or indirect effects to PALA, its habitat, or its nesting habitat as the result of project activities not being implemented under Alternative 1. However, effects to PALA from potential wildfire under Alternative 1 from the lack of fuel-reduction-related activities could negatively affect PALA aquatic habitat by increasing sediment deposition, by increasing nutrient-loading to streams where they may occur, or by suppressing recolonization in unoccupied but suitable habitats.

Overall, the lack of actions implementing Alternative 1 would likely not affect PALA,; however, since there would be no reduction in wildfire risk in an untreated landscape, effects could be expected, and may have lasting consequences, if habitat is rendered unsuitable from lack of these activities. Response of lamprey from lack of treatment will likely depend on the type and magnitude of disturbance, the amount and configuration of remaining habitat, and life-history characteristics.

Cumulative Effects

No cumulative effects are expected with this alternative.

Alternative 2, 4, and 5

Direct and Indirect Effects

Effects from timber harvest, road-related activities, fuels reduction, prescribed burning, and restoration activities under the action alternatives are possible; however, since PALA is highly associated with water within stream channels, meadows, and pond areas. In conjunction with project design features listed, any direct or indirect effects to PALA or aquatic habitat are expected to be minimal and limited to treatment areas within RCAs. The greatest threat to PALA would most likely be from prescribed fire-related mortality or injury, or from post-fire related sediment deposition in response to precipitation events in, or near, riparian zones in which the outcome of prescribed fire and post-fire effects can be difficult to predict.

Direct and indirect effects to PALA could occur from the use of dust palliatives, such as Magnesium Chloride (MgCl2) (dust suppressant) for dust abatements, on logging roads under the design criteria for thinning treatments. Impacts to aquatic sites would be the same for all aquatic species.

The effect to aquatic life and habitat can vary based upon species and is dependent on concentrations of suppressants used and proximity (Lewis, 1999). Impacts are also dependent on whether the suppressant is used as a diluted liquid or a dry palliative. For the Trestle project, it will be used as a dry

palliative and, in this state, is less likely to be carried off by water runoff into drainages when compared to a liquid application. However, since the suppressant is water-soluble and moves laterally, movement will depend on concentrations and amount of rainfall. Application of the suppressant will occur in the summer months when rainfall is minimal (approximately July 1), which increases the likelihood of the suppressant not moving into drainages and affecting water quality and aquatic life.

The Colorado Department of Transportation (CDOT 1998) conducted extensive research on the environmental impacts of magnesium chloride as a de-icer on state roads. While this research focuses on a different activity than dust abatement, the results in terms of the chemicals' environmental impact are relevant. Chloride concentration from two separate sources, magnesium chloride and sand with chloride, increased background chloride concentrations by 50 to 100 mg/L during winter application. These concentrations are below levels considered potentially harmful to the most sensitive aquatic organisms (CDOT 1998). The conclusions of the CDOT report stated that magnesium chloride is "highly unlikely to cause or contribute to environmental damage at distances greater than 20 yards. Even very close to the roadway, the potential for magnesium chloride to cause environmental damage is probably much smaller than other factors related to road maintenance."

Direct physiological effects from magnesium chloride for PALA may not be known; however, it is reasonable that similar issues exist with the osmoregulation of fish affecting their survival, growth, and reproduction (Hunt et al., 2012). They can also be affected through the uptake (ingestion) of the pollutant directly from the environment or from prey items, such as plankton. Indirect effects would include alterations in water quality and negative impacts on growth of vegetation due to osmotic pressure in soils. Chloride levels may be elevated from runoff after precipitation events, which can cause a decrease in biological, oxygen-demand influences on the aquatic site. These potential impacts could only occur if the suppressant enters drainages, and, based on the Colorado study and the timing of application, impacts are unlikely.

Cumulative Effects

When considered with past, present, and reasonably foreseeable future activities, any cumulative impacts to PALA, its preferred habitat, or its nesting habitat, as a result of implementing the action alternatives, are expected to be minor for the following reasons: there are no treatments within, or adjacent to, known occupied or suitable breeding areas; the expected duration of project-level effects is short (less than 5 years); short buffer exclusion zones were established to minimize potential effects to suitable habitat; the project provides an overall reduction in wildfire risk; and the project restores dispersed recreational sites in riparian habitat.

Overall, the actions of Alternative 2, 4, and 5 will ultimately benefit PALA because they will reduce wildfire risk, promote riparian habitat through prescribed fire, reduce sediment delivery to streams from road repair and road closure, and restore dispersed recreational sites. However, project activities may still impact this species even when the outcome is positive. Response of PALA likely depends on the type and magnitude of disturbance, the amount and configuration of remaining habitat, and their life-history characteristics.

Terrestrial Wildlife

The National Forest Management Act, the Code of Federal Regulations (CFR 219.19), the Forest Service Manual (FSM, 2672), and the Sierra Nevada Forest Plan Amendment Final Supplemental Environmental Impact Statement (USDA Forest Service, 2004) provide direction to maintain the viability of Region 5 endangered, threatened, and sensitive species. Yasuda (2014) summarizes the potential effects of project activities to federally listed threatened, endangered or proposed species, and to Region 5 Forest Service-designated sensitive terrestrial wildlife species.

Federally Listed Species

No proposed, threatened or endangered terrestrial wildlife species or designated critical habitats are known to occur in the project area.

Sensitive Species

California Spotted Owl

Affected Environment

The Eldorado National Forest (ENF) occurs in the central portion of the species range and represents about 16% of the known population in the Sierra Nevada. The California spotted owl has several characteristics that are associated with increased species vulnerability: they have large individual spatial requirements, they have low population densities, and they are habitat specialists. Spotted owls have high adult survival rates and low reproductive rates—these life-history characteristics render spotted owl populations slow to recover from population declines (Verner et al., 1992). California spotted owl demographics and population trends are monitored at four study areas, one of which occurs in the ENF. Blakesley et al. (2010) analyzed demographic data for the period 1990-2005 and concluded that, with the exception of the Lassen study area, owl populations were stable. However, ongoing research on the three studies on National Forest System (NFS) lands and a stable/increasing population on the National Park Service study area provides increasing evidence of population decline (Keane, 2012). The factors driving these population trends are not known, but the increasing evidence of declining population trends of spotted owls on NFS lands in the Sierra Nevada points to the need for a careful approach to management of California spotted owls and their habitat. Numerous studies and reviews have identified risk factors for California spotted owl populations that revolve around habitat abundance and distribution, habitat quality, and the influence of climate and wildfire (USDI Fish and Wildlife Service, 2006; USDA Forest Service, 2003; Verner et al., 1992). In addition to habitat concerns, California spotted owls face a significant emerging threat due to the recent range expansion of barred owls into the Sierra Nevada. In 2014, the demographic study area in the ENF showed preliminary good nesting, as it did in other PACs across the forest; however; a portion of the demographic study area was adversely impacted by the 2014 King Fire, resulting in impacts to a large number of PACs. The post-fire condition of these PACs is currently being assessed, so the conditions for continued occupancy are unknown.

In the ENF, California spotted owls are known to occur between 2,000 and 7,200 feet in elevation, with most nesting pairs found in the Sierran mixed-conifer habitat type. California spotted owl habitat is often subdivided into nesting habitat, roosting habitat, and foraging habitat. Habitats used for nesting and roosting are very similar, and so they are combined and described as "nesting-roosting habitat." Such areas are used for nesting, roosting, foraging, and dispersal by spotted owls, and these areas are usually forests with more late-seral forest characteristics than those of a "foraging" habitat. The spotted owl's foraging habitat is largely used for foraging and for dispersal, but it often lacks nest or roost sites or may have insufficient canopy cover to provide nesting or roosting opportunities. These categories are generalizations; however nesting-roosting habitats are generally considered to provide all or most habitat requirements, whereas foraging habitats are considered to provide only a subset of the spotted owl's habitat requirements.

Suitable habitat for the California spotted owl consists of mature forested habitats with large trees, and dense canopy cover with at least two canopy layers with 70 percent canopy closure preferred for nesting and roosting and more than 50 percent canopy closure preferred for foraging (USDA Forest Service, 2001; USDA Forest Service, 2004; Verner et al., 1992). Using the 2005 Forest Vegetation Inventory data and modeling of spotted owl habitat using CWHR, there are approximately 4,559 acres of high quality habitat (5M/5D) and 10,887 acres of medium quality habitat (4M/4D) on NFS lands within the 20,453-acre project-area boundary (see Table 34 for definitions). On private land, there are 545 acres of medium quality habitat and 64 acres of high quality habitat.

Core Area and Home Range Scale

Research results from the Eldorado demographic study area (Seamans, 2005; Seamans & Gutierrez, 2007) suggest that California spotted owl territories with greater amounts of mature, dense-canopied conifer forest (MCF), defined as having an average tree size greater than 12 inches dbh and a canopy cover greater than 70%, have a higher probability of being colonized and a lower probability of becoming unoccupied. Seamans and Gutierrez (2007) also found that alteration of more than 50 acres of this habitat in spotted owl territories appeared to increase the likelihood of territory extinction. Based upon these results, mature, dense-canopied forest is considered high-quality habitat since it correlates to occupancy probability. If high-quality habitat is limited within a spotted owl territory, treatments that reduce canopy cover may increase the probability of territory extinction. Because the referenced studies used discreet categories of ">70%" and "30-69%" for canopy cover, the real threshold for canopy cover that contributes to or detracts from territory occupancy and survivorship remains unknown. For example, although it is known that habitat with more than 70% canopy cover contributes to territory occupancy, it remains unknown whether habitat with 60-70 percent canopy cover might also contribute to territory occupancy.

The optimal amount of area that should be maintained as mature, dense-canopied forest in the area surrounding spotted owl activity centers remains uncertain, but Seamans (2005) reported that the probability of territory extinction on the ENF demographic study area approached zero as the area with mature, dense forest (average tree size greater than 12 inches dbh and canopy cover greater than 70%)

approached 617 acres within a 1,000-acre circular area surrounding the territory center. Based on this information, however, this analysis assumes that when 617 acres of mature-conifer habitat is maintained surrounding the spotted owl activity center (preferably within 0.7 miles of the activity center), thinning of additional dense-canopied habitat is unlikely to increase the likelihood of territory extinction or to reduce spotted owl survivorship.

Surveys

The project area has been surveyed to protocol for spotted owls in 2008, 2009, 2012, and 2013 (USDA Forest Service, 1991). Nineteen spotted owl PACs and corresponding Home Range Core Area (HRCA) boundaries within the project boundary were assessed, updated, and redrawn based on the survey data. Table 21 provides the status of these PACs and their associated HRCAs.

Table 21
Status of California Spotted Owl territories within the Trestle Project area

PAC #	PAC Habitat Suitability Acres High=5M/5D Medium=4M/4D				HRCA Habitat Suitability Acres High=5M/5D Medium=4M/4D				Status in last 10 years up to 2013[1]	
	High	Medium	Other	Total	High	Medium	Other	Total	1	2
ELD0007[2]	235	114	2	350	304	739	8	1,050	No	Yes
ELD0011	74	177	48	300	148	679	174	1,000	Yes	Yes
ELD0017	152	143	5	300	295	658	48	1,000	Yes	Yes
ELD0019	212	85	3	300	371	577	53	1,000	Yes	Yes
ELD0035	192	105	3	300	607	375	18	1,000	Yes	Yes
ELD0059	194	77	30	300	516	411	43	1,000	No	Yes
ELD0063	190	72	38	300	401	475	124	1,000	Yes	Yes
ELD0110	148	148	5	300	255	734	12	1,000	No	Yes
ELD0111	219	81	0	300	419	581	0	1,000	No	Yes
ELD0112	87	204	10	300	152	809	39	1,000	No	No
ELD0155	76	204	20	300	98	778	124	1,000	Yes	Yes
ELD0208	178	103	19	300	427	513	61	1,000	Yes	Yes
ELD0322	261	36	3	301	539	415	47	1,000	No	No
ELD0323	66	202	32	301	233	669	98	1,000	No	Yes

PAC #	PAC Habitat Suitability Acres High=5M/5D Medium=4M/4D				HRCA Habitat Suitability Acres High=5M/5D Medium=4M/4D				Status in last 10 years up to 2013[1]	
	High	Medium	Other	Total	High	Medium	Other	Total	1	2
ELD0324	26	244	30	300	30	788	183	1,000	No	Yes
ELD0325	153	144	3	300	458	538	3	1,000	No	Yes
ELD0326	35	266	22	324	128	833	40	1,000	No	Yes
Leoni Meadows	196	100	4	300	346	609	45	1,000	No	Yes
Shingle Mill Gulch	40	250	10	300	263	716	21	1,000	No	No

[1]1= Reproductive; 2 = Pair multiple years, or if new PAC, has recent pair status.
[2]Exceeds 1,000 acres due to combination PACs of both spotted owl and great gray owl

Environmental Consequences

Alternative 1

Direct and Indirect Effects

There are no activities related to this project; therefore, there will be no direct effects to spotted owls or their habitat.

Cumulative Effects

Since there would be no activities, this alternative would not contribute toward any adverse cumulative effects related to disturbance of individuals or habitat.

Alternative 2

Direct and Indirect Effects

DIRECT DISTURBANCE

Disturbance during the nesting season can result in nest-site failure or abandonment. Direct disturbance to nesting owls would be avoided by the implementation of a Limited Operating Period (LOP) for all units within a quarter-mile of a known activity center.

Prescribed burn units that come within a quarter-mile of PACs will need surveys in future years to determine if LOPs are required. Additional surveys would occur through project implementation to provide valid information in accordance with survey protocols or to assess if LOP timeframes can be altered or lifted.

Since prescribed fire use would occur within several PACs, which include roost sites and areas in which spotted owls do a substantial amount of foraging, prescribed fire implementation is likely to cause temporary disturbance from people, smoke, and other consequences of natural understory wildfires. Activities may cause individual roosting owls to awaken or relocate within the stand, particularly from the noise associated from hand thinning with chainsaws. This activity will be of less effect when it occurs in the late fall outside the breeding season (October) and when the fledglings are no longer completely dependent on the adult birds.

Road maintenance and reconstruction could be a potential source of disturbance for spotted owls if they are nesting in close proximity to these activities. Road reconstruction or maintenance would produce noise levels similar to logging for 1 to 4 hours on any average 300-foot portion of road reconstruction. United States Fish and Wildlife Service (USFWS) guidelines for northern spotted owls recommend a 100-meter (approximately 330 feet) noise disturbance buffer from action-generated noise from heavy equipment, such as dozers and road graders. Several PACs have owls that roost alongside roads, which would result in disturbance to spotted owls. When PACs have owl roosts or nest stands outside this distance, the nesting of California spotted owls would not be impacted. To avoid or minimize disturbance from project activities associated with the Trestle Project, implement design criteria, such as LOPs for the spotted owl.

HABITAT ALTERATION

The effects of altering spotted owl habitat occur at multiple scales. The direct and indirect effects of the project are described at the stand scale and at the territory scale, which includes the PAC and HRCA land allocations.

Vegetation treatments that are designed to reduce stand density and reduce surface and ladder fuels can alter spotted owl habitat by reducing canopy cover and structural diversity in nesting and foraging habitats; reducing the density of snags and the amount of down, woody debris; and affecting understory vegetation and ground cover. Under Alternative 2, 4,450 acres of suitable spotted owl habitat would be treated with mechanical thinning.

Collectively, studies suggest the presence of large trees and high overstory canopy cover are the most important conditions associated with spotted owl occurrence and survival (North, 2012; Blakesley, 2005; Seamans, 2005; Seamans & Gutierrez; 2007). High structural diversity, provided through a diversity of tree heights and canopy layers, is thought to benefit spotted owls by contributing to a greater diversity of prey species, providing a variety of perch sites for increased hunting opportunities, providing cooler microclimates for roost sites, and increasing protection from predators (North et al., 1999; Verner et al., 1992; Weathers et al., 2001). Reductions in canopy cover may have adverse effects on site occupancy, survival, and reproduction of spotted owls due to exposure to weather, predators, and modification of preferred forest structure for prey (Federal Register, 2006).

Although spotted owls have been studied for more than twenty years, the effects of fuels treatments on the species remain largely unknown. In an exploratory case study on the Plumas National Forest (PNF), spotted owls did not avoid foraging in habitat where fuels reduction mechanically removed

trees up to 10 inches dbh or used hand thinning, or used prescribed fire. They did avoid foraging in recently treated Defensible Fuel Profile Zones (DFPZs) thinning treatments (Gallagher 2010). The initial results from the Meadow Valley Project on the PNF indicated that spotted owls avoided foraging in understory thinning areas that created DFPZs, probably because such treatments did not maintain conditions suitable for spotted owl prey (Gallagher, 2010). Researchers have postulated that retention of patches of dense cover, higher than average amounts of down wood and snags, a variety of tree heights, and patches of understory vegetation are important for maintaining the density of spotted owl prey in treated sites. The PNF study found that home ranges tend to contain fuel treatments; however, home range size tended to increase with increasing proportion of treatments. Increases in the size of home range suggest that foraging habitat quality is reduced by fuel treatments; thus, the owls have to forage further to meet their needs, increasing risk of mortality and the loss of reproductive success. Thus, although treatments may retain California Wildlife Habitat Relationships (CWHR) classes that are identified as suitable habitat (4M, 4D, or 5M), the treated stands may provide less suitable habitat than untreated stands of equal CWHR type due to the removal of habitat attributes, particularly the reduction of dense cover patches, reduction in the diversity in tree heights, and reduction in woody debris.

Temple et al. (2014) looked at 74 spotted owl territories in the Sierra Nevada, and analyzed 20 years' worth of data in relation to effects of wildfire, forest condition, and fuels reductions, adult survival, and occupancy of territories. Medium intensity harvest that is characteristic of fuels treatments was negatively related to spotted owl reproduction (Ibid). Owls responded to modest amounts of harvest and were predicted to decline from 0.54 to 0.45 when 20 hectares were treated, and areas harvested larger than this only showed a slightly higher decline (Ibid). Effects to reproduction may be the result of effects on prey base that rely on vertical layers and complex understories, which are also important components of spotted owl foraging habitat. Temple et al. (2014) stated, "When medium-intensity harvests were implemented within high-canopy forests, they reduced the canopy sufficiently for mapped polygons to be reclassified into a lower-canopy vegetation class in 90.1% of these treated areas. . . . [S]uch changes were associated with reductions in survival and territory colonization rates, as well as increases in territory extinction rates. As a result, we believe the most appropriate inference about the influence of medium-intensity harvesting practices is that they appear to reduce reproductive potential, and when implemented in high-canopy forests, likely reduce survival and territory occupancy as well. They also recommended that fuels treatments focus on ladder fuels and reduction in tree density while maintaining relatively high canopy cover."

In the Meadow Valley study on the PNF, the effects on spotted owls across a landscape treated with fuel reduction projects showed declines in the territorial spotted owl sites after treatment. Stephens et al. (2014) documented the following:

1. After the final year of DFPZ treatments and after 3 to 4 years, the number of spotted owl sites had declined from nine to four, a 43% decline from pre-treatment numbers;

2. Additional radio telemetry studies showed avoidance of DFPZs for 1 to 2 years after treatments and a change in owl territory size that was positively related to the amount of fuel treatments;
3. A change in spatial redistribution across the landscape by owls was seen;
4. Heterogeneity across the landscape is needed for both owl foraging and managing fire; and
5. Effects on owls could have been mitigated across the landscape by increasing spatial heterogeneity of fuels treatments and by increasing the use of prescribed fire to better mimic historic fire patterns, with which the spotted owl has evolved.

Higher levels of snags and down wood are also associated with spotted owl habitat use and are likely important elements supporting prey. Snags provide nesting and denning habitat for spotted owl prey, such as squirrels and woodrats (Verner et al., 1992). Management practices that decrease these elements, as well as decreases in litter depth and decreases in the soil organic layer, could affect the production of hypogeous fungi, which is major food source for flying squirrels and white footed mice, both of which are prey for the spotted owl (Meyer et al., 2007). Because snags and down wood have inherently uneven distribution and temporal transience, some researchers have recommended managing the source of coarse, woody debris and suggested that retaining sufficient large diameter trees across the landscape will allow for a steady recruitment of snags and logs (Innes et al., 2006).

Studies that have investigated the effects of fire on spotted owls have generally indicated that low- to moderate-severity fires, which were historically common within montane forests of the Sierra Nevada, maintain habitat characteristics essential for spotted owl site occupancy (Roberts et al., 2010; Lee et al., 2012). Keane et al. (2011) reported that California spotted owls did not avoid foraging in areas treated with prescribed fire and reported that, in fact, one owl strongly selected underburn treatments over untreated forest for foraging. Bond et al. (2009) reported that owls nested and roosted in unburned or low- to moderate-severity patches of forest, and, four years after the fire, they foraged selectively in high-severity burn patches that were located within larger home ranges that generally burned at low- to moderate-severity. Patches of early successional vegetation recovering from high-severity fire may provide access to early successional associated prey, such as woodrats and gophers, within the mosaic of mixed fire-severity landscapes. North (2012) concluded that where overstory tree mortality remains low and areas of high canopy cover remain after a burn, prescribed burning is likely to retain habitat features that are important for roosting and reproducing spotted owls.

Mechanical Thinning and Follow-up Treatments of Surface and Ladder Fuels:

Mechanical thinning treatments in Alternative 2 will result in removal of small and intermediate size (less than 30” dbh) co-dominant and understory trees, resulting in measurable reductions of canopy cover and a simplification of stand structure (reduction in tree height diversity) from pre-treatment conditions. Objectives established in the 2004 Sierra Nevada Forest Plan Amendment (SNFPA) allow for up to 30% canopy reduction. For the Trestle project, it is estimated that average canopy cover will decrease approximately 18% following commercial thinning (Trestle Silvicultural Report, 2014).

Follow-up prescribed burn activities are expected to reduce canopy cover by another 5%. Thus, thinning and follow-up treatments are estimated to reduce existing canopy cover by a maximum of 23%. Canopy cover should return to pre-treatment levels within 20 to 30 years. Prescriptions are generally expected to retain at least 50% canopy cover in spotted owl HRCAs. Thinning treatments measured on the ENF in 2007 found the density of large trees (greater than 30" dbh) decreased between the pre-treatment and post-treatment sampled plots within mechanical thinning treatments, but these declines, which could have resulted from hazard tree removal, placement of landings, and skid trials, were relatively minor (Guitierrez & Whitmore, 2008).

Understory shrub cover and coarse, woody debris would decrease following understory burning or piling and burning treatments in thinned units (Innes et al., 2007). It is anticipated that prey species (particularly dusky-footed woodrats and flying squirrels) would decrease in thinned and tractor piled units for 3 to 5 years, as these species are positively related to shrub cover, litter depth, and woody debris (Converse et al., 2006; Innes et al., 2007; USDA Forest Service, 2006).

Mechanical Thinning in CWHR 5M/5D Stands:

In Alternative 2, 610 acres of large tree stands (CWHR 5M/5D) are proposed for commercial thinning. This represents 13% of the 5M/5D habitat on NFS lands in the project boundary. The SNFPA describes a management intent of avoiding vegetation treatments in CWHR 5D and 5M types occurring in HRCAs as these types typically correspond to high-quality spotted owl nesting and foraging habitats. Higher proportions of the 5M/5D habitat type in territories are considered important for occupancy within territories (Verner et al., 1992; USDA Forest Service, 2001; Seamans & Gutierrez, 2007).

Mechanical Thinning in CWHR 4M/4D Stands: In Alternative 2, understory thinning would occur on 3,840 acres of CWHR 4M and 4D vegetation types. A sizeable portion of the 4D stands are likely to provide nesting-roosting habitat now, if not in the future, as trees continue to increase in size where conditions allow. This represents 35% of the 4M/4D habitat on NFS lands in the project boundary.

According to the 2014 Silviculture Report for the Trestle Forest Health Project, stand exams in 2012 and 2013 showed stands proposed for commercial thinning containing approximately 3 dead trees greater than 15 inches dbh, with an average diameter of 25 inches, and about 60 feet tall per acre. In the eastern Cascade Range, snag populations were found to decline following thinning treatments, probably as a result of snag removal to prevent safety hazards. However, thinning, followed by burning, was found to increase total snag abundance and clumpiness in all but the largest diameter class (Hesselburg, 2010). Though new snags will be created from burning, late decay snags may be consumed, thus reducing or removing this habitat component for both spotted owls and prey that may be utilizing existing cavities within these trees for nesting or denning.

Alternative 2 follows General Technical Report (GTR) prescriptions and will retain some patches of vegetation for heterogeneity in the stand; however, these could be consumed during follow-up prescribed burning if they are not avoided, further reducing prey habitat in these units. Shrub and understory cover along with prey species abundance and composition after prescribed burning, would

decrease in treatment units but would be expected to return to pre-treatment conditions within 5 to 10 years. Large downed, woody material would decrease with piling and burning (Silviculture Report, 2014). Retention patches following GTR prescriptions may retain some coarse, woody debris on the ground. Nonetheless, thinning and follow-up treatments will reduce large coarse, woody debris and canopy cover, which is likely to reduce habitat quality for spotted owl prey (woodrats and flying squirrels) within treatment units (Meyer et al., 2007). Herbers (2008) found that northern flying squirrel density in the northwest averaged 60% lower in harvested treatments from 1 to 4 years following treatment, regardless of intensity or pattern of logging. Flying squirrels were detected on multiple occasions and locations during spotted owl surveys (Yasuda, pers. obs. 2012 and 2013) and would be a prey species of concern to maintain for spotted owls in the Trestle project.

Prescribed Fire Treatments

Alternative 2 would treat 9,583 acres of spotted owl habitat using prescribed fire. Regional monitoring of vegetation changes associated with prescribed burn treatments documented no significant change in canopy cover or structure (Fites-Kaufman, 2007). Roberts (2010) found that prescribed fire treatments implemented in Yosemite National Park resulted in similar basal area of large snags between burned and unburned sites. However, Bagne et al. (2007) found an overall loss of about 12% of snags as a result of prescribed fire treatments in Sierra Nevada pine-dominated forests.

Prescribed fire treatments under Alternative 2 are not expected to reduce canopy cover more than 5%, averaged across the treatment area. Delayed mortality of large diameter trees following prescribed burn treatments has occurred on the ENF where treatment areas have contained a heavy layer of duff. Design criteria, such as raking, to reduce the potential for mortality in large diameter legacy pine will substantially reduce the likelihood of large tree mortality.

Available studies suggest that, with careful implementation, prescribed burning may benefit California spotted owls by protecting their nesting and roosting habitat from catastrophic fires while creating a diversity of landscape conditions (Roberts, 2011; Gallagher, 2010; Lee et al., 2012).

PROBABILITY OF TERRITORY ABANDONMENT, REDUCED OWL SURVIVORSHIP, AND/OR REDUCED COLONIZATION (PACS AND HRCAS)

The status of spotted owl territories is displayed in Table 21 above. Impacts to spotted owl sites that have reproduced, or that have had consistent pairs within the last 10 years, would be of greatest concern, since abandonment of these sites would have the greatest impact on the status and trend of the local population.

Suitable Habitat (CWHR 4M/4D and 5M/5D) Affected within PACs and HRCAs:

Spotted owl PACs will not be entered for commercial harvest. Commercial harvest would occur within nineteen HRCAs, ranging from 2% to 38% of the suitable habitat within the HRCA affected. Alternative 2 alters 20% or more of the available suitable habitat within five of the HRCAs, including ELD0007, ELD0035, ELD0110, ELD0111, and Shingle Mill Gulch. See Table 22.

Table 22
Amount of CWHR 4M/4D and 5M/5D Habitat Acres on NFS lands for spotted owl PACs in the project area with HRCAs affected by commercial harvest

PAC #	Existing HRCA Habitat Suitability Acres High = 5M/5D Medium = 4M/4D				
	High Suitability Acres	**% High Affected in HRCA**	**Medium Suitability Acres**	**% Medium Affected in HRCA**	**%HRCA (1000[1]) high and medium suitable acres affected by harvest**
ELD0007	37	12%	254	34%	28%
ELD0011	11	7%	113	17%	12%
ELD0017	1	1%	31	5%	3%
ELD0019	42	11%	95	16%	14%
ELD0035	235	39%	144	38%	38%
ELD0059	31	6%	10	2%	4%
ELD0063	49	12%	11	2%	7%
ELD0110	20	8%	328	45%	35%
ELD0111	84	20%	245	42%	33%
ELD0112	40	26%	80	10%	12%
ELD0155	5	5%	58	7%	7%
ELD0208	19	4%	1	<1%	2%
ELD0322	5	1%	98	24%	10%
ELD0323	100	43%	87	13%	19%
ELD0324	30	100%	72	9%	10%
ELD0325	27	6%	60	11%	9%
ELD0326	128	100%	0	0%	13%
Leoni Meadows	4	1%	61	10%	7%

PAC #	Existing HRCA Habitat Suitability Acres High = 5M/5D Medium = 4M/4D				
	High Suitability Acres	% High Affected in HRCA	Medium Suitability Acres	% Medium Affected in HRCA	%HRCA (1000[1]) high and medium suitable acres affected by harvest
Shingle Mill Gulch	113	43%	244	34%	36%

[1]ELD0007 has 1,050 total acres

Mature Conifer Forest (CWHR 4D and 5D with greater than 70% canopy cover) Affected within Circular Core Areas (CCAs) and HRCAs

There are sixteen (out of nineteen) spotted owl sites that have reproduced or that have had repeated detections of pairs that would be affected by altering Mature Conifer Forest (MCF) within the circular core area or HRCA. These include some of the most highly utilized sites in the project area, and the extent of habitat alteration under Alternative 2 increases the risk to these sites.

Table 22 displays the pre- and post-MCF habitat within the Circular Core Areas (CCAs) and HRCA associated with each PAC. Table 23 displays the information as it pertains to effects to habitat, territory loss, and potential abandonment of sites.

Table 23
Amount of Mature Conifer Forest (MCF) on National Forest System lands in spotted owl PAC Circular Core Areas and HRCAs prior to and following commercial thinning treatments under Alternative 2

PAC #	Circular Core Area (CCA) MCF Habitat within .7 miles of an activity center			HRCA MCF Habitat		
	Total MCF Pre-Treatment	Total MCF Being Treated	% of MCF in Circular Core Affected	Total MCF Pre-Treatment	Total MCF Being Treated	% of MCF in HRCA Affected
ELD0007	546	17	3	654	290	44
ELD0011	457	6	1	565	124	22
ELD0017	493	1	<1	787	32	4
ELD0019	401	8	20	694	137	20
ELD0035	758	131	17	916	379	41

PAC #	Circular Core Area (CCA) MCF Habitat within .7 miles of an activity center			HRCA MCF Habitat		
	Total MCF Pre-Treatment	Total MCF Being Treated	% of MCF in Circular Core Affected	Total MCF Pre-Treatment	Total MCF Being Treated	% of MCF in HRCA Affected
ELD0059	616	26	4	800	41	5
ELD0063	481	9	2	589	60	10
ELD0110	753	29	4	862	348	40
ELD0111	855	43	5	863	328	38
ELD0112	705	29	4	515	120	23
ELD0155	503	2	<1	490	63	13
ELD0208	434	1	<1	721	21	3
ELD0322	530	5	1	677	102	15
ELD0323	487	68	14	517	187	36
ELD0324	404	0	0	421	72	17
ELD0325	646	23	4	851	87	10
ELD0326	424	0	0	556	0	0
Leoni Meadows	638	1	<1	799	65	8
Shingle Mill Gulch	613	51	8	792	357	45

Table 24
Summary of Findings for Table 23

Factor	Number of Territories	Interpretation of Effects
Affected by harvest prescriptions that will reduce habitat quality – MCF habitat within CCA and HRCA	18	About 9% of ENF spotted owl sites (PACs)
HRCA: Owl sites that currently have >600 acres of MCF habitat within the HRCA	12	N/A
Owl sites that would have >600 acres of MCF habitat within HRCA post-project	5	N/A
Less than 600 acres of MCF habitat remaining in HRCA post-project.	14	Treatments increase the probability of territory loss. **Note:** One of territories, ELD0326 has no proposed commercial thinning within HRCA MCF habitat.
Less than 370 acres of MCF habitat in HRCA following treatments	3	Likelihood of territory abandonment would increase steeply following treatments.
Circular Core Area (CCA): Owl sites that currently have >600 acres of MCF habitat within the CCA.	8	N/A
Owl sites that would >600 acres MCF habitat within CCA post-project	6	N/A
Less than 600 acres of MCF habitat remaining in CCA post-project.	13	Treatments increase the probability of territory loss. Note: Two of the territories, ELD0324 and ELD0326 have no proposed commercial thinning within CCA MCF habitat
Less than 370 acres of quality habitat in CCA after treatments	0	N/A

Cumulative Effects

Within the 45,461-acre cumulative effects analysis area (with a 2-mile buffer around the project boundary), about 6,878 acres (6,187 NF acres and 691 private acres), or 15%, are estimated to be high-quality habitat and 24,298 acres (16,509 NF acres and 7,789 private acres), or 53%, are estimated to be medium-quality habitat for the spotted owl.

Owls with substantial alteration of habitat within their home range likely enlarge their home range and shift habitat use, utilizing the suitable portions of their home range heavily and/or shifting their home range to encompass more suitable habitat (Gallagher, 2010). Thus, for owl HRCAs and for home ranges that have had a large amount of past habitat modification, the residual unmodified habitat may be heavily utilized and less opportunity may exist to shift use to other areas, particularly habitat that is adjacent to residential or developed private property, such as Grizzly Flats and Leoni Meadows.

The level of habitat alteration likely to result in a loss of occupancy or reduced fitness in spotted owl territories remains unknown. The Sierra Nevada Forest Plan Amendment assumed in its analysis that 80% of the acres within HRCAs would remain untreated and that provisions were provided for habitat abundance at the landscape level and at the home range scale level (USDA Forest Service 2004, p. 206). Observations of 10 spotted owl sites from one project area on the ENF, noted sites were unoccupied where more than 40% of the HRCA had been altered by past treatments. In the past 14 years (since 2001), 16% of all HRCA acres (including overlapping acres) have been treated on the ENF; thinning treatments in individual owl HRCAs have varied, but increasingly exceed 40% of the HRCA. In the Trestle analysis area, between 0% and 26% of the HRCA habitat for individual owl sites has received past thinning treatments, such as mechanical harvest, which would contribute to higher impacts to habitat.

Of the 19 spotted owl sites in the analysis area, Alternative 2 would result in eight spotted owl sites with more than 20% of HRCA habitat cumulatively treated using high-impact past treatments; four spotted owl sites would have more than 30% percent of HRCA habitat cumulatively affected by high-impact treatments. Table 25 displays HRCAs affected by mechanical thinning (displayed under high-impact column). Suitable habitat displayed under the high-impact column does not include prescribed burning or hand thinning treatments, since these activities are unlikely to reduce habitat quality to a degree that current CWHR typing will be greatly altered. However, these contribute moderate effects and are shown in combination with high impacts under the both columns to show the contribution these effects have cumulatively on individual HRCAs.

Table 25
Proportion of suitable habitat within spotted owl HRCAs and acreage affected by past, present, and future treatments

PAC	Acres of Suitable Habitat	Acres Affected past and reasonably foreseeable future actions		% HRCA altered by past and reasonably foreseeable future actions		Acres altered by Alternative 2 treatments	% HRCA altered by Alternative 2 treatments	% HRCA altered by past, present, and reasonably foreseeable future actions	
		High[1]	Both[2]	High[1]	Both[2]			High[1] w/Alt2	Both[2] w/Alt2
ELD0007	1,043	1	318	1	30	291	28	29	58

PAC	Acres of Suitable Habitat	Acres Affected past and reasonably foreseeable future actions		% HRCA altered by past and reasonably foreseeable future actions		Acres altered by Alternative 2 treatments	% HRCA altered by Alternative 2 treatments	% HRCA altered by past, present, and reasonably foreseeable future actions	
		High[1]	Both[2]	High[1]	Both[2]			High[1] w/Alt2	Both[2] w/Alt2
ELD0011	827	54	126	5	13	124	12	17	25
ELD0017	953	260	332	26	33	32	3	29	36
ELD0019	948	85	243	9	24	137	14	23	38
ELD0035	982	18	100	2	10	379	38	40	48
ELD0059	927	48	192	5	19	41	4	9	23
ELD0063	876	35	162	4	16	60	6	6	22
ELD0110	989	5	241	1	24	348	35	35	59
ELD0111	1,000	6	359	1	36	329	33	34	69
ELD0112	961	34	477	3	48	120	12	15	60
ELD0155	876	46	550	4	55	63	6	10	61
ELD0208	940	35	79	4	8	20	2	6	10
ELD0322	954	9	187	1	19	103	10	11	29
ELD0323	902	45	910	5	100	187	19	24	100
ELD0324	818	50	218	5	22	102	10	15	32
ELD0325	996	21	220	2	22	87	9	11	31
ELD0326	961	42	50	4	5	128	13	17	18
Leoni Meadow	955	3	206	1	21	65	7	7	27
Shingle Mill Gulch	979	0	208	0	21	357	36	36	57

[1]High=mechanical treatments

[2]Both=high impact (mechanical treatments) and moderate impacts (prescribed burning)

Commercial thinning would occur within nineteen HRCAs, altering between 6% to 41% of suitable habitat on NFS lands within the HRCA of PACs, some of which are the most productive spotted owl sites in the analysis area. Results from Seamans and Guitierrez (2007) suggest that habitat alteration of this magnitude may increase the risk of dispersal from these territories. Considering the uncertainties surrounding spotted owl response to treatments, the number of spotted owl sites affected by treatments, and the extent of habitat alteration in circular core areas and HRCAs, Alternative 2 may result in a loss of occupancy within one or more spotted owl sites. The increased risk of localized "territory extinction" is significant since it would apply to territories that have consistently supported spotted owls.

Alternative 4

Direct and Indirect Effects

Alternative 4 has similar direct, indirect, and cumulative effects as Alternative 2 with the following exceptions:

1. Alternative 4 was developed to reduce project effects upon spotted owls by focusing mechanical thinning treatments in areas that are outside high-quality spotted owl habitat and/or are a greater distance from owl territory centers, particularly where such habitat may be limited for an owl site.
2. When compared with Alternative 2, Alternative 4 calls for 2,018 fewer acres of suitable habitat to be mechanically thinned. There are 305 acres of CWHR 5D (compared to 610 acres under Alternative 2) having trees up to 29.9" removed within treatment units; there are also 1,703 acres of 4D (compared to 3,162 acres under Alternative 2) and 424 acres of 4M (compared to 678 acres under Alternative 2) proposed for mechanical thinning.
3. Alternative 4 assessed canopy cover reducing treatments in MCF habitat within 400 hectares Circular Core Areas (CCAs) and HRCAs. This resulted removing areas that were planned for harvest under Alternative 2, to lower the risk of reducing occupancy of existing spotted owl sites. Under Alternative 4, canopy-reducing treatment units that affected territories with limited MCF habitat is reduced when compared to Alternative 2 and Alternative 5.
4. Effects at the stand scale are the same as described for Alternative 2; however, the effects of mechanical thinning and follow-up treatments would occur on fewer acres as compared to Alternative 2. The acreage treated with prescribed fire is similar between both alternatives, and effects of these treatments would be similar to Alternative 2. The location of thinning treatments would generally be a greater distance from owl activity centers, and slightly less than half of 5M/5D habitat would be treated through mechanical treatments than would be treated under Alternative 2.

5. Commercial thinning would occur within nineteen HRCAs, ranging from 0% to 45% of the suitable habitat within the HRCA affected. Alternative 4 alters 20% or more of the available suitable habitat within three of the HRCAs, including ELD0110, ELD0111, and Shingle Mill Gulch, as compared to five of the HRCAs altered under Alternative 2. See Table 26.

Table 26
Amount of CWHR 4M/4D and 5M/5D Habitat Acres on NFS lands for spotted owl PACs in the project area with HRCAs affected by commercial harvest

PAC #	Existing HRCA Habitat Suitability Acres High = 5M/5D Medium = 4M/4D				
	High	**% High Affected in HRCA**	**Medium**	**% Medium Affected in**	**%HRCA (1000[1]) high and medium suitable acres affected by harvest**
ELD0007	17	6%	145	20%	16%
ELD0011	10	7%	170	25%	18%
ELD0017	0	0%	0	0%	0%
ELD0019	33	9%	95	16%	13%
ELD0035	99	16%	77	21%	18%
ELD0059	31	6%	17	4%	5%
ELD0063	13	3%	72	15%	9%
ELD0110	13	5%	309	42%	33%
ELD0111	48	11%	156	27%	20%
ELD0112	29	19%	84	10%	11%
ELD0155	5	5%	66	8%	8%

PAC #	Existing HRCA Habitat Suitability Acres High = 5M/5D Medium = 4M/4D				
	High	% High Affected in HRCA	Medium	% Medium Affected in	%HRCA (1000[1]) high and medium suitable acres affected by harvest
ELD0208	0	0%	0	0%	0%
ELD0322	1	< 1%	7	2%	1%
ELD0323	19	8%	55	8%	8%
ELD0324	0	0%	46	6%	5%
ELD0325	6	1%	10	2%	2%
ELD0326	0	0%	0	0%	0%
Leoni Meadows	4	1%	176	29%	18%
Shingle Mill Gulch	35	20%	393	55%	45%

[1]ELD0007 has 1,050 total acres

6. Table 27 displays the pre- and post-Mature Conifer Forest (MCF), identified as 4D and 5D, with 70% or greater canopy cover within the CCA and HRCA associated with each PAC. There are 16 (out of 19) spotted owl sites that have reproduced or have had repeated detections of pairs, 14 of which would be affected by removal of MCF habitat within the Circular Core Area or HRCA. Habitat alteration under Alternative 4 is less than under Alternative 2. Table 28 displays the information as it pertains to effects to habitat, territory loss, and potential abandonment of sites.

Table 27
Amount of Mature Conifer Forest (MCF) on National Forest System lands in spotted owl PAC Circular Core Areas and HRCAs prior to and following commercial thinning treatments under Alternative 4

PAC #	Circular Core Area (CCA) MCF Habitat within .7 miles of an activity center				HRCA MCF Habitat		
	Total MCF Pre-Treatment	Total MCF Being Treated	% of MCF in Circular Core Affected		Total MCF Pre-Treatment	Total MCF Being Treated	% of MCF in HRCA Affected
ELD0007	546	5	1		654	78	12
ELD0011	457	6	1		565	100	18
ELD0017	493	0	0		787	0	0
ELD0019	401	0	0		694	74	11
ELD0035	758	55	7		916	172	19
ELD0059	616	26	4		800	39	5
ELD0063	481	9	2		589	20	3
ELD0110	753	18	2		862	243	28
ELD0111	855	29	3		863	180	21
ELD0112	705	26	4		515	73	14
ELD0155	503	1	<1		490	49	10
ELD0208	434	1	<1		721	0	0
ELD0322	530	2	<1		677	4	1
ELD0323	487	25	5		517	72	14
ELD0324	404	0	0		421	31	7

PAC #	Circular Core Area (CCA) MCF Habitat within .7 miles of an activity center				HRCA MCF Habitat		
	Total MCF Pre-Treatment	Total MCF Being Treated	% of MCF in Circular Core Affected		Total MCF Pre-Treatment	Total MCF Being Treated	% of MCF in HRCA Affected
ELD0325	646	2	<1		851	13	2
ELD0326	424	0	0		556	0	0
Leoni Meadows	638	0	0		799	64	8
Shingle Mill Gulch	613	35	6		792	71	9

Table 28
Summary of Findings for Table 27

Factor	Number of Territories	Interpretation of Effects
Affected by harvest prescriptions that will reduce habitat quality within MCF habitat within CCA and HRCA	17	About 9% of ENF spotted owl sites (PACs). One fewer territory as compared to Alternative 2.
HRCA: Owl sites that currently have >600 acres of MCF habitat within the HRCA	12	N/A
Owl sites that would have >600 acres of MCF habitat post-project	11	Six more territories would maintain >600 acres of MCF habitat post-project as compared to Alternative 2.
Less than 600 acres of MCF habitat remaining in HRCA post-project.	8	Treatments increase the probability of territory loss. Six fewer owl territories would have less than 600 acres of MCF habitat post-project as compared to Alternative 2. **Note:** One of the eight territories, ELD0326 has no commercial thinning proposed within HRCA MCF habitat.
Less than 370 acres of MCF habitat in HRCA following treatments	0	Alternative 2 has 3 territories where less than 370 acres of MCF habitat would remain following treatments.

Factor	Number of Territories	Interpretation of Effects
Circular Core Area (CCA): Owl sites that currently have >600 acres of MCF habitat within the CCA.	13	N/A
Owl sites that would have >600 acres MCF habitat within CCA post-project	6	Same as Alternative 2.
Less than 600 acres MCF habitat remaining in the CCA post-project.	13	Treatments increase the probability of territory loss. Same as Alternative 2, although 2 fewer territories have proposed commercial thinning within CCA MCF habitat under Alt. 4. **Note:** Four of the territories have no proposed commercial thinning within CCA MCF habitat; three territories have <1% of CCA MCF habitat affected.
Less than 370 acres of quality habitat in CCA after treatments	0	Same as Alternative 2.

Cumulative Effects

Of the 19 spotted owl sites in the analysis area, Alternative 4 would result in six spotted owl sites with more than 20% of HRCA habitat cumulatively treated, which is two fewer sites than would be treated under Alternative 2. Under Alternative 4, only one HRCA would have greater than 30% of habitat cumulatively treated, as compared to four HRCAs under Alternative 2. None of the HRCAs would have greater than 40% of habitat cumulatively treated, as compared to the one under Alternative 2.

Table 29
Proportion of suitable habitat within spotted owl HRCAs and acreage affected by past, present, and future treatments

PAC	Acres of Suitable Habitat	Acres Affected past/future actions		% HRCA altered by past/future actions		Acres altered by Alternative 2 treatments	% HRCA altered by Alternative 2 treatments	% HRCA altered by past, present/future vegetation treatments	
		High[1]	Both[2]	High[1]	Both[2]			High[1] w/Alt2	Both[2] w/Alt2
ELD0007	1,043	1	318	1	30	162	16	17	46

PAC	Acres of Suitable Habitat	Acres Affected past/future actions		% HRCA altered by past/future actions		Acres altered by Alternative 2 treatments	% HRCA altered by Alternative 2 treatments	% HRCA altered by past, present/future vegetation treatments	
		High[1]	Both[2]	High[1]	Both[2]			High[1] w/Alt2	Both[2] w/Alt2
ELD0011	827	54	126	5	13	180	18	23	31
ELD0017	953	260	332	26	33	0	0	26	33
ELD0019	948	85	243	9	24	128	13	22	37
ELD0035	982	18	100	2	10	176	18	20	28
ELD0059	927	48	192	5	19	48	5	10	24
ELD0063	876	35	162	4	16	85	9	13	25
ELD0110	989	5	241	1	24	322	32	33	56
ELD0111	1,000	6	359	1	36	204	20	21	56
ELD0112	961	34	477	3	48	113	11	14	59
ELD0155	876	46	550	4	55	71	7	11	62
ELD0208	940	35	79	4	8	0	0	4	8
ELD0322	954	9	187	1	19	8	1	2	20
ELD0323	902	45	100	5	100	74	7	12	100
ELD0324	818	50	218	5	22	46	5	10	27
ELD0325	996	21	220	2	22	16	2	4	24
ELD0326	961	42	50	4	5	0	0	4	50
Leoni Meadow	955	3	206	1	21	180	18	19	39
Shingle Mill Gulch	979	0	208	0	21	93	9	9	30

[1]High=mechanical treatments
[2]Both=high impact (mechanical treatments) and moderate impacts (prescribed burning)

Alternative 5

Direct and Indirect Effects

Alternative 5 has similar indirect, direct, and cumulative effects as Alternative 2 with the following exceptions:

1. Alternative 5 was developed to reduce project effects upon spotted owls by focusing mechanical thinning treatments in areas that are outside high-quality spotted owl habitat and/or are a greater distance from owl territory centers, particularly where such habitat may be limited for an owl site.
2. When compared with Alternative 2, Alternative 5 calls for 1,048 fewer acres of suitable habitat to be mechanically thinned. There are 372 acres of 5D (compared to 610 acres in Alternative 2 and 305 acres under Alternative 4) having trees up to 29.9" removed within treatment units; there are also 2,540 acres of 4D (compared to 3,162 acres under Alternative 2 and 1,703 acres under Alternative 4); and 490 acres of 4M (compared to 678 acres under Alternative 2 and 424 acres under Alternative 4) proposed for mechanical thinning.
3. Effects at the stand scale are the same as described for Alternative 2; however, the effects of mechanical thinning and follow-up treatments would occur on fewer acres as compared to Alternative 2. The acreage treated with prescribed fire is similar between both alternatives, and effects of these treatments would be similar to Alternative 2. The location of thinning treatments would generally be a greater distance from owl activity centers, and slightly less than a third of 5M/5D habitat would be treated through mechanical treatments than would be treated under Alternative 2.
4. Commercial thinning would occur within nineteen HRCAs, ranging from 0% to 39% of the suitable habitat within the HRCA affected. Alternative 5 alters 20% or more of the available suitable habitat within seven of the HRCAs, including ELD0007, ELD0011, ELD0035, ELD0110, ELD0111, ELD0112, and Shingle Mill Gulch, as compared to the five altered under Alternative 2.

Table 30
Amount of CWHR 4M/4D and 5M/5D Habitat Acres on NFS lands for spotted owl PACs in the project area with HRCAs affected by commercial harvest

PAC #	Existing HRCA Habitat Suitability Acres High = 5M/5D Medium = 4M/4D				
	High Suitability Acres	% High Affected in HRCA	Medium Suitability Acres	% Medium Affected in HRCA	%HRCA (1000[1]) high and medium suitable acres affected by harvest
ELD0007	30	10%	344	47%	37%
ELD0011	11	7%	194	29%	21%

PAC #	Existing HRCA Habitat Suitability Acres High = 5M/5D Medium = 4M/4D				
	High Suitability Acres	% High Affected in HRCA	Medium Suitability Acres	% Medium Affected in HRCA	%HRCA (1000[1]) high and medium suitable acres affected by harvest
ELD0017	0	0%	0	0%	0%
ELD0019	33	9%	122	21%	16%
ELD0035	119	20%	117	31%	24%
ELD0059	31	6%	17	4%	5%
ELD0063	13	3%	72	15%	9%
ELD0110	18	5%	369	50%	39%
ELD0111	71	17%	190	33%	26%
ELD0112	37	37%	210	26%	25%
ELD0155	5	5%	87	11%	9%
ELD0208	9	2%	0	0%	1%
ELD0322	5	1%	155	37%	16%
ELD0323	19	8%	55	8%	8%
ELD0324	0	0%	46	6%	5%
ELD0325	26	6%	32	6%	6%
ELD0326	0	0%	0	0%	0%
Leoni Meadows	4	1%	177	29%	19%
Shingle Mill Gulch	52	20%	393	55%	45%

[1]ELD0007 has 1,050 total acres

5. Table 31 displays the pre- and post-Mature Conifer Forest (MCF), identified as 4D and 5D, with 70% or greater canopy cover, within the Circular Core Area and HRCA associated with each PAC. There are 16 (out of 19) spotted owl sites that have reproduced or have had repeated detections of pairs, of which thirteen would be affected by removal of MCF habitat

within the Circular Core Area or HRCA. Habitat alteration of MCF habitat within CCAs and HRCAs under Alternative 5 would affect fewer acres than both Alternatives 2 and 4. Alternative 5 alters 0% to 13% of available MCF habitat within the HRCAs (Table 28), as compared to Alternative 2, which alters greater than 20% of available MCF habitat within six HRCAs. Table 31 displays the information as it pertains to effects to habitat, territory loss, and potential abandonment of sites.

Table 31
Amount of Mature Conifer Forest (MCF) on National Forest System lands in spotted owl PAC Circular Core Areas and HRCAs prior to and following commercial thinning treatments under Alternative 5

PAC #	Circular Core Area (CCA) MCF Habitat within .7 miles of an activity center				HRCA MCF Habitat		
	Total MCF Pre-Treatment	Total MCF Being Treated	% of MCF in Circular Core Affected		Total MCF Pre-Treatment	Total MCF Being Treated	% of MCF in HRCA Affected
ELD0007	546	17	3		654	78	12
ELD0011	457	6	1		565	11	2
ELD0017	493	0	0		787	0	0
ELD0019	401	0	0		694	33	5
ELD0035	758	68	9		916	119	13
ELD0059	616	26	4		800	31	4
ELD0063	481	9	2		589	13	2
ELD0110	753	28	4		862	18	2
ELD0111	855	40	5		863	71	8
ELD0112	705	26	4		515	37	7
ELD0155	503	2	<1		490	5	1
ELD0208	434	1	<1		721	0	0
ELD0322	530	5	1		677	5	1

PAC #	Circular Core Area (CCA) MCF Habitat within .7 miles of an activity center				HRCA MCF Habitat		
	Total MCF Pre-Treatment	Total MCF Being Treated	% of MCF in Circular Core Affected		Total MCF Pre-Treatment	Total MCF Being Treated	% of MCF in HRCA Affected
ELD0323	487	25	5		517	19	4
ELD0324	404	0	0		421	0	0
ELD0325	646	21	3		851	26	3
ELD0326	424	0	0		556	0	0
Leoni Meadows	638	1	<1		799	4	1
Shingle Mill Gulch	613	45	7		792	52	7

Table 32
Summary of Findings for Table 31

Factor	Number of Territories	Interpretation of Effects
Affected by harvest prescriptions that will reduce habitat quality within MCF habitat within CCA and HRCA	16	About 9% of ENF spotted owl sites (PACs). Two fewer territories as compared to Alternative 2.
HRCA: Owl sites that currently have >600 acres of MCF habitat within the HRCA	12	N/A
Owl sites that would have >600 acres of MCF habitat post-project	11	Six more territories would maintain >600 acres of MCF habitat post-project as compared to Alternative 2; same as Alternative 4.
Less than 600 acres of MCF habitat remaining in HRCA post-project	8	Treatments increase the probability of territory loss. Six fewer owl territories would have less than 600 acres of MCF habitat post-project as compared to Alternative 2; same as Alternative 4. **Note:** Two of the eight territories, ELD0324 and ELD0326 have no commercial thinning proposed within HRCA MCF habitat.
Less than 370 acres of MCF habitat in HRCA following treatments	0	Alternative 2 has 3 territories where less than 370 acres of MCF habitat would remain following treatments.
Circular Core Area (CCA): Owl sites that currently have >600 acres of MCF habitat within the CCA.	8	N/A
Owl sites that would have >600 acres MCF habitat within CCA post-project	6	Same as Alternative 2 and 4.
Less than 600 acres of MCF habitat remaining in circular core area post-project	13	Treatments increase the probability of territory loss. Same as Alternative 2, although 2 fewer territories have proposed commercial thinning within CCA MCF habitat under Alternative 5. **Note:** Four of the territories have no proposed commercial thinning within CCA MCF habitat. Two territories have $\leq$ 1% of MCF habitat affected within the CCA.
Less than 370 acres of quality habitat in CCA after treatments	0	Same as Alternative 2.

Cumulative Effects

Alternative 5, in combination with past high-impact treatment, alters 4% to 45% of the available suitable habitat within nineteen HRCAs. Of the 19 spotted owl sites in the analysis area, Alternative 5 would result in ten spotted owl sites with more than 20% of HRCA habitat cumulatively treated, which is two more than under Alternative 2. Under Alternative 5, three HRCAs would have greater than 30% of habitat cumulatively treated as compared to four HRCAs under Alternative 2. Two of the three HRCAs would have greater than 40% habitat cumulatively treated, as compared to one under Alternative 2.

Table 33
Proportion of suitable habitat within spotted owl HRCAs and acreage affected by past, present, and future treatments

PAC	Acres of Suitable Habitat	Acres Affected past/future actions		% HRCA altered by past/future actions		Acres altered by Alternative 2 treatments	% HRCA altered by Alternative 2 treatments	% HRCA altered by past, present/ future vegetation treatments	
		High[1]	Both[2]	High[1]	Both[2]			High[1] w/Alt2	Both[2] w/Alt2
ELD0007	1,043	1	318	1	30	374	4	5	35
ELD0011	827	54	126	5	13	205	25	30	38
ELD0017	953	260	332	26	33	0	0	26	33
ELD0019	948	85	243	9	24	155	16	25	40
ELD0035	982	18	100	2	10	236	24	26	34
ELD0059	927	48	192	5	19	48	5	10	24
ELD0063	876	35	162	4	16	85	10	14	30
ELD0110	989	5	241	1	24	387	39	40	64
ELD0111	1,000	6	359	1	36	261	26	27	62
ELD0112	961	34	477	3	48	247	26	29	74
ELD0155	876	46	550	4	55	92	11	15	66
ELD0208	940	35	79	4	8	9	10	14	18
ELD0322	954	9	187	1	19	200	21	22	40

PAC	Acres of Suitable Habitat	Acres Affected past/future actions		% HRCA altered by past/future actions		Acres altered by Alternative 2 treatments	% HRCA altered by Alternative 2 treatments	% HRCA altered by past, present/ future vegetation treatments	
		High[1]	Both[2]	High[1]	Both[2]			High[1] w/Alt2	Both[2] w/Alt2
ELD0323	902	45	910	5	100	74	8	13	100
ELD0324	818	50	218	5	22	46	6	11	28
ELD0325	996	21	220	2	22	58	6	8	28
ELD0326	961	42	50	4	5	0	0	4	5
Leoni Meadow	955	3	206	1	21	181	19	20	41
Shingle Mill Gulch	979	0	208	0	21	445	45	45	66

[1]High=mechanical treatments
[2]Both=high impact (mechanical treatments) and moderate impacts (prescribed burning)

Northern Goshawk

Affected Environment

It is estimated that there are around 600 known goshawk territories on National Forest system lands in the Sierra Nevada, with about 70 territories occurring in the ENF. Territories appear to be well distributed across the Sierra Nevada; however, occupancy of many territories is unknown and population trend is unknown due to a lack of demographic studies for this species. On the ENF, known goshawk sites appear to be fairly well distributed across the forest, between 4,000 and 7,000 feet in elevation (USDA Forest Service, 2001). Northern goshawk habitat remains broadly distributed on the ENF; however, habitat gaps exist in the areas burned by the Cleveland, Star, Freds, Power, and King wildfires on the forest.

Suitable habitat for the northern goshawk consists of mature-forest habitats with large trees, dense canopy cover with at least two canopy layers, and abundant snags and down logs (USDA Forest Service, 2001 and 2004). Northern goshawk habitat is defined on the Eldorado National Forest using the California Wildlife Habitat Relationships Models (CWHR) canopy and size classes. In general, foraging habitat is defined as canopy cover greater than 40% and trees greater than 12 inches dbh (CWHR 4M, 4D, 5M, 5D), nesting habitat is defined as canopy cover greater than 60% and trees greater than 24 inches dbh (CWHR 5M, 5D).

Using the 2005 Forest Vegetation Inventory data and modeling of goshawk habitat using CWHR, there are approximately 4,559 acres of high-quality habitat (4M, 4D, 5M, 5D) and 10,887 acres of medium-quality habitat on National Forest System lands within the 20,453-acre project area. There are an additional 545 acres of medium-quality habitat and 64 acres of high-quality habitat on private lands within the project area.

The northern goshawk primarily preys upon passerine birds, particularly favoring Stellar's Jays and woodpeckers, as well as squirrels and chipmunks. Passerine birds are common throughout the open- and dense-canopied forest. It is believed that mature forest, with open understory and with 40% overstory canopy cover and large trees, allow for northern goshawks to hunt prey most efficiently, due to maneuverability between trees (Beier & Drennan, 1997; La Sorte et al., 2004). Goshawk reproduction is known to be linked to habitat structure, prey density, and prey availability due to forest structure. Low levels of supplemental feedings to goshawks were found to make the difference in successful fledging of goshawk young in poorer habitats (Bytholm & Kekkonen, 2008). Because goshawks select foraging sites based upon habitat structure, goshawks would forage in suitable habitat even when prey densities are lower than other habitats (Beier & Drennan, 1997). Thus goshawks would likely continue to forage where they have foraged in the recent past.

Goshawk nesting habitat requirements are thought to be more specific than foraging requirements, as goshawks are generally believed to be foraging generalists (Federal Register, 1998). Northern goshawk protected activity centers (PAC) have been delineated around territorial goshawk activity centers and include the best 200 acres of suitable habitat surrounding known activity center and habitat with highest nesting habitat capability (CWHR type 5D). Habitat patches surrounding nest locations are known to range from 25 to 250 acres in size; therefore, the SNFPA required 200-acre protected activity centers (PAC) to be delineated around breeding sites (USDA Forest Service, 2004). There are five goshawk PACs within the project boundary and one additional PAC within a quarter-mile of the project area. Most recent surveys were conducted within, and adjacent to, the Trestle project area in 2009 and 2010. PAC boundaries were delineated or redrawn based on the latest survey information.

Environmental Consequences

Alternative 1

Direct and Indirect Effects

Since there are no project activities proposed under this alternative, there would be no direct or cumulative effects to the northern goshawk or its habitat.

Cumulative Effects

Since there would be no activities, this alternative would not contribute toward any adverse cumulative effects related to disturbance of individuals or habitat.

Alternative 2

Direct and Indirect Effects

Disturbance during the nesting season can result in nest site failure or abandonment. There are five goshawk PACs located within a quarter-mile of the proposed units (PACs T26-03, T27-02, T27-07, T37-04, and T37-06), and all would have LOPs around their nest site. The LOP should protect nesting goshawks from disturbance during the breeding season. The SNFPA allows a breeding season LOP to be waived when necessary to allow for early-season prescribed fire use in up to 5% of goshawk PACs per year.

The proposed treatment units contain about 4,450 acres of suitable nesting and foraging habitat for goshawk. The effects on goshawk habitat on the west slope of the Sierra Nevada from treatments following the SNFPA standards and guidelines are analyzed in the SNFPA Final Environmental Impact Statement (FEIS) and Final Supplemental Environmental Impact Statement (FSEIS) and that analysis is incorporated by reference (USDA Forest Service 2001 and 2004). Known nest locations (PACs) and the surrounding habitats are protected, and Standards and Guidelines requiring retention of large trees are followed, and 40% to 50% of canopy cover is available in treated stands and snags. Habitat should be maintained with capability to support goshawks.

Stand structural components will be altered from project activities potentially affecting goshawk foraging behavior. Foraging opportunities for goshawks would be enhanced in these areas (provided prey habitat is maintained) by opening up the understory, enabling higher maneuverability through the stand. Weber's (2006) study on the Six Rivers National Forest found that nearly 81% of trees in the Post-Fledgling Area (PFA) were at least medium-sized and only 11% of the PFA's total area was composed of trees in the smallest size class. Goshawks' ability to fly through early seral stands of shrub and pole sized trees may be limited due to their size (Weber, 2006).

Reduction in understory density may also enable a greater number of prey species, which favor a moderate canopy closure (40% to 69%), medium size openings (greater than 4 acres), and a medium- to high-level of interspersion of seral stages within forest habitats to occur (Reynolds et al., 1992). In general, a greater number of prey species favor a moderate canopy closure (40% to 69%), medium size (greater than 4 acres) openings and a medium to high level of interspersion of seral stages within forest habitats (Ibid), which are conditions that will be created by the proposed thinning treatments. However, a more recent study suggests "that prey availability is more important than prey abundance in habitat selection" by goshawk and "as long as prey numbers are above a rather low threshold, goshawks select foraging sites where structural characteristics favor their foraging strategies" (Greenwald et al., 2005). This study also suggests that recommendations focusing on increasing prey abundance at the expense of forest structure within occupied home ranges are not likely to improve goshawk occupancy rates (Greenwald et al., 2005).

Cumulative Effects

Past timber management may have lessened habitat quality by reducing canopy closure and by removing larger size class trees that goshawk tend to prefer for nesting. "There is a concern that northern goshawk populations and reproduction may be declining in North America and California due to changes in the amount and distribution of habitat or reductions in habitat quality (Bloom et al., 1986; Reynolds et al., 1992; Kennedy, 1997, Squires & Reynolds, 1997; Smallwood, 1998; DeStefano, 1998 as cited in USDA Forest Service, 2001). However, the United States Fish and Wildlife Service (USFWS) completed a formal review of the species and determined that the goshawk is currently well distributed throughout its historic range and that there is "no evidence that the goshawk population is declining in the western United States, that habitat is limiting the overall population, that there are any significant areas of extirpation, or that a significant curtailment of the species' habitat or range is occurring" (Federal Register, 1998). The USFWS further found that the goshawk appears to be a "habitat generalist in terms of the variety and age classes of forest types it uses to meet it life requirements" and that the "contention that the goshawk is dependent on large, unbroken tracts of old growth and mature forest" was not supported by available information (Ibid). Observations of goshawk nest sites on the ENF have found numerous nests in second-growth forests with medium-size trees (USDA Forest Service, 2005). Since goshawks prefer open understories for foraging, past fire exclusion in the Trestle Project may have reduced habitat quality due to the ingrowth of shade tolerant species.

Habitat effects across the landscape in the project boundary, as well as cumulative effects to goshawk habitat (4M, 4D, 5M, and 5D), would be the same as described for the spotted owl as the two species utilize similar habitats. It is estimated that within 20 years, areas treated on NFS lands are expected to recover higher canopy closures and tree size and therefore have an increase in habitat quality (USDA Forest Service, 2001 and 2004). The proposed project will not impact goshawk nest stands from commercial harvest and will maintain suitable habitat for goshawk foraging following treatments, by retaining large trees and 40% canopy cover where it currently meets or exceeds it.

Alternative 4

Direct, Indirect, and Cumulative Effects

Alternative 4 has similar indirect, direct, and cumulative effects as Alternative 2 with the following exceptions. Alternative 4 was developed to aid in maintaining habitat components on the landscape for the California spotted owl. Harvest prescriptions in the majority of the units proposed under Alternative 4 would primarily focus on maintaining understory trees contributing to fuel loading, and on maintaining larger diameter trees contributing to a dense canopy, which is favored by late seral dependent species, such as the northern goshawk.

The proposed treatment units contain about 2,432 acres of suitable nesting and foraging habitat for goshawk (compared to 4,450 acres under Alternative 2). There are 305 acres of 5D within treatment units (compared to 610 acres under Alternative 2); there are 1,703 acres of 4D (compared to 3,162

acres under Alternative 2); and there are 424 in acres of 4M (compared to 678 acres under Alternative 2) proposed for thinning. Effects to goshawk habitat (4M/D and 5M/D) would be similar to spotted owls, as the majority of this habitat type across the landscape falls within spotted HRCA acreage.

Medium- to large-diameter trees will not be intentionally removed from the remaining acres within units containing 4M, 4D, 5M or 5D habitat (outside of HRCAs), thus retaining the integrity of the existing CWHR classification of these stands. These stands will be having understory trees (4" to12" dbh) removed to reduce fuel ladders within the understory. This alternative will serve to retain large diameter trees and dense canopy and to reduce the risk of wildfire by removing small diameter trees, particularly those adjacent to and near large diameter legacy trees in the stands,that may be contributing to ladder fuels.

Alternative 5

Direct, Indirect, and Cumulative Effects

Alternative 5 has similar direct, indirect, and cumulative effects as Alternative 2 with the following exceptions. The unit treatments are focusing on thinning trees 4" to 12" in dbh. These stands will be having understory trees removed to reduce fuel ladders within the understory. These size trees will be able to re-establish in the understory within a few years, if conditions permit, and they will be able to contribute to a multi-story stand. This alternative will serve to retain large diameter trees and dense canopy and to reduce the risk of wildfire by removing small-diameter trees, particularly adjacent to and near large-diameter legacy trees in the stands, that may be contributing to ladder fuels.

The proposed treatment units contain about 3,402 acres of suitable nesting and foraging habitat for goshawk (compared to 4,450 acres under Alternative 2). There are 372 acres of 5D (compared to 610 acres in Alternative 2); there are 2,540 acres of 4D (compared to 3,162 acres under Alternative 2), and 490 in acres of 4M (compared to 678 acres under Alternative 2) proposed for thinning. Effects to goshawk habitat (4M/D and 5M/D) would be similar to spotted owls, as the majority of this habitat type across the landscape falls within spotted HRCAs.

Great Gray Owl

Affected Environment

Great gray owls in California utilize pine and fir forests adjacent to meadows between 750 and 2,250 meters (Winter, 1986). Availability of nesting structures and prey limit their use of habitat. Foraging habitat in the Sierra Nevada is generally open meadows and grasslands in forested areas, and trees along the forest edge are used for hunting perches. Leaning trees that lay against other trees provide structure for non-flying owlets to maneuver on and get off the understory floor. Openings caused by fires or timber harvest serve as foraging habitat when the vegetation is in early successional stages (Hayward, 1994; Greene, 1995). Greene (1995) found that sites occupied by great gray owls had greater plant cover, vegetation height, and soil moisture than sites not occupied by owls. Canopy closure was the only variable of three variables measured (canopy closure, number of snags greater

than 24" dbh, and number of snags less than 24" dbh) that was significantly larger in occupied sites than in unoccupied sites. Meadows are utilized for breeding and wintering habitat and also provide attributes important for foraging areas. Recent studies in Yosemite National Park showed that over 60% of detections occurred within 328 feet and 80% occurred within 656 feet of a meadow (Van Riper et al., 2006).

The diet of the great gray owl may vary locally but consists primarily of small mammals, predominantly rodents (Kalinowski et. al, 2014). All available literature indicates that great gray owls in the western United States overwhelmingly select only two prey taxa: voles (*Microtus spp.*) and pocket gophers (*Thomomys spp.*). Voles prefer meadows with dense herbaceous vegetative cover (CWHR, 2005). A four-inch stubble height at the end of the growing season is thought to provide suitable cover for voles (Beck, 1985), although other studies suggest herbaceous heights of 12" are preferred (Greene, 1995). Gophers are predominantly subterranean but they also appear to have herbaceous cover preferences (Ibid). Great gray owls catch these mammals by breaking through their tunnels. Compaction of meadow soils may reduce the suitability of areas for prey. During the winter, great gray owls have been observed plunging through the snow to capture prey.

Using the 2005 Forest Vegetation Inventory data and modeling of great gray owl habitat using CWHR, there is approximately 16,079 acres of suitable habitat (4M, 4D, 5M, 5D and wet meadow), including 24 acres of wet meadow on National Forest System lands within the 20,453-acre project area.

Great gray owls currently occur within the Trestle Project boundary. Surveys specific for great gray owls were not conducted for this species however; surveys for spotted owls in the area for the Trestle project and historical projects detected incidental detections of great gray owls in the project area. In 2004 and 2005, Sears in coordination with the California Department of Fish and Wildlife (formerly California Department of Fish and Game), surveyed 82 meadow sites in CA and detected owls at 12 sites; however, though meadow sites occurred on the Eldorado National Forest, none of the great gray owl detections occurred on the Eldorado National Forest (Sears 2006). Great gray owls do occur on and adjacent to the Eldorado National Forest land, including on Sierra Pacific Industries land and other property managed by private entities.

Two great owl PACs are located within the Trestle Project Boundary. The Leoni Meadow PAC is incorporated into California spotted owl PAC ELD0007 bumping that spotted owl PAC acreage up to 350 acres. The great gray owl PAC is adjacent to an unrelated "preserved" natural area on Leoni Meadows property that is not incorporated into recreational camp activities and to enable it to retain relatively undisturbed. A territorial pair as well its roost and potential nest (adult was sitting in broken top snag but unable to observe young) were located at this site. The great gray owls forage in Leoni Meadows and nearby Gould Meadow (private); primarily on meadow voles.

A fifty acre PAC was established for a territorial adult great gray owl detected in 2012 during spotted owl surveys in Tony's Gulch drainage. This PAC has great gray owl presence, but the nest or roost location is not known. The owl may be foraging for voles in small wet areas as well as gophers in nearby plantations where foraging conditions are suitable.

Environmental Consequences

Alternative 1

Direct and Indirect Effects

There are no activities related to this project, therefore, there will be no direct or indirect effects to great gray owls or their habitat.

Cumulative Effects

Since there would be no activities, this alternative would not contribute toward any adverse cumulative effects related to disturbance of individuals or habitat.

Alternative 2

Direct and Indirect Effects

Disturbance during the nesting season can result in nest site failure or abandonment. There are two great gray owl PACs located within a quarter mile of the treatment units. A limited operating period (LOP) would be implemented for great gray owls, prohibiting vegetation treatments within ¼ mile of the PAC during the nesting period (March 1 to August 15), unless surveys confirm that great gray owls are not nesting. The LOP should protect nesting great gray owls from disturbance during the breeding season.

The proposed treatment units contain about 4,450 acres of suitable nesting and foraging habitat for great gray owl (CWHR 4M/4D and 5M/5D). Effects to great gray owl habitat would be similar to spotted owls as the majority of this habitat type across the landscape falls within spotted owl HRCA. Treatment of understory brush and small diameter trees (less than 10" dbh) through prescribed burning as well as machine piling, especially in plantations will alter prey habitat (cover and forage), including that of the gopher. However, meadow and other riparian protection and restoration projects will benefit habitat for voles, which is another primary prey species.

Restoration efforts along road 9N73A will enhance the meadow to condition where it could potentially become suitable to provide nesting habitat for future occupancy by great gray owls. Efforts to control invasive plants, remove disturbance and vegetation damage from vehicle use; hand remove encroaching seedlings and saplings; will benefit future great gray owl use and current vole populations which a preferred prey item.

Cumulative Effects

Alternative 2 will not contribute to adverse cumulative effects on great gray owl in combination with any past, present, or reasonably foreseeable future projects. This is based on no treatment in the WUI that overlaps suitable habitat for the only known roost/nest site for great gray owls on the Forest.

Alternative 4

Direct, Indirect, and Cumulative Effects

Alternative 4 has similar indirect, direct and cumulative effects as Alternative 2 with the following exceptions. Alternative 4 was developed to aid in maintaining habitat components on the landscape for the California spotted owl. Alterations to harvest prescriptions in the majority of the units proposed under Alternative 4 would primarily focus on understory trees contributing to fuel loading; and maintaining larger diameter trees that are contributing to a dense canopy which is favored by late seral dependent species.

The proposed treatment units contain about 2,432 acres of suitable nesting and foraging habitat for goshawk (compared to 4,450 acres under Alternative 2). There are 305 acres of 5D (compared to 610 acres in Alternative 2) within treatment units; there are 1,703 acres of 4D (compared to 3,162 acres under Alternative 2) and 424 in acres of 4M (compared to 678 acres under Alternative 2) proposed for thinning. Effects to great gray owl habitat (4M/D and 5M/D) would be similar to spotted owls as the majority of this habitat type across the landscape falls within spotted owl HRCA acreage.

The remaining acres within units containing 4M, 4D, 5M or 5D habitat (outside of HRCAs) and having understory trees (4" to 12" dbh) removed to reduce fuel ladders, will not be removing medium to large diameter trees; retaining the integrity of the existing CWHR classification of these stands as they currently are classified. These stands will be having understory trees (4" to 12" dbh) removed to reduce fuel ladders within the understory. This alternative will serve to retain large diameter trees, dense canopy and reduce the risk of wildfire by removing small diameter trees that may be contributing to ladder fuels; particularly adjacent to and near large diameter legacy trees in the stands.

Alternative 5

Direct, Indirect, and Cumulative Effects

Alternative 5 has similar indirect, direct and cumulative effects as Alternative 2 and 4, with the following exception. The proposed treatment units contain about 3,402 acres of suitable nesting and foraging habitat for great gray owl (compared to 4,450 acres under Alternative 2). There are 372 acres of 5D (compared to 610 acres in Alternative 2), there are 2,540 acres of 4D (compared to 3,162 acres under Alternative 2), and there are 490 in acres of 4M (compared to 678 acres under Alternative 2) proposed for thinning.

Pacific Fisher

Affected Environment

On April 8, 2004, the US Fish and Wildlife Service determined that listing of the fisher was "warranted but precluded"; therefore appropriate status for this species is as a candidate for listing under the Endangered Species Act. "Fisher populations are presently at low numbers, or absent throughout most of their historic range in Montana, Idaho, Washington and California" (Heinmeyer & Jones 1994, as cited in USDA Forest Service, 2001). Small populations of fisher occur in northwestern California and

the southern Sierra in very low numbers (USDA Forest Service, 2001). In 2014, the fisher was proposed for listing as a threatened species.

Habitat characteristics for Pacific fisher are believed to be mature timber stands with moderate to fairly dense canopy cover, large trees, and abundant snags and down logs (USDA Forest Service, 2001 and 2004). Mature hardwoods are also thought to be important habitat components used by fisher (Ibid), and the presence of large conifers and hardwoods is a highly significant predictor of fisher occurrence (USDA Forest Service, 2005). Preferred habitat for fisher is generally found between 3,000 and 8,000 feet elevation in large, relatively unfragmented blocks of older forest, characterized by a 60% to 100% canopy closure, multistoried structure, and a high number of large snags and down logs. Suitable habitat in this analysis is defined as forested types with CWHR 4M, 4D, 5M, 5D, and 6. High Quality Habitat is defined as forested types of 60% to 79% CC of CWHR 4D, and 5D. Preferred habitat or denning habitat is defined as CWHR classes 5D and density greater than 80%.

Fisher primarily have a diet composed of reptiles, amphibians, insects, fungi, small mammals, deer, and birds in the Sierra Nevada (Zielinski et al., 1999; Fisher & Marten as cited in California Conference, 2006), contrary to their northern counterparts that eat primarily porcupine and snowshoe hare.

The project occurs within the historic range of fisher, but track plate/camera surveys completed on the ENF in compliance with 1992/1993 and 1997 Regional survey protocols had no detections. It has been conjectured, based upon the lack of recent sightings and results of limited systematic surveys, that fisher may be extirpated from the Sierra Nevada north of Yosemite National Park and south of Lassen National Park (USDA Forest Service, 2001). Nonetheless, maintenance or establishment of habitat with the potential to support fisher may be important for future recovery of the species.

Using the 2005 Forest Vegetation Inventory data, there is approximately 4,559 acres of high quality habitat (CWHR 4D, 5D, and 6; canopy cover greater than 60%) and 10,887 acres of medium quality habitat on National Forest lands within the 20,453 acre project area. The suitability of the project area for fisher is limited by high public use, habitat fragmentation, high density of road areas, and private property composed of urban development.

Environmental Consequences

Alternative 1

Direct and Indirect Effects

There are no activities related to this project, therefore, there will be no direct effects to fisher or their habitat.

Cumulative Effects

Since there would be no activities, this alternative would not contribute toward any adverse cumulative effects related to disturbance of individuals or habitat.

Alternative 2

Direct and Indirect Effects

Direct disturbance to fisher from project activities is unlikely since it is unlikely that fisher occur in the area.

The proposed treatment units contain about 4,450 acres of habitat for fisher. Key habitat characteristics on which fisher depend include higher than average downed woody material, snags, and high canopy cover. The effects on fisher habitat from treatments following the SNFPA standards and guidelines are analyzed in the SNFPA FEIS and FSEIS and that analysis is incorporated by reference (USDA Forest Service, 2001, section 4.4, pp. 6-18; USDA Forest Service, 2004, pp. 242-253). Immediately following treatment, all of the stands treated would be within the range of habitats used by fisher due to the retention of larger size class trees and canopy cover, but reduction of stand density and understory structure is likely to reduce habitat quality.

Enhancement of oaks along ridgetops and protection and restoration of riparian areas contribute to improvement of potential movement corridors for the fisher. Understory thinning will increase the vigor of residual trees and may provide future benefits to the fisher by increasing the amount of canopy cover provided by large trees. The proposed conifer thinning will not affect large hardwoods, and may actually improve conditions around scattered individual oaks by reducing competition and increasing the hardwood component within the stands. An exception would be thinning round cavitory hardwoods which could degrade potential denning habitat for fisher by removal of security cover and access routes to the cavity. Marking guidelines have incorporated retaining conifers around cavitory oaks which will minimize impacts to these habitat features.

Prescribed burning may result in some consumption of down logs. The use of ignition techniques to reduce effects to large down logs that could provide hiding cover or den sites will be incorporated into the burn plan. In general, burning within these mature and late-seral stands would decrease the risk of losing the stands to wildfire through reduced ground and ladder fuels, and the restoration of fire as a natural process in the ecosystem. This addresses one of the threats to the continued existence of the fisher in the Sierra Nevada (Lamberson et al., 2000).

Cumulative Effects

Some of the higher quality habitat for fisher occurs within spotted owl PACs and northern goshawk PACs that are dispersed throughout the cumulative effects analysis area, and do not have any proposed project activities that will result in significant vegetative changes or reduced habitat quality. These areas will have prescribed burning so reduction of ground cover, understory, existing snags, down logs, and mature oaks may be reduced or removed in localized areas.

The importance of protecting mature forest conditions from loss as a result of wildfire is exacerbated for fisher, as they are known to avoid open canopy areas. It could be over 100 years to re-develop quality habitat for this species should habitat be lost from fire. Alternative 2 will augment the other fuels reduction activities that have occurred within the cumulative effects analysis area in establishing

prescribed burning treatments to reduce the risk of habitat loss from wildfire. Cumulative effects to fisher habitat (4M, 4D, 5M, and 5D) would be the same as described for the spotted owl.

Since no fisher are currently believed to occupy the area, the project will not impact a fisher population but may remove some denning habitat and decrease the suitability of foraging habitat for a number of years. Alternative 2 should increase fisher habitat in the long-term by promoting tree growth and increasing the resilience of habitat to the effects of wildfire.

Alternative 4

Direct, Indirect, and Cumulative Effects

Alternative 4 has similar direct, indirect, and cumulative effects as Alternative 2 with the following exceptions. Alternative 4 was developed to aid in maintaining habitat components on the landscape for the California spotted owl. Alterations to harvest prescriptions in the majority of the units proposed under Alternative 4 would primarily focus on understory trees contributing to fuel loading; and maintaining larger diameter trees that are contributing to a dense canopy which is favored by late seral dependent species such as the fisher.

The proposed treatment units contain about 2,432 acres of suitable nesting and foraging habitat for goshawk (compared to 4,450 acres under Alternative 2). There are 305 acres of 5D (compared to 610 acres in Alternative 2) within treatment units; there are 1,703 acres of 4D (compared to 3,162 acres under Alternative 2) and 424 in acres of 4M (compared to 678 acres under Alternative 2) proposed for thinning. Effects to fisher habitat (4M/D and 5M/D) would be similar to spotted owls as the majority of this habitat type across the landscape falls within spotted owl PAC and HRCA acreage.

Alternative 5

Direct, Indirect, and Cumulative Effects

Alternative 5 has similar indirect, direct and cumulative effects as Alternative 2, with the following exceptions. The unit treatments are focusing on thinning trees 4-12” in dbh in a large portion of the units. These stands will be having understory trees removed to reduce fuel ladders within the understory. These size trees will be able to re-establish in the understory, conditions permitting within a few years and contribute to a multi-story stand. This alternative will serve to retain large diameter trees, dense canopy and reduce the risk of wildfire by removing small diameter trees that may be contributing to ladder fuels; particularly adjacent to and near large diameter legacy trees in the stands.

The proposed treatment units contain about 3,402 acres of suitable nesting and foraging habitat for goshawk (as compared to 4,450 under Alternative 2). There are 372 acres of 5D (as compared to 610 acres in Alternative 2), 2,540 acres of 4D (compared to 3,162 acres under Alternative 2), and 490 in acres of 4M (678 acres under Alternative 2) proposed for thinning.

Pallid Bat, Townsend's Big-eared Bat, and Fringe-tailed Bat

Affected Environment

Pallid Bat

Throughout California, the pallid bat is usually found in low to middle elevation habitats below 6,000 feet (Philpott, 1997); however, the species has been found up to 10,000 in the Sierra Nevada (Sherwin, 1998). Pallid bats are most common in open, dry habitats that contain rocky areas for roosting. They are a yearlong resident in most of their range and hibernate in winter near their summer roost (Zeiner et al., 1990). Day roosts may vary but are commonly found in rock crevices, tree hollows, mines, caves and a variety of human-made structures. Tree roosting has been documented in large conifer snags, inside basal hollows of redwoods and sequoias, and bole cavities in oaks (Sherwin, 1998).

There is a strong association with roosting in black oak cavities (Pierson, 1996) for pallid bats. Maternal roosts are typically colonies (usually between 20 to several hundred individuals). Breeding occurs between May and July, with young weaned in mid-late August (Sherwin, 1998 as cited in USDA Forest Service, 2008) and maternity colonies breaking up by mid-October (Barbour & Davis, 1969 as cited in USDA Forest Service, 2008). Little is known about the winter habits of this species although it is thought to winter near the summer roost sites (Ibid). Pallid bats forage near and at ground level. Pallid bats are known to feed predominately on ground-dwelling arthropods, such as scorpions and Jerusalem crickets (USDA Forest Service, 2001). Foraging occurs over open ground, where pallid bats are more often found along edges and open stands, particularly hardwoods (Ibid).

Townsend’s Big-eared Bat

The Townsend's big-eared bat occurs throughout the west, and is distributed from the southern portion of British Columbia south along the Pacific Coast to central Mexico and east into the Great Plains (Sherwin as cited in USDA Forest Service, 2008). In California, the species is typically found in low desert to mid elevation montane habitats, although sightings have been reported up to 10,800 feet (Philpott, 1997; Sherwin, 1998 as cited in USDA Forest Service, 2008). Habitat associations include desert, native prairies, coniferous forests, mid-elevational mixed conifer, mixed hardwood-conifer forests, riparian communities, active agricultural areas and coastal habitat types (Kunz & Martin, 1982; Brown, 1996; and Sherwin, 1998 as cited in USDA Forest Service, 2008). Refer to the section on hardwood guidelines under the SNFP ROD in section II under the bat species. Populations have incurred serious declines over the past 40 years in parts of California (Brown, 1996 as cited in USDA Forest Service 2008).

Foraging usually begins well after dark (Kunz & Martin, 1982 as cited in USDA Forest Service, 2008). Foraging associations include edge habitats along streams and areas adjacent to and within a variety of wooded habitats (Sherwin, 1998 as cited in USDA Forest Service, 2008). In California, the species is shown to forage preferentially in association with native vegetation (Brown, 1996 as cited in USDA Forest Service, 2008). Flight is slow and maneuverable, with the species capable of hovering (Zeiner et al., 1990) and gleaning insects off foliage (Brown, 1996 as cited in USDA Forest Service, 2008).

The Townsend's big-eared bat is a moth specialist, with over 90% of its diet composed of lepidopterans (Sherwin, 1998 as cited in USDA Forest Service 2008).

Fringe-tailed Bat

The species was added to the sensitive species list for Region 5 in 2013 and as such has not had specific management direction associated with it at this time. The following information on this species is taken from the 2013 Angerer and Pierson species account (draft in review). In California, the species is found throughout the state, from the coast to greater than 5,900 feet in elevation in the Sierra Nevada. The species occurs in open habitats with nearby dry forest and open water (Keinath, 2004 as cited in Angerer & Pierson, 2013). It occurs in pinyon-juniper, valley foothill, hardwood, and hardwood-conifer habitats. The species has been documented from mist net captures, utilizing secondary streams. Roosts utilized are crevices in rocks, cliffs, buildings, underground mines, bridges and large decadent trees (Weller, 2005 as cited in Angerer & Pierson, 2013).

The fringe-tailed bat may migrate short distances to lower elevations; however; winter records show it does not migrate long distances and may also become active intermittently in CA, during winter months (O'Farrell & Studier, 1980 as cited in Angerer & Pierson, 2013). The species primarily forages on beetles but will also eat other flying insects.

Mating occurs in the fall after maternity colonies have dissolved. Nursery colonies are formed mainly in early to mid-decay stage large diameter snags from 23" to 66" dbh (Weller & Zabel, 2001 as cited in Angerer & Pierson, 2013). May to July, primarily the later end of the season in California, is when young are born.

Surveys

No species specific surveys for the three bat species have been conducted in the project area, and the distribution of these species on the Forest is unknown with the exception of 2001 and 2002 bat inventories conducted by the Sierra Nevada Framework monitoring crew, recent abandoned mine surveys on the Forest (2010-2012), and incidental sightings during spotted owl surveys (2012). No Townsend's big-eared bats were captured or observed during any of the survey efforts or incidental sighting detections.

Protective closures; typically in the form of gates enhance bat habitat and aid in public safety when abandoned mines are closed. Mine workings, particularly adits and shafts provide roosting habitat for a variety of species throughout the year or during portions of the year. Mine surveys in 2010, at Artic Mine in the project boundary, detected two individual bats but identification could not be verified. Based on suitable bat habitat and occupancy this feature was fitted with a bat friendly gate to maintain current bat species and provide habitat for other bat species that may find the protected site suitable for roosting. Mine surveys in 2011, within ½ mile west of Henrys Diggins, outside the project boundary, detected two species - big brown and California myotis. As these areas provide suitable bat habitat based on occupancy by bats; it could also serve as potential roost habitat for fringe-tailed, pallid and Townsend's big-eared bats. Pallid bats have been captured in mist nets along the Silver Fork of the

American River as a result of the monitoring efforts. They have also been observed flying in the Trestle Project during spotted owl surveys east of Tony's Gulch, within Sierran mixed conifer habitat with large black oaks (Yasuda, pers. obs., 2012).

Environmental Consequences

Alternative 1

Direct and Indirect Effects

There are no activities related to this project, therefore, there would be no direct effects to pallid bat, Townsend's big-eared bat or fringe-tailed bats or their habitat.

Cumulative Effects

Since there would be no activities, this alternative would not contribute toward any adverse cumulative effects related to disturbance of individuals or habitat.

Alternative 2

Direct and Indirect Effects

Activities associated with the alternative may disturb individuals that could be roosting in hardwoods, snags, or mines within or adjacent to harvest units. Prescribed burns could cause displacement of bats and possible increased risk of mortality due to predation and exposure. Smoke from prescribed burning may also disturb and displace roosting bats during active burning (usually less than two hours of smoke around any given tree). The health effects of smoke on bats are unknown, but the duration, intensity and frequency of exposure from this project is not expected to be substantial. Since prescribed burns occur during the day, displacement of bats could result in increased mortality due to predation and exposure. Design criteria for Artic Mine and prescribed burning will aid in reducing or avoiding impacts to known roosting populations of bats within this mine.

There are likely to be both beneficial and adverse effects of understory thinning and prescribed burning on foraging habitat for these bat species. On 1,203 acres of bat habitat, treatments may reduce foraging quality for bats in the immediate and short-term by removing understory shrubs and herbaceous species and reducing the associated invertebrate fauna. However, new growth of understory shrubs and forbs are anticipated to occur within 1 to 5 years. Thinning and prescribed fire may have positive effects for foraging bats by opening the stand understory sufficiently to allow for foraging where current undergrowth prevents flight. Thinning unit prescriptions are designed to leave downed woody material and pockets of untreated areas and prescribed burning units would be designed to create a mosaic, allowing unburned islands to remain, will reduce effects to foraging bats. Understory thinning, pre-commercial thinning, brush-cutting, and prescribed burning may, overall, improve foraging habitat for bats by removing "clutter" that can impair echolocation.

Hardwoods, large trees and large snags would not be directly removed, except for large snags that pose a risk to woodworker safety and for operability where necessary. The short-term and long-term increase in hardwoods as a result of treatments within thinning units should increase possible bat

roosting habitat. A thinned understory would improve conditions around roosting areas for bats since roosts are generally in areas that are free of immediately adjacent obstacles that might hinder emergence or allow predators access to roost sites. Effects to oaks will primarily come from prescribed burning.

The effect of understory thinning and prescribed burning on favored prey species is unknown. There may be short term effects on prey availability in treatment areas, particularly where shrubs are removed. Leaving pockets of untreated areas and prescribed burning with a mosaic pattern allowing unburned islands to remain will reduce this effect. Timing of brush treatments may impact larvae preferred by Townsend's big-eared bats, particularly in May and June when large quantities were observed during spotted owl surveys, throughout the project area in shrub habitat; including alongside roadways (Yasuda pers. obs., 2012 and 2013).

Cumulative Effects

Given the changes in forest vegetation that have been described within the Sierra Nevada over the last 100 years, it is likely that vegetation is denser between 0 and 8 feet high and that there are fewer mature hardwoods within mid-elevation stands than there were historically. This would suggest a historic reduction in foraging habitat quality. It is unclear what the cumulative effect of past actions may have been on sensitive bat species in the analysis area.

Timber harvest and previous fuels reduction projects have removed large trees and snags that could have been utilized by bats for roosting, however some treatments have opened the understory increasing foraging opportunities. Forest openings may have benefited bats as they are found foraging more often in edges and open stands. This and other projects in the area with the primary prescription of understory thinning and prescribed burning will likely improve habitat across the landscape for bats by improving foraging opportunities, provided adequate prey habitat (shrubs, etc.) and roosting habitat (snags and mature oaks) are retained. The reduction in risk of future wildfires, promotion of future hardwood habitat, and maintenance of open understory over the long term meets several of the conservation measures suggested for bats in the SNFPA (USDA Forest Service, 2004).

Alternative 4

Direct, Indirect, and Cumulative Effects

Direct, indirect, and cumulative effects of Alternative 4 are anticipated to be similar to Alternative 2, except that Alternative 4 focuses more on the removal of understory trees contributing to fuel loading; and maintaining larger diameter trees that are contributing to a dense canopy which is favored by late seral dependent species such as the spotted owl. Less acreage will be affected by treatments. However, development and retention of hardwoods for bat foraging and roosting would not be as great under this Alternative.

This alternative will have a large portion of the treatment units having understory trees (4" to 12" dbh) removed to reduce fuel ladders within the understory. This alternative will serve to retain large

diameter trees which will serve as future recruitment snags. It will also reduce the risk of wildfire by removing small diameter trees that may be contributing to ladder fuels; particularly adjacent to and near large diameter legacy snags and live trees in the stands. The removal of dense understory tree thickets will also enhance foraging for bats by removing "clutter" that may interfere with their foraging attempts.

Alternative 5

Direct, Indirect, and Cumulative Effects

Direct, indirect, and cumulative effects of Alternative 5 are anticipated to be similar to Alternative 2 and 4 except that Alternative 5 enhances hardwoods less than Alternative 2, but more than Alternative 4. Prescribed burning acres are similar resulting in effects mentioned under Alternative 2.

Western Bumble Bee

Affected Environment

The western bumblebee was added to the Regional Forester's sensitive species list in 2013. A draft document entitled PSW Sensitive Species Review-Conservation Status of the Western Bumble bee Bombus occidentalis (2013) provides a species account for the species of which information is included here. Bombus occidentalis currently occurs in all states adjacent to California. Historically, the species was broadly distributed across western North America along the Pacific Coast and westward from Alaska to the Colorado Rocky Mountains (Thorp & Shepard, 2005; Koch et al., 2012). Historically, B. occidentalis was one of the most broadly distributed bumble bee species in North America (Cameron et al., 2011). Currently, the western bumble bee is experiencing severe declines in distribution and abundance due to a variety of factors including diseases and loss of genetic diversity (Tommasi et al., 2004; Cameron et al., 2011; and Koch et al., 2012).

There are 94 collection records for the western bumble bee Bombus occidentalis on 11 national forests of the PSW Region, in California (Hatfield, 2012): the Angeles (one record), Eldorado (2), Klamath (15), Lake Tahoe Basin Management Unit (7), Lassen (8), Modoc (3), Plumas (21), Sequoia (1), Shasta-Trinity (25), Six Rivers (5), and Tahoe (6). There are only three collection records from national forest lands since 2000: two are on the Plumas, and one is on the Lake Tahoe Basin Management Unit.

Queens overwinter in the ground in abandoned rodent (i.e. mouse, chipmunk or vole) nests at depths from 6-18 inches and typically emerge about mid-March. The queen then lays fertilized eggs and nurtures a new generation. She first creates a thimble-sized and shaped wax honey pot, which she provisions with nectar-moistened pollen for 8-10 individual first-generation workers when they hatch. The larvae will receive all of the proteins, fats, vitamins and minerals necessary for growth and normal development from pollen. Eventually all the larvae will spin a silk cocoon and pupate in the honey pot. The workers that emerge will begin foraging and provisioning new honey pots as they are created to accommodate additional recruits to the colony. Individuals emerging from fertilized eggs will become workers that reach peak abundance during July and August.

Foraging individuals are largely absent by the end of September. Those that emerge from unfertilized eggs become males, which do not forage and only serve the function of reproducing with newly emerged queens. During the season, a range of 50 to hundreds of individuals may be produced depending on the quantity and quality of flowers available. When the colony no longer produces workers, the old queen will eventually die and newly emerged queens will mate with males and then disperse to found new colonies. During this extended flight that may last for up to two weeks she may make several stops to examine the ground for a suitable burrow.

Unlike all other bees, bumble bees are large enough to be capable of thermoregulation, which allow them to maintain their foraging activities for longer periods of the day, but also to occupy regions with more extreme latitudes and temperatures compared to other bees (Heinrich, 1979). Bumble bees may continue to forage when temperatures are below freezing even in inclement weather (Heinrich, 1979). Queens end the year by locating a sheltering burrow, where they may spend the winter months under cover.

Suitable habitat occurs randomly within the project boundary where forage and nesting substrate occur.

Environmental Consequences

Alternative 1

Direct and Indirect Effects

Since there are no project activities proposed under this alternative, there would be no direct or cumulative effects to the western bumble bee or their habitat.

Cumulative Effects

Since there would be no activities, this alternative would not contribute toward any adverse cumulative effects related to disturbance of individuals or habitat.

Alternative 2

Direct and Indirect Effects

Bumble bees are threatened by habitat alterations that may fragment or reduce the availability of flowers that produce the nectar and pollen they require, and decrease the number of abandoned rodent burrows that provide nest and hibernation sites for queens.

Cumulative Effects

Earlier timber and fire salvage harvest on the Eldorado National Forest within the cumulative effects area that had plantations as an outcome potentially provide shrub habitat capable of producing flowering plants and shrubs for forage. They also provided early seral habitat with open ground cover with rodent burrows (squirrels and gophers), bunchgrasses and remnant small woody debris for nesting and overwintering. The reduction of shrub ground cover and ground disturbance from mastication, piling and burning will reduce habitat quality for bumble bees. Treatment units could potentially

affect up to 12% of the available shrub habitat where eventual growth of conifers will shade out shrubs in the understory. The remaining shrubland habitat (up to 88%) will be altered to younger stages of shrub from prescribed burning primarily due to the large acreage being considered for treatment. However; mosaic burn prescriptions may aid in retaining patches of flowering shrub where it currently exists. Prescribed burn plans should take into consideration, the distance between flowering plants; particularly shrub species, preferred by the bumble bee to avoid habitat fragmentation and disruption of dispersal and foraging patterns.

Other major threats that alter landscapes and habitat required by bumble bees include pesticides, agriculture and urban development. In the absence of fire, native conifers encroach upon meadows, which also decrease foraging and nesting habitat available for bumble bees.

Alternative 4

Direct, Indirect, and Cumulative Effects

Alternative 4 has similar direct, indirect, and cumulative effects as Alternative 2 with the following exceptions: less disturbance would occur from reduction in road miles having brush treatment; and less road reconstruction miles.

Alternative 5

Direct, Indirect, and Cumulative Effects

The effects of Alternative 5 would also be very similar to those for Alternative 2 and 5, except that Alternative 5 has fewer acres of potential impact to bumble bee than Alternative 2, but more than Alternative 4.

Black-backed Woodpecker

Affected Environment

The Oregon Cascades-California population and Black Hills population of the black- backed woodpecker (*Picoides arcticus*) warranted listing in March 2013, under the Endangered Species Act of 1973, as amended (Act), as subspecies or distinct population segments (DPSs) that are endangered or threatened, and to designate critical habitat concurrent with listing (Federal Register, 2013b).

The black-backed woodpecker has been managed on the forest as a MIS species to represent the habitat "snags in burnt forest". There have been no recent large wildfires in the project area; therefore; this aspect of the black-back woodpeckers nesting and foraging behavior is not being analyzed for any existing habitat in the project area that would represent burnt forest. Recent concerns pertaining to live green trees; particularly large and dense patches of trees, have been raised as how they could contribute to future black-backed habitat should they be killed during a wildfire. This analysis focuses on the concern of thinning green trees and its potential effect of the future capability of the project area to provide for black-backed woodpecker habitat should a wildfire alter the landscape to favor preferred nesting and foraging habitat for this burnt forest species specialist.

Black-backed woodpeckers have been found in green forest or utilizing snags created by insects or other causes. However, the black-backed woodpecker is primarily a fire specialist that relies on large trees in dense accumulations that have died as a result of wildfire. The woodpeckers are drawn to fire areas in search of their preferred prey (beetles) and remain to nest and continue foraging in the burn areas. In order for fire killed trees to be present after a wildfire; there first must be green trees on the landscape to succumb to the fire and become snags.

Within the project boundary there are 14,797 acres of green trees that could support habitat for future snags. There are 10,188 acres (9,544 acres of NF and 644 private acres), or 69%, within medium snag size categories (assuming size class CWHR 4) and 4,609 acres (4,545 acres of NF, and 64 private acres), or 31%, within large (assuming size class 5) snag size categories.

Environmental Consequences

Alternative 1

Direct and Indirect Effects

Since there are no project activities proposed under this alternative, there would be no direct or cumulative effects to the western bumble bee or their habitat.

Cumulative Effects

Since there would be no activities, this alternative would not contribute toward any adverse cumulative effects related to disturbance of individuals or habitat.

Alternative 2

Direct and Indirect Effects

There are 3,946 acres of green trees, that should they burn from a wildfire, could support size 4 snags and 610 acres that could support size 5 snags, within the treatment units, for a combined total of 4,556 acres. The remainder of the habitat type outside of the treatment units will potentially be prescribed burned only.

Snag levels are low in the project area; particularly from past insect salvage sales, illegal wood cutting; and lack of fire. Hazard tree removal during both the harvest and the burn associated portions of the project will reduce the average snag levels per acre even further in localized areas. Hazard tree removal and prescribed burning will change the existing snag and down log component by altering the existing age and size classes currently within the area. It can be expected that losses of late decay stages will occur reducing this age class in the area. It is also expected that there may be creation of new age classes from the death of green trees that become snags and serve as recruitment logs from prescribed burning. This could result from the natural falling of both existing snags and live green trees weakened from both fire and loss of previous vegetation (that served as protection from high winds) which would reduce snag levels but increase early decay class down logs within the area.

Though some later decay stage snags and down logs may be lost; prescribed burning may also result in additions to the existing snag and down log component through mortality of individual live green

trees. The extent and numbers are difficult to determine due to unpredictability of the exact behavior of prescribed fire; current numbers of snags and down logs; and number of susceptible live green trees in individual stands. If snags are lost and snag recruitment doesn't occur during prescribed burning, average snags per acre will be reduced further; particularly late decay stage snags and logs. Project design to protect specific large down logs and snags from consumption will be incorporated into the burn plan to avoid impacts to these habitat components, including consumption of snags created through prescribed burning or scorching from pile burning.

Harvest of green trees 16" dbh and larger will alter future snag and down log recruitment including age classes and size ranges in both the short and long term. Trees (over 30" dbh) impacted from harvest equipment that result in skin-ups will be left on the landscape in the event they succumb to injuries and as a result serve as recruitment snags. In addition some green trees initially selected for harvest, on each acre should be selected (outside the roadside or fireline hazard zones), to create snags; particularly in areas where prescribed burning or hazard tree removal may decrease existing numbers of late decay stage snags.

Cumulative Effects

Past activities have included tree removal through commercial and non-commercial timber harvest, salvage of insect killed trees, thinning in plantations, hazard tree removal (for trails and roads), reforestation, prescribed burning, mechanical piling and burning, firewood collecting, herbicides, recreation trail use, wildfires, and activities on adjacent private lands (timber harvest plans, road right of ways, and continued recreational and residential development). The majority of the projects occurred after 2005 with the exception of large scale insect salvage sales in the 1990's. CWHR data from the 2005 vegetation data layers were used to display habitat conditions in the project area from that timeframe.

Project activity that occurs in treatment units as well as burn only units that support the green trees that could provide for size 4 and size 5 future snags, will maintain existing snag levels (except hazard trees), retain trees over 30" dbh, retain high levels of retention live green trees, and potentially increase snag levels during prescribed burning in snag deficit areas.

Hazard tree removal and prescribed burning will change the existing snag and down log component by altering the existing age and size classes currently within the area. It can be expected that losses of late decay stages will occur reducing this age class in the area. It is also expected that there may be creation of new age classes from the death of green trees that become snags and serve as recruitment logs from prescribed burning. This could result in the natural falling of both existing snags and live green trees weakened from both fire and loss of previous vegetation (that served as protection from high winds) which would reduce snag levels but increase early decay class down logs within the area.

There have been no projects in the project area since 2005 that have affected large size trees (size 5). Past projects utilizing CASPO and Sierra Nevada Framework guidelines retained at least 40% canopy cover and trees over 30" dbh through understory thinning prescriptions. Earlier timber and post-fire salvage harvest on National Forest that resulted in the creation of plantations within the project area

removed late seral habitat. In plantation treatment areas it can be expected that in the short-term there will be no significant changes but in the long term, treatments to move stands to late seral conditions will increase large diameter tree habitat and potential future recruitment snags for the black-backed woodpecker.

Alternative 4

Direct, Indirect, and Cumulative Effects

Alternative 4 has similar direct, indirect, and cumulative effects as Alternative 2, with the following exceptions. There are 2,169 acres of habitat, that if burned by wildfire, could support medium size snags (size 4) and 305 acres that could support large size snags (size 5), within the treatment units, for a combined total of 2,474 acres.

Under this alternative, treatments focus on thinning understory trees 4-12" in dbh to reduce ladder fuels. These size trees will be able to re-establish in the understory, conditions permitting, within a few years. The remaining treatment units will have similar treatments as described under Alternative 2 in that trees up to 29.9" dbh will be harvested, affecting future size class 4 and 5 snags. The remainder of the acres, providing green trees for future size 4 and 5 snags, outside the treatment units, will be prescribed burned. This could potentially create new snags that would provide the proper conditions to attract beetles and the black-backed woodpecker to forage on them.

Alternative 5

Direct, Indirect, and Cumulative Effects

The effects of Alternative 5 would also be very similar to those for Alternative 2 and 4, except that Alternative 5 has fewer acres of potential impact than Alternative 2, but more than Alternative 4. There are 3,074 acres of green trees, that if burned by wildfire, could support size 4 snags and 372 acres that could support size 5 snags, within the treatment units, for a combined total of 3,446 acres.

Management Indicator Species

Management Indicator Species (MIS) are animal species identified in the Sierra Nevada Forest MIS Amendment Record of Decision (ROD) signed December 14, 2007. Guidance regarding MIS set forth in the Eldorado National Forest LRMP as amended by the 2007 SNF MIS Amendment ROD directs Forest Service resource managers to complete the following actions: at project scale, analyze the effects of proposed projects on the habitat of each MIS affected by such projects; and, at the bioregional scale, monitor populations and/or habitat trends of MIS, as identified in the Eldorado National Forest LRMP as amended.

Effects to MIS species are summarized from the MIS Report for the Trestle Forest Health Project (Yasuda, 2014a).

Shrubland (West-Slope Chaparral) Habitat (Fox Sparrow)

The fox sparrow was selected as the MIS for shrubland (chaparral) habitat on the west-slope of the Sierra Nevada, comprised of montane chaparral (MCP), mixed chaparral (MCH), and chamise-redshank chaparral (CRC) as defined by the California Wildlife Habitat Relationships System (CWHR) (CDFG 2005).

Affected Environment

There are approximately 591 acres of shrubland (chaparral) habitat [CWHR montane chaparral (MCP), mixed chaparral (MCH) within the analysis area. Shrub age varies across similar acres from mature fields to young plants in newly created gaps. Based on field review, additional montane chaparral occurs within the understory of stands with low canopy cover (1X, 2X, 2S, 3S, 3P, 4S, 4P), particularly in plantations consisting of pre-commercial size trees. These areas are a mix of shrub and young trees and not pure dense MCP or MCH, which may be why they were not categorized as MCP or MCH under GIS, but rather classified as to what tree size and density the area fell under. For this analysis the effects to MCP and MCH will be in regards to those acres classified under CWHR MCP or MCH.

Table 34
California Wildlife Habitat Relationship Strata and Code Definitions

Tree Canopy Closure			**Shrub Canopy Closure**			**Herbaceous Canopy Closure**		
Closure	**Class**	**Canopy Closure**	**Closure**	**Class**	**Canopy Closure**	**Closure**	**Class**	**Canopy Closure**
S	Sparse	10-24%	S	Sparse	10-24%	S	Sparse	2-9%
P	Open	25-39%	P	Open	25-39%	P	Open	10-39%
M	Moderate	40-59%	M	Moderate	40-59%	M	Moderate	40-59%
D	Dense	60-100%	D	Dense	60-100%	D	Dense	60-100%
Tree Size Class			**Shrub Size Class**			**Herbaceous Size Class**		
Size	**Class**	**dbh**	**Size**	**Class**	**Crown Decadence**	**Height**	**Class**	**Height at Maturity**
1	Seedling	< 1 in.	1	Seedling	seedlings or sprouts < 3 years	1	Short	< 12 in.
2	Sapling	1 to 5.9 in.	2	Young	None	2	Tall	> 12 in.
3	Pole	6 to 10.9 in.	3	Mature	1 - 25%			
4	Small	11 to 23.9 in.	4	Decadent	> 25%			
5	Medium/ Large	> 24 in.						
6	Multi - Layered*							

*Size class 5 trees over a distinct layer of size class 4 or 3 trees, total tree canopy exceeds 60 percent closure.

Status and Trend

There are currently 1,009,681 acres of west-slope chaparral shrubland habitat on National Forest System lands in the Sierra Nevada. Over the last two decades, the trend is slightly increasing (changing from 8% to 9% of the acres on National Forest System lands).

Monitoring of the fox sparrow across the ten National Forests in the Sierra Nevada has been conducted since 2009 in partnership with PRBO Conservation Science, as part of a monitoring effort that also includes mountain quail, hairy woodpecker, and yellow warbler (USDA Forest Service, 2010a). Fox sparrows were detected on 36.9% of 1659 point counts in 2009 and 44.3% of 2266 point counts in 2010, with detections on all 10 national forests in both years. The average abundance (number of individuals recorded on passive point count surveys) was 0.563 in 2009 and 0.701 in 2010. These data indicate that fox sparrows continue to be distributed across the 10 Sierra Nevada National Forests. In addition, the fox sparrows continue to be monitored and surveyed in the Sierra Nevada at various sample locations by avian point count, spot mapping, mist-net, and breeding bird survey protocols. These are summarized in the 2008 Bioregional Monitoring Report (USDA Forest Service, 2008). Current data at the rangewide, California, and Sierra Nevada scales indicate that, although there may be localized declines in the population trend, the distribution of fox sparrow populations in the Sierra Nevada is stable.

Environmental Consequences

Alternative 1

Direct and Indirect Effects

Under Alternative 1, no direct or indirect effects would occur to shrubland habitat because no project activities would occur.

Cumulative Effects

Cumulative effects are not expected with this alternative. There would be no changes in shrubland habitat from current conditions under this alternative.

Alternatives 2

Direct and Indirect Effects

This project would prescribe burn and/or pile the brush component within up to 76 acres of shrubland habitat. These actions would remove shrub habitat from approximately 76 acres of shrubland habitat in Alternative 2 and 46 acres of shrubland in Alternatives 4 and 5. Project activities within commercial harvest units or prescribed burning within plantations may have indirect effects that could affect conditions for brush enhancement and/or retention both in the short and long term in regards to reaching a condition where it would be considered as CWHR MCP or MCH in the future.

Prescribed Burning

Prescribed understory burning would result in mortality of small diameter trees and shrubs within areas treated. In areas with prescribed burning, changes to the amount of acres of shrub dominated habitat are expected to result from the Trestle Project. The age class and ground cover of shrubs will change from mature or decadent to seedlings or sprouts. Shrub cover will be reduced for two to three years as shrubs regenerate and resprout following prescribed burning. Fox sparrows prefer burned-over forest land at a stage of recovery with heavy growth of brush (Austin, 1968). At sites in the Sierra Nevada, post-fire, fox sparrow densities change as brushy fields of chaparral mature (Bock & Kynch, 1970; Bock et al., 1978). Approximately 10 years after a fire, montane chaparral reached a density sufficient to support the species.

Based upon this information, the Trestle Project will reduce habitat for fox sparrows for approximately 10 years following prescribed burning, in areas with complete consumption. Mosaic burning leaving unburned large patches of shrubs will aid in providing habitat that will continue to support fox sparrows over this 10 year period. Additional shrub growth within openings created in forested stands are likely to increase for the species in the long term until conifer canopy development shades out the brush component in the stand.

Machine Piling

Piling and cutting small trees and brush, with follow-up pile burning will occur within commercial harvest units. Some of the brush removal acres here will overlap acres within commercial harvest units that may have brush removal to facilitate tree removal. Within the acres of machine piling, shrub habitat could be removed from the area through the effects of dozers pushing materials into piles; removing this habitat from the unit understory.

Restoration Activities – Roads and Trails

Restoration activities will create additional shrub habitat that will develop within these areas, increasing habitat quality in the short term. Depending on site conditions, conifer establishment may occur within ten to twenty years, potentially reducing or eliminating the conditions for shrub retention and/or establishment, resulting in site specific habitat reductions.

Cumulative Effects to Habitat

There is 591 acres of shrubland habitat in the cumulative effects analysis area. The project activities that temporarily reduce shrub ground cover and decadence will affect up to 76 acres out of the 591 acres of habitat within the cumulative effects analysis area. This may change the age structure and localized distribution of shrub habitat, but will not alter existing trend in the habitat, nor will it lead to a change in the distribution of fox sparrow across the Sierra Nevada bioregion. This is based on effects primarily coming from prescribed burning, in which it is anticipated that not all acres will be burned or burned at the same time, leaving pockets of habitat across the landscape.

Relationship of Project-Level Habitat Impacts to Bioregional-Scale

Though the quality of size class and cover class shrub habitat will be altered, the change in acres of shrubland habitat on potentially up to 72 acres in harvest units and prescribed burning outside of treatment units out of 591 acres (less than 1% of shrubland habitat in the Sierra Nevada) of shrubland

habitat occurring across the Sierra Nevada area will not alter the existing trend in the amount of habitat acres, nor will it lead to a change in the distribution of fox sparrows across the Sierra Nevada bioregion.

Oak-Associated Hardwoods and Hardwood/Conifer Habitat (Mule deer)

The mule deer was selected as the MIS for oak-associated hardwood and hardwood/conifer in the Sierra Nevada, comprised of montane hardwood (MHW) and montane hardwood-conifer (MHC) as defined by the California Wildlife Habitat Relationships System (CWHR) (CDFG, 2005). Mule deer range and habitat includes coniferous forest, foothill woodland, shrubland, grassland, agricultural fields, and suburban environments (CDFG, 2005).

Affected Environment

A total of 539 acres of oak associated hardwood and hardwood/conifer habitat [CWHR montane hardwood (MHW), montane hardwood-conifer (MHC)] habitat is within the analysis area. Hardwoods also occur mixed in the CWHR Sierra Mixed Conifer (SMC) designated stands as individual trees or small groves intermixed with conifers. These areas are a mix of hardwoods and conifer and are not pure stands of hardwoods which may be why they were not categorized as MHW or MHC under GIS but rather classified as Sierra Mixed Conifer (SMC) which contains a mixture of conifer species as well as hardwoods within stands. For this analysis the effects to MHW and MHC will be in regards to those acres classified by GIS under CWHR MHW or MHC.

Status and Trend

There are currently 808,006 acres of oak-associated hardwood and hardwood/mixed conifer habitat on National Forest System lands in the Sierra Nevada. Over the last two decades, the trend is slightly increasing (changing from 5% to 7% of the acres on National Forest System lands).

The mule deer has been monitored in the Sierra Nevada at various sample locations by herd monitoring (spring and fall) and hunter survey and associated modeling (CDFG, 2007 and 2010). These data indicate that mule deer continue to be present across the Sierra Nevada, and current data at the rangewide, California, and Sierra Nevada scales indicate that, although there may be localized declines in some herds or Deer Assessment Units (including DUA 5 of which the Grizzly Flat deer herd resides), the distribution of mule deer populations in the Sierra Nevada is stable.

Environmental Consequences

Alternative 1

Direct and Indirect Effects

Under Alternative 1, no direct or indirect effects would occur to oak associated habitat because no project activities would occur. Oak would continue to decline over time due to competition with conifers.

Cumulative Effects

Cumulative effects are not expected with this alternative.

Alternatives 2, 4, and 5

Direct and Indirect Effects

A total ranging between 49 acres under Alternative 5 to 76 acres under Alternative 2 of oak associated habitat would be affected by the project. The project would be anticipated to improve the oak component of oak associated habitat through the removal of competing and overtopping conifers, allowing for more sunlight and less competition of oaks with adjacent vegetation (primarily conifers). Openings will also enable acorn establishment and multi-aged hardwood stands, perpetuating black and canyon oak within the project area.

Similar effects can be anticipated for prescribed burning in regards to removal of small diameter conifers that may compete with young and mature oak for resources. Prescribed burning could affect oak established seedlings and saplings through consumption. Re-sprouting of oak, or ground cover removal for the establishment of oak seedlings, will enable hardwoods to reamin and/or increase within the stands.

A few incidental oak hazard trees may be fallen for safety or operations reasons, although these incidental trees would be too few to affect overall CWHR types.

Cumulative Effects to Habitat

The cumulative effects analysis contains 539 acres of oak associated habitat. Because project activities are expected to maintain or improve oak habitat, the project would be expected to slightly increase oak associated habitat for mule deer in the analysis area.

Relationship of Project-Level Habitat Impacts to Bioregional-Scale

As there will be no adverse change in size class, canopy cover or quantity of CWHR montane hardwood (MHW)/montane hardwood-conifer (MHC) oak-associated hardwood and hardwood/conifer habitat from project activities in the Trestle Project area, the project will not alter the existing trend in the habitat, nor will it lead to a change in the distribution of mule deer across the Sierra Nevada bioregion under Alternative Two for the Trestle Project. Localized conifer removal around existing hardwoods or prescribed burning may improve conditions in localized areas but acreages are not large enough to alter existing trends or population distributions.

Early and Mid Seral Coniferous Forest Habitat (Mountain quail)

Affected Environment

There is a total of 14,125 acres of early and mid seral coniferous habitat in the analysis area [CWHR ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), eastside pine (EPN), tree sizes 1, 2, 3, and 4, all canopy closures]. Most of this habitat is in the mid seral stage, mostly consisting of 4M and 4D CWHR types. No white fir, red fir, or eastside pine types are present.

Status and Trend

There are currently 530,851 acres of early-seral and 776,022 acres of mid-seral coniferous forest (ponderosa pine, Sierran mixed conifer, white fir, and red fir) habitat on National Forest System lands in the Sierra Nevada. Over the last two decades, the trend for early seral is decreasing (changing from 9% to 5% of the acres on National Forest System lands) and the trend for mid seral is increasing (changing from 21% to 25% of the acres on National Forest System lands).

Monitoring of the mountain quail across the ten National Forests in the Sierra Nevada has been conducted since 2009 in partnership with PRBO Conservation Science, as part of a monitoring effort that also includes fox sparrow, hairy woodpecker, and yellow warbler (USDA Forest Service, 2010a). Mountain quail were detected on 40.3 percent of 1659 point counts (and 48.6% of 424 playback points) in 2009 and 47.4% of 2266 point counts (and 55.3% of 492 playback points) in 2010, with detections on all 10 national forests in both years. The average abundance (number of individuals recorded on passive point count surveys) was 0.103 in 2009 and 0.081 in 2010. These data indicate that mountain quail continue to be distributed across the 10 Sierra Nevada National Forests. In addition, mountain quail continue to be monitored and surveyed in the Sierra Nevada at various sample locations by hunter survey, modeling, and breeding bird survey protocols. These are summarized in the 2008 Bioregional Monitoring Report (USDA Forest Service, 2008b). Current data at the rangewide, California, and Sierra Nevada scales indicate that the distribution of mountain quail populations in the Sierra Nevada is stable.

Environmental Consequences

Alternative 1

Direct and Indirect Effects

Under Alternative 1, no direct effects would occur to early- and mid-seral coniferous habitat because no project activities would occur. Early- and mid-seral would continue along the succession trajectory at the current pace.

Cumulative Effects

Cumulative effects are not expected with this alternative.

Alternatives 2, 4, and 5

Direct and Indirect Effects

Overall between 2,575 acres under Alternative 4 and 4,090 acres under Alternative 2 of early- and mid-seral habitat would be affected by the project.

Changes in the percentage of canopy cover would vary within the mechanical thinning units. Thus some stands would have a larger change than others in CWHR canopy cover class. The removal of competing understory conifers though thinning will move stands into mature forest sooner, reducing the habitat capability for quail in these areas in the long term. In the short term, forage and cover in the form of dense stands of young trees will be removed, reducing both forage and cover until these

components return in these stands (3 to 5 years) as site conditions allow. The remaining acres of early-mid seral habitat, outside of treatment units, may be potentially burned within the prescribed burn units. Both harvest and burn units will result in changes in tree size and canopy closure.

Reduction of tree canopy closure from the removal of conifers will open up the understory, changing site conditions and potentially enhancing development of shrubs preferring a more xeric environment. An increase in understory shrubs and associated canopy closure, though small, may occur in the openings created by the reduction in tree canopy closure.

The effects of fire suppression in the project area have caused preferred habitats for the mountain quail to become decadent or succeed into later seral stages, reducing the amount of available forage and cover. Prescribed understory burning would result in mortality of small diameter trees within areas treated. In areas with prescribed burning, changes to the amount of acres of shrub dominated habitat are not expected to result from the Trestle Project. However; shrub cover will be reduced for two to three years as shrubs regenerate and resprout following prescribed burning. The age class and ground cover of shrubs will change from mature or decadent to seedlings or sprouts. Since the Trestle Project will not burn at the same intensity as a wildfire, it is expected that some unburned patches of shrubs will remain in the project area and will continue to support mountain quail.

Additional shrub growth within openings created in forested stands is likely to increase for the species in the long term until conifer canopy development shades out the brush component in the stand. Burning of vegetation retention islands or created brush piles may permanently remove these components as hiding or nesting habitat.

Loss of existing shrub component may occur in units with tractor piling from activities such as piling, cutting small trees and brush (1” to 3.9” dbh) and follow-up pile burning within commercial harvest units. Within the acres of machine piling, shrub habitat could be removed through the effects of dozers pushing materials into piles; removing both plants and their root structures; resulting in a longer re-establishment of shrubs within created openings. Some of the brush removal acres will overlap acres that occur within commercial harvest units that may have brush removal to facilitate tree removal.

Cumulative Effects to Habitat

Projects utilizing CASPO and Sierra Nevada Framework guidelines retained at least 40% canopy cover and reduced the amount of early-mid seral habitat through understory thinning prescriptions. Earlier timber and post-fire salvage harvest on National Forest that resulted in the creation of plantations within the project area provided early-seral habitat. The Trestle Project will have beneficial effects upon shrub and early seral conifer regeneration within the project area over time, increasing the diversity and structure in early and mid-seral stands within areas of prescribed burning. In areas of commercial and plantation treatments, it can be expected that in the short-term there will be reductions in brush and early-mid seral conifer habitat after initial treatment. Openings created in stands as well as follow-up burning may mitigate this by improving site conditions for shrub establishment within 1 to 3 years. However; in the long term, treatments to move stands to late seral conditions will reduce habitat for the mountain quail.

Relationship of Project-Level Habitat Impacts to Bioregional-Scale

The change in canopy closure and short-term reduction of understory shrub and tree cover in commercial harvest units on up to 4,090 acres and up to an additional 8,376 in burn areas (outside of treatment units) out of 14,125 acres of habitat in the cumulative effects analysis area, will change the age structure and localized distribution of early and mid seral habitat but will not alter the existing trend in the habitat, nor will it lead to a change in the distribution of mountain quail across the Sierra Nevada bioregion. This is based on the effects primarily coming from prescribed burning in which it is anticipated that not all acres will be burned or burned at the same time, leaving pockets of habitat across the landscape.

Late Seral Open Canopy Coniferous Forest Habitat [Sooty (blue) grouse]

Affected Environment

Total late seral open canopy coniferous forest habitat [CWHR ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), eastside pine (EPN), tree size 5, canopy closures S and P] in the analysis area is 87 acres. Current forest vegetation inventory does not include understory shrub canopy closure information, and thus this information is described qualitatively. In general areas with less than 40% canopy cover tend to have an understory shrub component, as the analysis area is generally lower elevation coniferous forest.

Status and Trend

There are currently 63,795 acres of late seral open canopy coniferous forest (ponderosa pine, Sierran mixed conifer, white fir, red fir, and eastside pine) habitat on National Forest System lands in the Sierra Nevada. Over the last two decades, the trend is decreasing (changing from 3% to 1% of the acres on National Forest System lands).

The sooty grouse has been monitored in the Sierra Nevada at various sample locations by hunter survey, modeling, point counts, and breeding bird survey protocols, including California Department of Fish and Game Blue (Sooty) Grouse Surveys (Bland, 1993, 1997, 2002, and 2006); California Department of Fish and Game hunter survey, modeling, and hunting regulations assessment (CDFG 2004a, CDFG 2004b); Multi-species inventory and monitoring on the Lake Tahoe Basin Management Unit (LTBMU 2007); and 1968 to present – BBS routes throughout the Sierra Nevada (Sauer et al., 2007). These data indicate that sooty grouse continue to be present across the Sierra Nevada, except in the area south of the Kern Gap, and current data at the rangewide, California, and Sierra Nevada scales indicate that the distribution of sooty grouse populations in the Sierra Nevada north of the Kern Gap is stable

Environmental Consequences

Alternative 1

Direct and Indirect Effects

Under Alternative 2 no direct effects would occur to late seral open canopy coniferous habitat because no project activities would occur.

Cumulative Effects

Cumulative effects are not expected with this alternative.

Alternatives 2, 4, and 5

Direct and Indirect Effects

There is no anticipated change in number of acres in 5P or 5S post-harvest in the commercial units as no 5P or 5S occurs within any harvest units. Based on the low acreage (87 acres) in the project area and lack of this habitat type in the units, it is not expected that there will be a change in acres of late seral open canopy coniferous forest from unit treatments. In addition, a substantial increase in canopy from burning will not occur; therefore; canopy conditions will remain stable for sooty grouse in the area, where it occurs.

The Trestle Project will have beneficial effects upon understory shrubs over time, increasing the diversity and structure in areas of prescribed burning. In areas of commercial treatments, it can be expected that in the short-term there will be reductions in brush but in the long term, treatments to move stands to late seral conditions will increase habitat for the sooty grouse by creating large diameter roosting trees for the species, providing canopy closure and shrub conditions remain suitable for the habitat of this species.

Cumulative Effects to Habitat

There have been no projects in the project area since 2005 (2005 vegetation data is used for this analysis) that have affected late seral open canopy forest. Past projects utilizing CASPO and Sierra Nevada Framework guidelines retained at least 40% canopy cover and trees 30" dbh and larger through understory thinning prescriptions. Earlier timber and post-fire salvage harvest on National Forest land that resulted in the creation of plantations within the project area removed late seral habitat but provided shrub habitat interspersed around any remaining large diameter trees within or adjacent to the plantations. As there are no direct or indirect changes in existing circumstances due to the small acreage of habitat in the project area and no treatments anticipated to alter it unsuitable; there will be no cumulative effects associated with this project under this alternative in regards to change in acres of late seral open canopy coniferous forest; tree canopy closure; or understory shrub canopy closure class associated with late seral open canopy coniferous forest.

Relationship of Project-Level Habitat Impacts to Bioregional-Scale

As there is no anticipated change in late seral open canopy coniferous forest; tree canopy closure; or understory shrub canopy closure class on 87 acres of 5P or 5S habitat in the Trestle cumulative effects

analysis area, the project will not alter the existing trend in the habitat, nor will it lead to a change in the distribution of sooty grouse across the Sierra Nevada bioregion.

Late Seral Closed Canopy Coniferous Forest Habitat (California spotted owl and northern flying squirrel)

Affected Environment

There is a total of 4,624 acres of late seral closed canopy coniferous forest habitat [CWHR ponderosa pine (PPN), Sierran mixed conifer (SMC), white fir (WFR), red fir (RFR), tree size 5 (canopy closures M and D), and tree size 6] in the project area.

Status and Trend

There are currently 1,006,923 acres of late seral closed canopy coniferous forest (ponderosa pine, Sierran mixed conifer, white fir, and red fir) habitat on National Forest System lands in the Sierra Nevada. Over the last two decades, the trend is slightly increasing (changing from 7% to 9% of the acres on National Forest System lands); since the early 2000s, the trend has been stable at 9%.

California spotted owl. California spotted owl has been monitored in California and throughout the Sierra Nevada through general surveys, monitoring of nests and territorial birds, and demography studies (Verner et al., 1992; Gutierrez et al., 2008, 2009, and 2010; USDA Forest Service, 2001, 2004, and 2006b; USFWS, 2006; Sierra Nevada Research Center, 2007, 2008, 2009, and 2010). Current data at the rangewide, California, and Sierra Nevada scales indicate that, although there may be localized declines in population trend [e.g., localized decreases in "lambda" (estimated annual rate of population change)], the distribution of California spotted owl populations in the Sierra Nevada is stable.

Northern flying squirrel. The northern flying squirrel has been monitored in the Sierra Nevada at various sample locations by live-trapping, ear-tagging, camera surveys, snap-trapping, and radiotelemetry: 2002-present on the Plumas and Lassen National Forests (Sierra Nevada Research Center, 2007, 2008, 2009, and 2010), and 1958-2004 throughout the Sierra Nevada in various monitoring efforts and studies (see USDA Forest Service, 2008, Table NOFLS-IV-1). These data indicate that northern flying squirrels continue to be present at these sample sites, and current data at the rangewide, California, and Sierra Nevada scales indicate that the distribution of northern flying squirrel populations in the Sierra Nevada is stable.

Environmental Consequences

Alternative 1

Direct and Indirect Effects

Under Alternative 1, no direct effects would occur to late seral closed canopy coniferous habitat because no project activities would occur.

Cumulative Effects

Cumulative effects are not expected with this alternative.

Alternatives 2, 4, and 5

Direct and Indirect Effects

A total ranging between 305 acres under Alternative 5 to 605 acres under Alternative 2 of late seral closed canopy coniferous forest habitat would be affected by the mechanical thinning treatments. There are 610 acres of 5D occurring within treatment units, primarily overlapping spotted owl Home Range Core Areas (HRCAs). These 5D acres comprise approximately 13% of the harvest unit acres. There are additional 5M/5D acres outside these units that are proposed for prescribed burning. This habitat primarily overlaps goshawk PACs, spotted owl PACs and HRCAs.

Acres of 5D/5M will be altered to a different CWHR size or density type within commercial harvest units under the Trestle Project. Trees that would potentially reach a size (30" or greater dbh) faster (where site conditions allow) that are being harvested could provide additional 5M/5D stands within the project area in the long term to provide nesting, denning, roosting and resting habitat for the California spotted owl and northern flying squirrel; particularly trees 20” dbh and greater.

Canopy Closure

Trees up to 29.9” dbh will be thinned under the Trestle Project; resulting in a reduction in canopy closure for the California spotted owl and northern flying squirrel within those units. Based on the Trestle Silvicultural Report (Howard and Walsh, 2014), canopy cover is not expected to drop below 60% on the 312 acres that currently range from 60% to 65% which will retain foraging habitat. Canopy cover will drop 101 acres below 70% on acres that currently range from 70% to 80%, which will retain foraging habitat but drop it to below the minimum canopy preferred for spotted owl nesting. This would be an immediate short-term effect until tree growth enables canopy cover to meet or exceed 70% in the long term (10 years or more).

Large Down Logs per Acre or Large Snags per Acre

Based on stand surveys and the Trestle Silvicultural Report (Howard and Walsh, 2014) there are approximately 1 snag per acre having an average diameter of 16 inches and a height of about 60 feet within treatment units. Snags range in size from 16" to 50" dbh, with heights ranging from about 50 feet to 180 feet. They are mostly white fir with smaller percentages being made up of sugar pine and ponderosa pine snags in various stages of decay.

Snag levels are low in the project area; particularly from past insect salvage sales, illegal wood cutting; and lack of fire. Hazard tree removal during both the harvest and the burn associated portions of the project will reduce the average snag levels per acre even further in localized areas. Hazard tree removal and prescribed burning will change the existing snag and down log component by altering the existing age and size classes currently within the area. It can be expected that losses of late decay stages will occur reducing this age class in the area. It is also expected that there may be creation of new age classes from the death of green trees that become snags and serve as recruitment logs from prescribed burning. This could result in the natural falling of both existing snags and live green trees

weakened from both fire and loss of previous vegetation (that served as protection from high winds) which would reduce snag levels but increase early decay class down logs within the area.

Though some later decay stage snags and down logs may be lost; prescribed burning may also result in additions to the existing snag and down log component through mortality of individual live green trees. The extent and numbers are difficult to determine due to unpredictability of the exact behavior of prescribed fire; current numbers of snags and down logs; and number of susceptible live green trees in individual stands. If snags are lost and snag recruitment doesn't occur during prescribed burning, average snags per acre will be reduced further; particularly late decay stage snags and logs. Project design to protect specific large down logs and snags from consumption will be incorporated into the burn plan to avoid impacts to these habitat components, including consumption of snags created through prescribed burning or scorching from pile burning.

Cumulative Effects to Habitat

The cumulative effects analysis area contains 4,624 acres of late seral closed canopy coniferous habitat. There have been no projects in the project area since 2005 (using 2005 vegetation data for the analysis) that have affected late seral closed canopy forest. Past projects utilizing CASPO and Sierra Nevada Framework guidelines retained at least 40% canopy cover and trees over 30" dbh through understory thinning prescriptions. Earlier timber and post-fire salvage harvest on National Forest that resulted in the creation of plantations within the project area removed late seral habitat. In areas of commercial treatments, it can be expected that in the short-term there will be no significant changes but in the long term, treatments to move stands to late seral conditions will increase habitat for the spotted owl and northern flying squirrel through increased growth rates of remaining trees. Trees that could potentially reach 30" or larger (where site conditions allow) are being removed, potentially affecting additional 5M/5D stands that could develop, within the project area in the long term and increasing the distance between trees that could change gliding distance for flying squirrel to reach nearby trees.

Hazard tree removal and prescribed burning will change the existing snag and down log component by altering the existing age and size classes currently within the area. It can be expected that losses of late decay stages will occur, reducing this age class in the area. It is also expected that there may be creation of new age classes from the death of green trees that become snags and serve as recruitment logs from prescribed burning. This could result in the natural falling of both existing snags and live green trees weakened from both fire and loss of previous vegetation (that served as protection from high winds) which would reduce future snag levels but increase early decay class down logs within the area.

Relationship of Project-Level Habitat Impacts to Bioregional-Scale

In Alternatives 2, 4, and 5, a potential change of 610 acres, 305, or 372 acres, respectively of 5D to 5M CWHR habitat type out of 4,624 acres 5D available, the project, would when combined with cumulative effects where projects generally maintain at minimum 5M habitat and promote resiliency to stand replacing fires, not alter the existing trend in the habitat, nor with it lead to a change in the

distribution of the California spotted owl or northern flying squirrel across the Sierra Nevada bioregion.

Snags in Green Forest Ecosystem Component (Hairy woodpecker)

Affected Environment

The analysis area has approximately 14,797 acres of forest with CWHR size class of 4 or larger that could support habitat as "snags in green forest ecosystem component." Based on the Trestle Silviculture Report (Howard and Walsh, 2014) and associated snag surveys, ther are approximately 1 snag per acre having an average diameter of 16 inches and a height of about 60 feet within treatment units. Snags range in size from16 to 50 inches dbh with heights ranging from about 50 to 180 feet. They are mostly white fir with smaller percentages being made up of sugar pine and ponderosa pine snags in various stages of decay.

Status and Trend

The current average number of medium-sized and large-sized snags (greater than 15" dbh, all decay classes) per acre across major coniferous and hardwood forest types (westside mixed conifer, ponderosa pine, white fir, productive hardwoods, red fir, eastside pine) in the Sierra Nevada ranges from 1.5 per acre in eastside pine to 9.1 per acre in white fir. In 2008, snags in these types ranged from 1.4 per acre in eastside pine to 8.3 per acre in white fir (USDA Forest Service, 2008).

Data from the early-to-mid 2000s were compared with the current data to calculate the trend in total snags per acre by Regional forest type for the 10 Sierra Nevada national forests and indicate that, during this period, snags per acre increased within westside mixed conifer (+0.76), white fir (+2.66), productive hardwoods (+0.35), and red fir (+1.25) and decreased within ponderosa pine (-0.16) and eastside pine (-0.14) Detailed information by forest type, snag size, and snag decay class can be found in the 2010 SNF Bioregional MIS Report (USDA Forest Service, 2010).

Monitoring of the hairy woodpecker across the ten National Forests in the Sierra Nevada has been conducted since 2009 in partnership with PRBO Conservation Science, as part of a monitoring effort that also includes mountain quail, fox sparrow, and yellow warbler (USDA Forest Service, 2010). Hairy woodpeckers were detected on 15.1% of 1659 point counts (and 25.2% of 424 playback points) in 2009 and 16.7% of 2266 point counts (and 25.6% of 492 playback points) in 2010, with detections on all 10 national forests in both years. The average abundance (number of individuals recorded on passive point count surveys) was 0.116 in 2009 and 0.107 in 2010. These data indicate that hairy woodpeckers continue to be distributed across the 10 Sierra Nevada National Forests. In addition, the hairy woodpeckers continue to be monitored and surveyed in the Sierra Nevada at various sample locations by avian point count and breeding bird survey protocols. These are summarized in the 2008 Bioregional Monitoring Report (USDA Forest Service, 2008).Current data at the rangewide, California, and Sierra Nevada scales indicate that the distribution of hairy woodpecker populations in the Sierra Nevada is stable.

Environmental Consequences

Alternative 1

Direct and Indirect Effects

Under Alternative 1, no direct effects would occur to snags in green forest habitat because no project activities would occur. The number of snags is expected to increase over the long-term, primarily due to mortality caused by insect and disease. The recruitment of snags would continue to be dependent upon the interplay of precipitation levels, stand density and other natural elements, such as the incidence of insect attack, natural mortality, and amounts of wind throw.

Cumulative Effects

Cumulative effects are not expected with this alternative.

Alternatives 2, 4, and 5

Direct and Indirect Effects

The project would affect up to 4,556 acres (ranging from 2,474 acres under Alt. 4 to 4,556 acres under Alt. 2) of CWHR size class 4 or larger stands. Some incidental reduction in the number of existing snags is expected as a result of incidental hazard tree falling; however this is not expected to have an impact on overall snag averages across the project area. Short-term direct effects upon snags and down logs are also likely to occur as part of the prescribed fire, machine piling, and pile burning activities.

Though some later decay stage snags may be lost, prescribed burning may also result in additions to the existing snag and down log component through mortality of individual live green trees. The exten and numbers are difficult to determine due to unpredictability of the exact behavior of prescribed fire, current snag numbers, and number of susceptible live green trees in individual stands. If snags are lost and snag recruitment doesn't occur during prescribed burning, average snags per acre will be reduced further; particularly the late decay stage snags.

Harvest of green trees 16 inches dbh and larger will alter future snag and down log recruitment including age classes and size ranges in both the short and long term.

Cumulative Effects to Habitat

The cumulative effects analysis area contains 14,797 acres of CWHR size class 4 or larger stands. Project activity that occurs in commercial thinning units, as well as burn only units that support the "snags in green forest ecosystem component" with the Trestle project will maintain existing levels (except hazard trees), retain trees over 30 inches dbh, and potentially increase snag levels during prescribed burning in snag deficit areas.

There have been no projects in the project area since 2005 (using 2005 vegetation data for the analysis) that have affected large size trees (CWHR size class 5). Past projects utilizing CASPO and Sierra Nevada Framework guidelines retained at least 40% canopy cover and trees over 30" dbh through understory thinning prescriptions. Earlier timber and post-fire salvage harvest on National Forest that

resulted in the creation of plantations within the project area removed late seral habitat. In plantation treatment areas, it can be expected that in the short-term there will be no significant changes but in the long term, treatments to move stands to late seral conditions will increase large diameter tree habitat for hairy woodpecker.

Relationship of Project-Level Habitat Impacts to Bioregional-Scale

Project activity that occurs on the 4,556 acres in commercial thinning units and in burn only units that support coniferous forest (that could provide snags in green forest) will maintain snags (except hazard trees) and live recruitment trees to provide for habitat within the project area. Therefore, the Trestle project would not lead to a change in the distribution of hairy woodpecker across the Sierra Nevada bioregion.

Air Quality

The Clean Air Act requires EPA to set National Ambient Air Quality Standards for six common air pollutants (Ozone, Particulate Matter, Carbon Monoxide, Nitrogen Oxides, Sulfur Dioxide, and Lead. Effects from the Trestle project on air quality are summarized from Riesenhuber and Allan (2014).

Affected Environment

The project area is bounded by the North Fork Cosumnes River drainage on the north and the Middle Fork Cosumnes River to the south. Steely Fork of the Cosumnes River flows within the project area. Both topography and weather play critical roles in the distribution of emissions within the project area. Steep, narrow canyons occur in and adjacent to the project area generally running in a west – east direction.

In the Trestle project area typical weather patterns are diurnal in nature; upslope, up-canyon winds during the afternoon hours with down-slope, down-canyon winds at night. General wind patterns are influenced by the high and low pressure gradients and predominately influence a southwest flow aloft along the ridges. Inversions may occur during the overnight hours in or adjacent to the project area.

CLASS 1 AIRSHEDS

Class 1 airsheds can be defined as USDA Forest Service Wilderness Areas that cover more than 5,000 acres and in existence as of August 7, 1977. Other Class 1 areas include National Parks exceeding 6,000 acres, National Memorial Parks exceeding 5000 acres, and International Parks.

Two Wilderness Areas have been classified as Class 1 airsheds (40 CFR 81.405) and are located within 20 miles of the Trestle project area. The Mokelumne Wilderness Area is located 15 miles southeast of the Trestle project boundary and Desolation Wilderness Area located 18 miles northeast of the Trestle project boundary.

SENSITIVE AREAS

The following communities are located within a 20 mile radius of the project area:

- Grizzly Flat (west, 2 miles)
- Pine Grove (southwest, 17 miles)

- Pollock Pines (north, 11 miles)
- Kyburz (northeast, 15 miles)
- Wilseyville (south, 17 miles)
- Pioneer (south, 10 miles)
- Mount Aukum (west, 14 miles)
- River Pines (west, 15 miles)
- El Dorado (west, 19 miles)
- Volcano (southwest, 12 miles)
- Omo Ranch (southwest, 5 miles)
- Somerset (southwest, 6 miles)
- Fiddletown (southwest, 14 miles)
- Diamond Springs (west, 18 miles)
- Placerville (northwest, 19 miles)
- Camino (northwest, 13 miles)

Other potential areas that smoke emissions may extend to include the Lake Tahoe Basin (northeast, 25 miles).

The following areas are recognized as sensitive areas due to their recreational opportunities in the general area. Recreational activities include camping, off-highway vehicles use (such as motorcycles and all-terrain vehicles), boating, fishing, hiking, panning for gold and hunting. These recreation sites see their highest use during the summer months with least visitation during the fall (post hunting season) through winter months.

- Cosumnes River: North Fork, Steely Fork, and Middle Fork (adjacent and within the project boundary)
- Elkins Flat Off-Highway Vehicle (OHV) area (within and adjacent to the project boundary)
- Capps Crossing Campground (east, 1 mile)
- Jenkinson Lake and Flemming Meadow recreation areas (north, 3 miles)
- Pipi Campground and Gold Note OHV area (south, 1 mile)

NON-ATTAINMENT AREAS

The 1990 amendment of the Clean Air Act published the General Conformity Rule. It states that in federal non-attainment areas, before actions can be taken on federal lands that have the potential to emit pollutants to the atmosphere, a determination must be made that the emissions will not exceed a de minimis (threshold) level (tons per year). If the action exceeds the de minimis level, then a conformity determination is required which documents how the federal action will not cause or contribute to any new violation of any standard in any area; increase the frequency or severity of any existing violation of any standard in any area; or delay timely attainment of any standard or any required interim emission reductions or other milestones in any area. If the project emissions are below de minimis levels the project would be considered exempt from conformity determination with the State Implementation Plan (SIP).

El Dorado County is currently in attainment for 5 of 6 criteria pollutants. 8-hour Ozone is in nonattainment status for El Dorado County and the Sacramento Metropolitan Area. There are no published emission factors that isolate ozone. Standards have been set though, for the ozone precursors such as hydrocarbons and oxides of nitrogen. Ozone is formed as a result of photochemical reactions

involving two types of precursor pollutants: volatile organic compounds (VOC) and nitrogen oxides (NOx). VOC and NOx air pollutants are emitted by many types of sources, including on-road and off-road combustion engine vehicles, power plants, industrial facilities, gasoline stations, organic solvents, and consumer products.

Nonattainment areas are classified as marginal, moderate, serious, severe, or extreme areas depending on the magnitude of the highest 8-hour ozone design value for the monitoring sites in the nonattainment area. The Sacramento region is classified as 'Severe' as determined by the Environmental Protection Agency's (EPA) "Green Book Nonattainment Areas For Criteria Pollutants" (http://www.epa.gov/oar/oaqps/greenbook/index.html). Threshold values for *de minimis* levels with a severe listing are less than 25 tons per year.

Environmental Consequences

Table 34
Emission Estimates from Harvesting Activities (Tons of Emissions)

	Alternative 1	Alternative 2	Alternative 4	Alternative 5
PM_{10}	0	1.58	0.91	0.48
CO	0	13.24	7.41	3.38
VOCs	0	1.54	0.88	0.46
NO_x	0	21.72	12.35	6.23

Table 35
Smoke Emissions Estimates from Prescribed Fire Activities (Tons of Emissions)

	Alternative 1*	Alternative 2	Alternative 4	Alternative 5
PM10	10,723.76	1,887.95	1,317.22	1,209.76
CO	103,938.00	14,159.65	9,879.19	9,073.21
VOCs	4,701.96	471.99	329.31	302.44
NOx	1,658.10	632.48	441.28	405.28
***Alternative 1 emission values are based on a wildland fire occurring in the proposed treatment units.**				

Alternative 1

Direct and Indirect Effects

Under this alternative, no increase in ozone precursors or PM10 emission levels would be produced from prescribed burning of activity generated fuels, harvest operations, or understory burning. Potential for substantial degradation of air quality from wildfire in the future as surface fuel deposition occurs would not be reduced. Alternative 1 will not provide any opportunities to reduce existing forest fuels and the hazard they pose in wildland fires. During the flaming phase of a catastrophic wildfire, air quality degradation can exceed Federal and State standards as far as 50 miles downwind. Examples of this occurred during the Freds and Power Fires (Eldorado National Forest, 2004), the Rim Fire (Stanislaus National Forest, 2013), American Fire (Tahoe National Forest, 2013) and most recently the King Fire (Eldorado National Forest, 2014). All things being equal, wildfire generally produces twice the emissions of prescribed fire due to increased consumption (Ottmar & Hessburg, 1998).

Cumulative Effects

Cumulative effects are not expected in with this alternative.

Alternatives 2, 4, and 5

General conformity is the federal regulatory process for preventing major federal actions or projects from interfering with air quality planning goals. Conformity provisions ensure that federal funding and approval are given only to those activities and projects that are consistent with state air quality implementation plans (SIPs). Conformity with the SIP means that major federal actions will not cause new air quality violations, worsen existing violations, or delay timely attainment of the national ambient air quality standards (NAAQS).

General conformity requirements apply only if federal actions satisfy one of the following two conditions: (40 CFR 93.153)

- The action's direct and indirect emissions have the potential to exceed the de minimus threshold levels established for criteria pollutants in the rule. For a severe nonattainment area, the threshold level is 25 tons per year of VOC or NOx.
- The action's direct and indirect emissions of any criteria pollutant represent 10% or more of a nonattainment or maintenance area's total emissions inventory for that pollutant.

General Conformity is not required for the Trestle Forest Health Project. The estimated emissions for mechanical thinning are below the 25 tons of emissions per year.

Generally conformity is not required for prescribed burn activities under 40 CFR 93.153 (i) (2). Prescribed burning activities are "presumed to conform" when conducted in accordance with a smoke management program (SMP) which meets the requirements of EPA's Interim Air Quality Policy on Wildland and Prescribed Fires or an equivalent replacement policy. Prescribed fire activities would be a multi-year process and typically occur during the time of year when air quality is less of a concern

for increasing Ozone emission levels. Yearly emissions are anticipated below de minimus threshold values for NOx or VOC.

Direct and Indirect Effects

Short term effects to air quality during mechanical thinning activities include the generation of dust and exhaust from equipment used at the worksite. Logging trucks would add emissions driving from the landing to the mill. Impacts related to dust would be localized and emissions would be dispersed upwind from the project site by wind. Mitigation measures to reduce impacts include watering dirt roads to limit dispersion of fugitive dust.

Short term effects to air quality during prescribed burning include visual impacts of smoke production and its associated emissions which can be a public health concern when in heavy concentrations. It is anticipated that localized effects in the project area would include pooling of smoke during nighttime hours when inversions are present. Downwind impacts related to smoke may potentially occur in populated areas such as Placerville, Pollock Pines, Grizzly Flat, Pleasant Valley, Plymouth, Latrobe, and the Lake Tahoe Basin.

During prescribed burning inversions may occur in or adjacent to the project area due to the canyons and drainages. Typically smoke from prescribed burning settles into the narrow canyons during the nighttime hours and lifts by early morning hours as the sun rises. Most often smoke settling into these topographic locations is localized in nature. In conjunction with nighttime cooling, smoke begins to settle into these areas and does not disperse as winds are typically calm during the night. Dependent on where the smoke emissions are as nighttime cooling occurs is where these emissions typically settle during the nighttime hours and disperse the following day as temperatures warm and convective forces begin to disperse smoke.

Several mitigation measures are available to reduce the amount and duration of smoke emissions dependent on meteorological conditions. All action alternatives that include prescribed fire can manage for smoke emissions compared to Alternative 1 (No Action Alternative). Examples of mitigation measures include limiting the size of the burn, cut-off burn times, and mop-up of large fuels or areas generating smoke. These mitigations allow fuels to burn down during favorable weather conditions which transport and disperse smoke. Managing smoke emissions on a wildfire is not feasible in many instances.

Prior to implementation of burning, the El Dorado County Air Quality Management District (AQMD) would be contacted and burn permit obtained from the county as to the type of burning, location, total amount of acres in the project and total potential emissions from the project. Prior to prescribed burn ignitions, a smoke management plan is drafted by the permitee and approved by El Dorado County AQMD in which potential smoke impacts are identified such as Class 1 Airsheds and populated areas. Included in the smoke management plan are mitigation and contingency strategies as well as desired and acceptable wind directions for smoke travel. The permitee is required to contact El Dorado County AQMD one week prior to ignitions to notify the air district of the planned burn location and acreage. The permitee is also required to notify the air district each day prior to planed ignitions for final burn

approval and the air district grants or denies burn approval each day. Actual acreage burned is submitted to the county air district upon completion of each day of burning. This process is conducted via the Prescribed Fire Information Reporting System (PFIRS); a web based program which allows land managers, air quality specialists, and general public to see locations of current and planned burn projects.

Should a wildfire occur within or move into the treated areas of the Trestle project area, a reduction in the size, change in type and arrangement of fuels post treatment would reduce wildfire smoke emissions. Finer fuels post treatment would consume faster emitting less smoke with minimal smoke generation as fuels would quickly consume.

Cumulative Effects

Emissions under this project would be cumulative to other projects in the area, but would comply with air quality regulations for the area.

Cultural Resources

Effects to Cultural Resources are summarized from Cultural Resources Management Report R2012050360011 (Klemic, 2014).

Affected Environment

Cultural Resources, the remains of past human activity, provide a record of human activity and manipulation within the ecosystem and provide meaningful context for resource managers to assess the existing condition of the landscape. The analysis area contains evidence of an extensive record of human activity, with the heaviest use occurring within the last 4,000 years. Materials from the surrounding forest indicate that people have been visiting the general vicinity for at least 7,000-9,000 years.

Ethnographic data indicates the project area was used primarily by the Washoe, the Nisenan (southern Maidu), and the Northern Sierra Miwok. The Nisenan and the Northern Sierra Miwok had their winter villages below the snowline on the west slope of the Sierra. The Washoe had their permanent villages east of the Sierra, roughly from the present-day Reno to Markleeville area. All three groups would have used this region as a travel corridor and locale to harvest acorns, pine nuts, deer, fish, plants and other resources. In addition to visiting the area to gather specific resources, each would acquire a variety of resources through trade with each other. Commerce among the Washoe, Nisenan and Miwok included exchange of salt, pine nuts, obsidian and rabbit skins from the east for acorns, bulbs and sea shells (used as currency and for ornaments) from the west.

The three groups continued their traditional lifeways until the California Gold Rush. The great influx of Euro-Americans in 1849 and the early 1850's had devastating consequences for most of the California native peoples. By the 1860's the impacts of disease, violence, environmental degradation and starvation had severely disrupted their conventional activities. Today many of the descendants of these people live in both the Sierra foothills and the valleys adjacent to the east slope. Numerous

traditional activities, such as hunting, fishing and basket-making are still practiced today. Archaeological evidence confirms use due to the presence of bedrock milling features and lithics within the project area, however over 100 years of major ground disturbing activities during the historic period have undoubtedly had a significant impact on the prehistoric record.

Historic activities left a definite imprint on the landscape within the analysis area. Historic sites include the remains of such land uses as logging and mining. Infrastructure such as dams, water conveyances, hydraulic cuts, roads, trails, railroad grades, collapsed trestles and flumes are all located in the vicinity.

The historic area of Henry's Diggings is located within the project boundary. This area saw major mining activities between the years of 1852 and 1950. Gwen Walter and Rebecca Palmer compiled a detailed history, which can be found in the Henry's Diggings Evaluation (1992), which is filed at the Eldorado National Forest Supervisor's Office in Placerville. Henry's Diggings has been evaluated and found to be eligible for inclusion in the National Register of Historic Places.

The Grizzly Flat Cutoff passes though the project area. This emigrant route was opened in 1852 and leaves the Carson Mormon Route just north of Leek Springs and follows Baltic Ridge west, descending to Capps Crossing on the Consumes River before ascending the hill south of the river to follows ridges down to the town of Grizzly Flat. The Grizzly Flat Cutoff has not been evaluated for the National Register of Historic Places.

The majority of the project area was also utilized by the Diamond and Caldor Railway, a subsidiary of the California Door Company, which operated a narrow gauge railroad for logging and passenger traffic from the early 1900s through 1953. The Caldor Railway and the majority of its associated camps and features have been found to be ineligible for inclusion in the National Register of Historic Places.

The Forest Service began administering the majority of the land located within the project boundary in 1906. The Eldorado National Forest was established in 1910. During the early 1900s the Forest Service attempted to limit grazing and prohibit burning practices of stockmen and homesteaders (Hunt 1986). By 1915 a fixed point fire detection system in conjunction with guard stations and fire lookouts was established Forest-wide and included the project area. Guard stations were constructed near the town at Caldor and along Plummer Ridge, the latter of which is still standing today.

Forty-four surveys have been conducted within in the Area of Potential Effect (APE) for a total of 13,036 acres (only 10,580 acres meet current inventory standards). These past archaeological surveys have resulted in coverage of the majority (74%) of public land within the project area, predominately within the archaeologically sensitive terrain. An additional 3,425 acres of new survey was conducted for this project. These surveys have resulted in the identification of 116 cultural resources within the project area. Of this total, 78 sites are historic, 24 sites are prehistoric and 14 are multi-component, containing both historic and prehistoric features.

At present, 3 resources have been determined to be eligible for the National Register of Historic Places and 60 have yet to be evaluated. The remaining 53 resources have been determined ineligible for the Register. Analysis for this project includes a recommendation that 27 of the previously unevaluated historic cultural resources do not qualify for eligibility on the Register as they are associated with the ineligible property of Caldor or due to their diminished integrity.

Environmental Consequences

Alternative 1

Direct and Indirect Effects

While there would be no direct risk to cultural resources from ground disturbing activities, this alternative would do nothing to reduce the risk to cultural resource sites from future high severity fires within the sites due to increasing fuel loading and years of avoidance. In addition, no restoration activities would occur to alleviate the existing and expected ongoing impacts resulting from dispersed camping, roads, and trails.

Cumulative Effects

Prior to the 1974 Forest and Rangeland Renewable Resources Planning Act (RPA) (predecessor of the NFMA), effects to heritage resources were not considered during project planning or implementation. Consequently, cumulative impacts of varying degrees occurred within the project area from various land management activities including logging, road construction and mining activities. Natural environmental processes and unrestricted land uses have also contributed to effects to heritage resources within the project area. These include: dispersed recreation, OHV uses, grazing, existing road conditions, wildfires, erosion and exposure to the elements. In addition, Heritage Resources have been primarily protected using "flag and avoid measures" during all project activities subsequent to the 1974 RPA, including projects such as timber sales and prescribed burns. Unfortunately, this management practice, which essentially deferred management, has resulted in unintended consequences as it contributed to unnatural and heavy fuel loading within site boundaries. Future wildfires would degrade the integrity of these fragile cultural resources. No predicted future management activities would affect cultural resources within the project area.

Alternatives 2, 4, and 5

Direct and Indirect Effects

Activities associated with the action alternatives will comply with Section 106 of the National Historic Preservation Act of 1966, as amended in accordance with provisions of the Programmatic Agreement among the U.S.D.A. Forest Service, Pacific Southwest Region (Region 5), the California State Historic Preservation Officer, the Nevada State Historic Preservation Officer, and the Advisory Council on Historic Preservation Regarding Processes for Compliance with Section 106 of the National Historic Preservation Act for Management of Historic Properties by the National Forest of the Pacific Southwest Region (Regional PA 2013).

The procedures and stipulations within the Regional PA include the identification and treatment of at-risk historic properties. An "at-risk" historic property is a property that has been identified as susceptible to being adversely affected as a result of activities associated with this project. An adverse effect to cultural resources is found when an undertaking may alter the characteristics of a historic property that qualify it for inclusion in the National Register of Historic Places in a manner that would diminish the integrity of the property's location, setting, materials, workmanship, feeling, or association [36 CFR 800.5(a)(1)]. A property is identified as "at-risk" based on that property's characteristics, proximity to project activities, and landscape features. Therefore, there may be a lower number of at-risk historic properties than the number of known cultural resource sites located within the APE.

Without management activities there is a concern for continuing unhealthy forest conditions as well as future high severity fires within the sites due to increased fuel loading from decadent fuels and the presence of dense brush fields. Studies conducted within Region 5 on the Six Rivers National Forest (Wilson, 1999) and the ENF have demonstrated that "specific methods of timber harvest over certain ground conditions can result in negligible damage to the underlying ground surface and archaeological materials" (Jackson, 1994). These methods include helicopter logging, full suspension sky-line, and full suspension rubber tire logging methods.

While ground-disturbing activities associated with this alternative have the potential to disturb or destroy cultural resources, implementation of this alternative is not expected to have any direct or indirect effects on known cultural resource sites located within the analysis area. Design criteria to protect cultural resources during project implementation have been incorporated into the design of this project. There is a concern for cultural resource sites not discovered due to factors such as steepness of terrain prohibiting safe survey or those sites that are located in their entirety sub-surface.

The action alternatives would reduce the risk of impacts to cultural resources due to the removal of standing dead trees, reducing overall fuel loading and risk of subsequent high intensity wildfires. These alternatives would also reduce the risk to cultural resources from erosion being caused by illegal recreation activities. These alternatives should, therefore, have an overall beneficial effect to cultural resources. However, there is a concern for sites within areas designated for no treatment.

Cumulative Effects

Cumulative effects of the action alternatives are the same as described under Alternative 1.

Social and Economic

Social and economic effects are summarized from Howard and Walsh (2014).

Affected Environment

The Trestle project is located primarily within El Dorado County – near the small (pop. 1,066) rural community of Grizzly Flat, CA, located northwest of the project area. El Dorado County encompasses

1,711 square miles and is part of the Greater Sacramento Metro Region (GSMR), which also includes the Counties of Placer, Sacramento, Sutter, Yolo, and Yuba. The County Seat is in Placerville.

Approximately 73% of the nearly 600,000-acre Eldorado National Forest (ENF) is located in El Dorado County. Private lands within and adjacent to the boundary of the project area are primarily owned by individuals.

The socio-economic environment affected by the Trestle project is primarily associated with the benefits/costs and opportunities that are present and of value, either monetarily or spiritually, to the public. The socio-economic environment of the Trestle project can be described in a multitude of ways, however for purposes of this analyses, the local socio-economic environment consists of El Dorado County and the Greater Sacramento Regional area.

Local Economy

Like most areas of the country, economic conditions in El Dorado County have suffered during recent years. El Dorado County's economy is slightly more diversified than the larger Sacramento Region, but both are much less diversified than the state overall. Major sectors where the County is specialized include: Construction; Accommodation and Food Services; Agriculture; Forestry; Fishing and Hunting; and Utilities. Businesses with one to four employees were the most common in El Dorado County, and made up 62 percent of all establishments. Another 17 percent of the businesses in El Dorado County consist of five to nine employees, suggesting a strong trend of small local businesses in the county.

Forest Products

The forest products industry provides about 27,692 jobs in California compared to approximately 13 million total employment statewide. The forest products industry represents about 1.6% of the overall California payroll at the state-wide level.

Over the past decade, three large wood product manufacturing facilities in the GSMR have closed. One of these was the Sierra Pacific Industries (SPI) sawmill in Camino, El Dorado County.

At the present time, the SPI sawmill in Lincoln is the only significant wood products manufacturing facility operating within the GSMR. The SPI sawmill in Lincoln is among the largest sawmills on the west coast and currently has approximately 315 employees and ranks about 13th in terms of number of workers employed by the private sector in Placer County.

National Forest management directly affects the socioeconomic environment of the Sierra Nevada through employment and income derived from resource extraction, production and use. Timber harvest from National Forest System lands provides a flow of products to area industries. Direct and indirect employment is produced by the jobs associated with the harvest and processing of timber. In terms of gross revenue, timber is one of the Sierra Nevada's most valuable products. Timber harvest activities have commonly been associated with the jobs they create in rural communities.

The majority of timber production in the Sierra Nevada now comes from private harvests. Timber harvesting on private lands accounts for 67-90 percent of total timber harvests in the Sierra Nevada. A decrease in available timber harvest continues to result in mill closings, lost jobs, and decreasing potential financial capital. During the last decade, the Eldorado National Forest has annually offered for sale approximately 20 million board feet of timber. This volume was bought by SPI or other purchasers, and primarily processed at the Lincoln, CA sawmill. The Lincoln mill sawlog capacity is 170 million board feet/year and annually relies on purchasing 20% (34 million board feet) of timber from national forest timber sales to sustain its operations.

Within the Trestle project area the primary uses by the local community are firewood collection, dispersed camping, motorized recreation, and hunting.

Social and Economic Consequences

Alternative 1

Direct and Indirect Effects

No direct or indirect costs would be incurred by implementing this Alternative. No harvesting of trees or any associated fuel treatments would be conducted. No volume would be provided to local mills and no fuel treatment investments or watershed enhancement activities would occur. In the event of a wildfire, suppression and rehabilitation costs would likely be much higher than with the implementation of action alternatives.

Cumulative Effects

Cumulative effects are not expected with this alternative.

Alternative 2

Direct and Indirect Effects

Timber volume associated with the Trestle project would help satisfy the demand by local mills for timber supplies. Funds received from the sale of timber products would be used to finance or partially off-set the need for the use of appropriated funds or retained receipts to accomplish the proposed fuel treatments. The proposed treatments would also provide employment to local business directly and indirectly associated with harvest activities, road reconstruction, fuels work and associated equipment use and maintenance.

Although the Eldorado NF has no annual timber sale volume targets, the Forest has attempted to offer about 40,000 ccf (hundred cubic ft) of timber/year which is equivalent to the timber volume that the local mill has on average purchased and/or processed from the ENF over the last decade.

A total of 36,386 ccf of timber would be removed under Alternative 2. This represents approximately 90% of the 40,000 ccf of Eldorado NF's average timber volume sold each year. The funds available from the harvest of 36,386 ccf of timber that would be available for fuels treatment would be approximately $1,455,441 if the sale were sold under the current, relatively depressed timber market conditions.

The $1,455,441 in estimated timber revenues would accomplish about 91% of the $1,605,409 of the direct, fuels treatment costs associated with the commercial harvest units, which includes $896,150 for road reconstruction and other activities associated with mechanical vegetation treatment (i.e. gates and barriers, ripping skid roads, noxious weed treatments). Funds would not be available through timber revenues to accomplish any of the $5,353,830 of treatments that are associated with non-commercial, initial and follow-up fuels treatments (i.e. non-commercial mechanical thinning units, hand thinning, pile burning, and understory burning). In addition, funding would not be available through timber revenues for the estimated $109,200 of watershed and recreation improvement activities. Additional allocated funding and grants would be needed to accomplish this work.

This alternative would generate approximately 116 direct and 243 indirect jobs created associated with the harvested volume.

Cumulative Effects

Effects for increased economic activity with this project would be cumulative to other projects ongoing and planned on the forest.

Alternative 4

Direct and Indirect Effects

A total of 19,728 ccf of timber would be removed under this Alternative. This represents approximately 49% of the 40,000 ccf of Eldorado NF's average timber volume sold each year. Funds for fuels treatment available from the harvest of 19,728 ccf of timber would be approximately $789,098 if the sale were sold under the depressed timber market conditions.

The $789,098 in estimated timber revenues would accomplish about 71% of the $1,114,080 of other costs directly associated with the commercial harvest units, including $632,150 for road reconstruction and other activities associated with mechanical vegetation treatment (i.e. gates and barriers, ripping skid roads, noxious weed treatments). No funds would be available to accomplish any of the $5,124,934 of treatment opportunities that are not associated with the commercial harvest units.

This alternative would generate approximately 63 direct and 243 indirect jobs created associated with the harvested volume.

Compared to Alternative 2, this alternative commercially thins fewer acres and relies more on additional funding sources to complete project activities. Similar to Alternative 2, alternative allocated and grant funding would be needed to accomplish project activities. This alternative decreases the amount of full-time equivalent jobs that are estimated to be supported by activities directly and indirectly associated with timber harvest, but would support a similar amount of jobs for other project work.

Cumulative Effects

Effects for increased economic activity with this project would be cumulative to other projects ongoing and planned on the forest.

Alternative 5

Direct and Indirect Effects

An estimated 27,654 ccf of timber would be harvested under this alternative. This represents approximately 69% of the 40,000 ccf of Eldorado NF's average timber volume sold each year. The funds available from the harvest of 25,944 ccf of timber that would be available for fuels treatment would be approximately $1,106,122 if the sale were sold under the current, relatively depressed timber market conditions.

The $1,106,122 in estimated timber revenues would accomplish about 88% of the $1,249,860 of the direct, fuels treatment costs associated with the commercial harvest units. No funds would be available to accomplish any of the $4,900,530 of other treatment opportunities that are not associated with the commercial harvest units.

This alternative would generate approximately 88 direct and 185 indirect jobs created associated with the harvested volume.

Compared to Alternative 2, this alternative commercially thins fewer acres and relies more on additional funding sources to complete project activities. Similar to Alternative 2, alternative allocated and grant funding would be needed to accomplish project activities. This alternative decreases the amount of full-time equivalent jobs that are estimated to be supported by activities directly and indirectly associated with timber harvest, but would support a similar amount of jobs for other project work.

Cumulative Effects

Effects for increased economic activity with this project would be cumulative to other projects ongoing and planned on the forest.

Climate Change

Affected Environment

While there is a great deal of uncertainty in the future climate that will be experienced in the area and how current and future events will interact to affect vegetation resources, climate change trends and projections for the Eldorado National Forest were examined in Mallek and Safford (2010). In general it is expected that temperatures will increase, including an increase in nighttime minimum temperatures. It is uncertain whether or not there would be more or less precipitation annually, but it is anticipated that summers will be drier and that more precipitation will come in the form of rain rather than snow. It is projected that forest types would migrate to higher elevations as higher temperatures and longer growing seasons make those areas suitable for colonization and survival. For this project

area that means that given time and ability to move, the mixed conifer forests, pine types and oak types would shift upward in elevation. Fire intensity and severity has been increasing in this area and is anticipated to continue to increase under climate change scenarios, which would affect future stand structure and species mixes. Large areas of uncharacteristically severe fire may shift ecosystems into less desirable states that may persist for long periods with the added influence of climate change on those trajectories.

Diameter growth in the Sierra Nevada conifers is positively correlated with winter precipitation and to a lesser extent, summer air temperature (Battles et al., 2009; Robards, 2009). Some increase in vegetation productivity, given adequate available moisture could increase tree growth for some species (Hannah et al., 2009). Other species may have decreased growth (Chen et al., 2010). Under wetter climates increased carbon storage with increased vegetation productivity could be limited by greater losses to wildfire. Under drier climate scenarios carbon storage could be limited and vegetation productivity (Lenihan et al., 2006; Shaw et al., 2009). Battles et al. (2006) projected conifer tree growth would be reduced and could lead to substantial decreases in tree survival in El Dorado County.

Forest pests including native and invasive species may have competitive advantages for expanding their ranges and can become very destructive when forests are stressed by extreme weather and climatic changes. Climate change will likely favor insects with multiple generations in each year. This could increase insect pests and add new insect pests to this area (Trumble & Butler, 2009). Many species in the southwestern United States and Mexico are currently limited by climate rather than host availability, suggesting a high potential for range expansion northward (Bentz et al., 2010). Rising winter temperature could also make conditions more favorable for pitch canker resulting in increased disease severity (Battles et al., 2006).

The major impact to terrestrial wildlife will most likely be from changes in the vegetation community. According to the California State Wildlife Action Plan (2007), climate change effects will be especially disruptive in the Sierra Nevada, primarily because drier summers may increase fire frequency and intensity, reduce sierra snowpack, and result in earlier snowmelt. The action plans states concern for species within the Sierra Nevada because of the addition of urbanization pressure causing the remaining natural areas to shrink and the gaps between habitats to grow. In addition to the loss of riparian associated vegetation, the possible increased gaps between habitats due to urbanization, fire and climate change make habitat connectivity to allow adaptive migration even more important. "As climate change shifts annual average temperatures along the elevation gradient, as fire reshapes plant communities, and as stream flow regimes change, habitats and wildlife populations will be substantially affected. So far, very little research has evaluated the consequences of projected climate change on species at risk in the Sierra" (UCD Wildlife Health Center, 2007).

Sensitive species will be impacted by these climate changes shifts, although consequences for species are uncertain. Climate change could lead to changes in sensitive species habitat location, quality, and quantity. Much of the habitat for late seral, old forest dependent species will be even more restricted to these north facing slopes and protected canyons; adding to further fragmentation of habitat. The

proposed project reduces the higher tree density, but should increase old forest characteristics like average snag and downed log numbers in the short-term. It increases the resiliency of these stands to withstand the increased potential removal through the increased fire frequency predicted with climate change. This increased resiliency should make these stands more sustainable and allow for development of high tree densities and canopy covers that provide old forest characteristics in the long-term.

Sensitive species such as goshawks and marten may find their habitat more limited or shifted higher in elevation. With warmer temperatures, alpine and subalpine communities will shrink by 40-50% by mid-century, which will mostly impact marten and wolverine. Most common prey species should move with shifting habitat such as rodents, reptiles and small birds. It is more likely that changes in habitat quality and quantity will influence sensitive species than changes in prey availability as a result of climate change.

Environmental Effects

Alternative 1

With projected climate change trajectories, stresses on currently unsustainable stand structures and species compositions including projections for more severe drought and larger, more severe fires are expected to be exacerbated. Strategic placement of treatments across the landscape would not take place and therefore the likelihood of unacceptably large, high intensity fire would not be reduced. With no action, large areas of uncharacteristically severe fire may shift ecosystems into less desirable states that may persist for longer periods. Even if these systems are able to regrow trees after large scale disturbance, stands may be more vulnerable to future fires. Loss of tree reproduction may become more common since compared to overstory trees are likely to be more sensitive to environmental changes (van Mantgem et al., 2006).

Alternative 2

Strategic placement of treatments across the landscape using a combination of treatments including prescribed fire is expected to reduce the likelihood of unacceptably large, high intensity fire for the short term and to begin to shift disturbance regimes toward patterns that are more consistent with how ecosystems evolved, promoting resilience to stressors such as climate change. Many of the proposed treatments are designed to meet an initial phase of an integrated landscape treatment strategy and are primarily designed to reduce fire hazard in strategic areas. Treated area along with vegetation directly adjacent to treated areas would be expect to be more resistant should temperature increase and longer fire seasons occur as a result of climate change. Some treatments would push species composition and structure to a condition where stands would be representative of reference stand structures and resilient under the foreseeable climate; however for the majority of the treatments, thinning and burning intensities are not expected to be sufficient to provide for resilience with this project for a timescale that would impact the very long term effects of climate change without future follow-up treatments. It is expected that treatment will reduce the potential for carbon loss in treated stands, as sequestering carbon in these forests it appears that low density forest, dominated by large, fire resistant pines, may

be a desired stand structure for stabilizing tree-based carbon stocks in wildfire prone forests (Hurteau & North, 2009).

The EPA and the USFS has established national policy goals to take actions to improve the resiliency of both watershed and riparian floodplain ecosystems in response to predicted climate change impacts. As it relates to hydrology, the BMPs are designed to address potential direct and indirect sources of accelerated runoff and erosion, within the current climatic regime. In regards to cumulative watershed effects, climate change predictions add even more urgency to ensuring that the stream channel networks are maintained in stable geomorphic condition and are well connected to adjacent floodplains. Channels that are maintained (or restored) in a healthy state of dynamic equilibrium in terms of geomorphic/floodplain function, will be more resilient to adapting to climate change impacts, and maintaining high quality function in terms of water quality and aquatic and riparian habitat. Channels within the Trestle project area are currently considered to be resilient to climate change effects, and the actions proposed under this project are not expected to contribute to channel destabilization.

Increasing temperatures and changes in precipitation with climate change will impact both ecosystem structure and ecosystem processes. Viability of a species is dependent on the availability of suitable habitat. Animal species respond to climate variability in the short term through shifts in geographic range (migration) when suitable habitat is not available in the former range. Mortality and population extirpation in parts of a species' former range often occur. Over time, extirpation and colonization events cumulatively result in shifts of the species' distribution range (Davis & Shaw 2001; Delcourt & Delcourt, 1991). Land-use changes, development, and introduction of invasive species often impede the ability of species to respond to climate change adaptively resulting in small population sizes and isolation of populations as a result impede gene flow (Joyce et al., in press).

Vegetation treatments such as those proposed in this project increase the resiliency of the current habitat within the area impacted by the project for two reasons: 1) they reduce the potential for stand replacing fire within treatments and over the landscape including protected sensitive species areas (PACs) and 2) they improve stand health by promoting trees species that are adapted to hotter, drier summers and increased fire frequency (pines and hardwoods). Landscape and habitat resiliency is better met under Alternatives 2 to the large area treated and the longer lasting vegetation changes from treatments. These treatments may delay some of the immediate impacts to species especially from fire, and allow them to adjust slowly with adjusting habitat by preserving their currently located, possibly unsustainable habitat. By helping retain older forest dense habitats that sustain nesting and reproduction (PACs) in pockets protected by treatment units; these treatments are creating a resiliency for old forest habitat.

Experts suggest that land managers manage current habitat as a reservoir until suitable habitat can be established elsewhere (Hansen et al., 2001). By retaining structure and characteristics suitable to foraging and dispersal, these treatment areas can still be considered suitable connective habitat to suitable high quality habitat. Because many of the late seral species habitat are located in protected

drainages, where habitat is not expected to change, some of their habitat may not shift. This project and its various action alternatives would likely protect that habitat and the creation of future habitat in those areas from the climate changes threats.

While climate change may pose a threat to some of the sensitive species within the forest boundary, this project will benefit most species through an increase in the resiliency of the current habitat.

Alternative 4 and 5

Strategic placement of treatments across the landscape using a combination of treatments including prescribed fire is expected to reduce the likelihood of unacceptably large, high intensity fire for the short term and to begin to shift disturbance regimes toward patterns that are more consistent with how ecosystems evolved, promoting resilience to stressors such as climate change. Benefits for increased long term resilience, however would be reduced from Alternative 2 since fewer of the proposed treatments designed to push species composition and structure to a condition where stands would be representative of reference stand structures and resilient under the foreseeable climate would occur with this alternative and more areas would be maintained at a structure and composition that is not expected to be resilient with long term climate change projections.

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, sec.101) Long and short term effects of project activities under each alternative considered in detail are described in the effects section specific to each resource.

Unavoidable Adverse Effects

Increased risk of dispersal and mortality of sensitive wildlife species and damage and mortality of sensitive plant species from project activities may occur in the short term. Additionally, increased potential for spread of noxious weeds, increased soil disturbance within treatment units and increased risk of cumulative watershed effects are all unavoidable effects for all action alternatives. These effects are discussed in detail in the Chapter 3 for each specific resource. Although short-term adverse effects are unavoidable with project implementation, no significant adverse effects are expected to result from project activities.

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 mined ore. 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 rights-of-way or road.

No irreversible commitments of resources are anticipated. Temporary road construction under Alternatives 2, 4 and 5 represent irretrievable commitments for the period of time the roads are used, although temporary roads would be decommissioned following use, restoring the productivity of the site. Compaction associated with tractor harvest and mastication is an irretrievable commitment of soil resources that would ameliorate with time. The levels of compaction anticipated are within the LRMP standards and guidelines.

Legal and Regulatory Compliance

NEPA at 40 CFR 1502.25(a) directs "to the fullest extent possible, agencies shall prepare draft environmental impact statements concurrently with and integrated with …other environmental review laws and executive orders." The proposed action and alternatives must comply with following:

Principle Environmental Laws

The following laws contain requirements for protection of the environment that apply to the proposed action and alternatives:

Endangered Species Act

Refer to Botany, Terrestrial Wildlife, and Aquatic Wildlife Effects Sections

Clean Water Act

Refer to Water Quality/Hydrology Effects Section

Clean Air Act

Refer to Air Quality Effects Section

National Historic Preservation Act

Refer to Cultural Resources Effects Section

National Forest Management Act

All project alternatives meet requirements for the National Forest Management act through compliance with the 1989 Eldorado Forest Plan as amended by the 2004 SNFPA. Analysis of threats to Threatened, Endangered, and Sensitive wildlife and plant species were disclosed.

Executive Orders

The following executive orders provide direction to federal agencies that apply to the proposed action and alternatives:

Indian Sacred Sites, Executive Order 13007 of May 24, 1996

See Cultural Resources Effects Section

Invasive Species, Executive Order 13112 of February 3, 1999

See Botany Effects Section

Recreational Fisheries, Executive Order 12962 of June 6, 1995

Fish and wildlife on the Eldorado National Forest are managed by the State of California Department of Fish and Wildlife, while habitat is managed by the Forest Service. Affects to aquatic habitat are discussed in the Aquatic Wildlife Effects Section.

Migratory Birds, Executive Order 13186 of January 10, 2001

A migratory bird report was developed for the project (Yasuda, 2014c). Though the project may in the short-term indirectly (loss of habitat or habitat components, disturbance) or directly (mortality) affect some species, the impacts will be site specific and not occur over the entire landscape at the same time enabling species to adjust and locate currently unoccupied territories for nesting or adjacent areas for wintering or foraging (Ibid).

Environmental Justice, Executive Order 12898 of February 11, 1994

Environmental Justice is discussed in the Socio-Economic Effects Section. This project would not disproportionately affect minority or impoverished persons.

Use of Off-Road Vehicles, Executive Order 11644, February 8, 1972

Through compliance with the Wheeled Motorized Travel Management Final Environmental Impact Statement (FEIS) (2008).

Special Area Designations

There are no special area designations within the project area.

Chapter 4. Consultation and Coordination

Preparers and Contributors

The Forest Service consulted the following individuals, Federal, State, and local agencies, tribes and non-Forest Service persons during the development of this Draft Environmental Impact Statement:

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Federal, State, and Local Agencies:

Environmental Protection Agency; California Department of Fish and Wildlife; Grizzly Flat Community Service District; El Dorado County Supervisor, District 2

Tribes:

Washoe Tribe of Nevada and California, United Auburn Indian Community, and Shingle Springs Rancheria

Others:

Sierra Pacific Industries; California Forestry Association; Sierra Forest Legacy; Grizzly Flat Fire Safe Council

Distribution of the Draft Environmental Impact Statement

This Draft Environmental Impact Statement (DIES) has been distributed to individuals who specifically requested a copy of the document. In addition, copies have been sent to the following Federal agencies, federally recognized tribes, State and local governments, and organizations: Environmental Protection Agency (EPA), Grizzly Flat Community Services District, Grizzly Flat Fire Safe Council, Sierra Forest Legacy, California Forestry Association, El Dorado County Supervisor, District 2, California Department of Fish and Wildlife, Washoe Tribe of Nevada and California, United Auburn Indian Community, and Shingle Springs Rancheria.

Glossary of Common Terms

BA	Biological Assessment
BE	Biological Evaluation
BMP	Best Management Practices
CFR	Code of Federal Regulations
CWA	Clean Water Act
CWE	Cumulative Watershed Effect
District	Placerville Ranger District
EIS	Environmental Impact Statement
EHR	Erosion Hazard Rating
ENF	Eldorado National Forest
ESA	Endangered Species Act
Forest	Eldorado National Forest
Forest Plan	Eldorado National Forest Land and Resource Management Plan
FWS	United States Fish and Wildlife Service
HRCA	Home Range Core Area
LOP	Limited Operating Period
MDM&B	Mount Diablo Meridian and Base
MIS	Management Indicator Species
NEPA	National Environmental Policy Act
NFMA	National Forest Management Act
NFS	National Forest System
OHV	Off Highway Vehicle
PAC	Protected Activity Center
PCT	Pre-Commercial Thinning
RCA	Riparian Conservation Area
RCO	Riparian Conservation Objectives
ROD	Record of Decision
SNFPA	Sierra Nevada Forest Plan Amendment
SPLATs	Strategically Placed Landscape Area Treatments
TOC	Threshold of Concern
USDA	United States Department of Agriculture

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References

Baker, M. D., Lacki, M. J., & Falxa, G. A. 2008. Habitat Use of Pallid Bats in Coniferous Forests in Northern California. Northwest Science, 28(4), 269-275.

Barrett, J. 1982. Twenty Year Growth of Ponderosa Pine Saplings Thinned to Five Spacings in Central Oregon. USDA For. Serv. Res. Pap. PNW-301 , 17pp.

Battles, J., T. Robards, A. Das, K. Waring, J.K. Gilles, F. Schurr, J. LeBlac, G. Binging, and C. Simon. 2006. Climate change impact on forest resources. (www.climatechange.ca.gov/)

Battles, J.J., T. Robards, A. DAS, and W. Stewart. 2009. Projecting climate change impacts on forest growth and yield for California's sierra mixed conifer forests – Final Report. Public Interest Energy Research, California Energy Commission, Sacramento, CA, US. CEC-500-2009-047-F.

Beesley, David. 1996. Reconstructing the Landscape: An Environmental History, 1820-1960. Sierra Nevada Ecosystem Project: Final report to Congress, vol. II Assessments and scientific basis for management options. Davis: University of California, Centers for Water and Wildland Resources.

Beier, P., & Drennan, J. E. 1997. Forest Structure and Prey Abundance in Foraging Areas of Northern Goshawks. Ecological Applications , 7 (2), 564-571.

Bingham, B. B., & Noon, B. R. 1997. Mitigation of habitat "take": Application to habitat conservation planning. Conservation Biology, 11, 127-139.

Blakesley, J.A., B.R. Noon, and D.R. Anderson. 2005. Site Occupancy, Apparent Survival, and Reproduction of California Spotted Owl in Relation to Forest Stand Characterisitics. J. Wildlife Management. 69(4): 1554-1564.

Bland, J.D. 1993. Forest grouse and mountain quail investigations: A final report for work completed during the summer of 1992. Unpubl. report, Wildl. Mgmt. Div., Calif. Dept. Fish & Game, 1416 Ninth St., Sacramento, CA.

Bland, J.D. 1997. Biogeography and conservation of blue grouse Dendragapus obscurus in California. Wildlife Biology 3(3/4):270.

Bland, J.D. 2002. Surveys of Mount Pinos Blue Grouse in Kern County, California, Spring 2002. Unpubl. report, Wildl. Mgmt. Div., Calif. Dept. Fish & Game, 1416 Ninth St., Sacramento, CA 95814.

Bland, J.D. 2006. Features of the Forest Canopy at Sierra Sooty Grouse Courtship Sites, Summer 2006. CDFG Contract No. S0680003.

Bock, C.E. and J.F. Kynch. 1970. Breeding Bird Populations of Burned and Unburned Conifer Forest in the Sierra Nevada. Condor 72:182-189.

Bouldin, Jim. 1999. Twentieth Century Changes in Forests of the Sierra Nevada Mountains. Dissertation. University of California, Davis.

Brown, Matt. 2014. Biological Evaluation/Assessment for Botanical Species and Weed Risk Assessment for the Trestle Forest Health Project. Eldorado National Forest. Placerville, CA.

Bytholm, P., & Kekkonen, M. 2008. Food regulates reproduction differently in different habitats: experimental evidence in the goshawk. Ecology , 89 (6), 1696-1702.

CDFG (California Department of Fish and Game). 2004a. Resident Game Bird Hunting Final Environmental Document. August 5, 2004. State of California, The Resources Agency, Department of Fish and Game. 182 pp + appendices.

CDFG (California Department of Fish and Game). 2004b. Report of the 2004 Game Take Hunter Survey. State of California, The Resources Agency, Department of Fish and Game. 20pp.

CDFG (California Department of Fish and Game). 2005. California Department of Fish and Game and California Interagency Wildlife Task Group. California Wildlife Habitat Relationships (CWHR) version 8.1. personal computer program. Sacramento, California. On-Line version. http://www.dfg.ca.gov/biogeodata/cwhr/cawildlife.asp.

CDFG (California Department of Fish and Game). 2007. Deer Hunting Final Environmental Document, April 10, 2007. State of California, The Resources Agency, Department of Fish and Game. 80pp + appendices.

CDFG (California Department of Fish and Game). 2010. Data supplement to the California Fish and Game Commission regarding: Recommended 2010 Deer Tag Allocations (Updated 2009 Deer Harvest and Population Estimates). April 21, 2010. State of California, The Resources Agency, Department of Fish and Game. 34pp.

Chow, Joe. 2014. Aquatic Species Biological Assessment and Biological Evaluation for the Trestle Forest Health Project. Eldorado National Forest. Placerville, CA.

CNNDDB, Classification of the Vegetation Alliances and Associations of the Northern Sierra Nevada Foothills. Accessed on May 13, 2013

Cochran, P., and J Barrett. 1995. Growth and Mortality of Ponderosa Pine Poles Thinned to Various Densities in the Blue Mountains of Oregon. Res. Pap. PNW-RP-483. Portland, OR: USDA Forest Service, Pacific Northwest Research Station.

Collins, B.M.; Everett, R.G.; and Stephens, S.L. 2011. Impacts of fire exclusion and managed fire on forest structure in an old growth Sierra Nevada mixed-conifer forest. Ecosphere. 2(4):51.

Colorado Division of Wildlife. 2008. Pallid Bat. Retrieved 12 1, 2010, from http://wildlife.state.co.us/WildlifeSpecies/Profiles/Mammals/BatsofColorado/PallidBat.htm

DiTomaso, J.M. and E.A. Healy. 2007. Weeds of California and other Western States. Publication 3488. University of California. Division of Agriculture and Natural Resources. Oakland, CA.

Elliot, W.E., Foltz, R.B., Robichaud, P.R. 2009. Recent findings related to measuring and modeling forest road erosion. USDA Forest Service, Rocky Mountain Research Station. Moscow, Idaho.

Federal Register. 1998. Endangered and Threatened Wildlife and Plants: Notice of 12-Month Finding on a Petition to List the Northern Goshawk in the Contiguous United States West of the 100th Meridian. 63 (124), 35183-35184.

Federal Register. 2006. Endangered and Threatened Wildlife and Plants; Notice of 90-Day Finding on a

Franklin, A. B., Anderson, D. R., Gutierrez, R. J., & Burnham, K. P. 2000. Climate, Habitat Quality, and Fitness in Northern Spotted Owl Populations in Northwestern California. Ecological Monographs(4), 539-593.

Gallagher, C. V. 2010. Spotted Owl Home Range and Foraging Patterns Following Fuels-Reduction Treatments in the Northern Sierra Nevada, California. Univeristy of California, Davis. Davis: University of California, Davis.

Grace, Johnny M. III, Clinton, Barton D. 2007. Protecting soil and water in forest road management. American Society of Agricultural and Biological Engineers, 50(5): 1579-1584.

Graham, R.T., T.B. Jain and S. McCaffrey. 2004. Science Basis For Changing Fuel Structure To Modify Wildfire Behavior and Severity. USDA Forest Service General Technical Report RMRS-GTR-120.

Gravelle, J.A., et. al. 2009. Nutrient concentration dynamics in an inland Pacific Northwest watershed before and after timber harvest.

Greenwald, D.N., D.C. Crocker-Bedford, L. Broberg, K.F. Suckling, and T. Tibbitts. 2005. A Review of Northern Goshawk Habitat Selection in the Home Range and Implications for Forest Management in the Western United States. Wildlife Society Bulletin 33(1):120-129.

Gresswell, R.E. 1999. Fire and Aquatic Ecosystems in Forested Biomes of North America. Transactions of the American Fisheries Society 128: 193-221.

Gutiérrez, R.J., D.J. Tempel, and W. Berigan. 2008. Population ecology of the California spotted owl in the Central Sierra Nevada: Annual Results 2007: Region 5, USDA Forest Service (CR Agreement: 06-CR-11052007-174). June, 2008. 29pp.

Gutiérrez, R.J., D.J. Tempel, and W. Berigan. 2009. Population ecology of the California spotted owl in the Central Sierra Nevada: Annual Results 2008: Region 5, USDA Forest Service (CR Agreement: 06-CR-11052007-174). April 2000. 29pp.

Gutiérrez, R.J., D.J. Tempel, and W. Berigan. 2010. Population ecology of the California spotted owl in the Central Sierra Nevada: Annual Results 2009: Region 5, USDA Forest Service (CR Agreement: 06-CR-11052007-174). March 2010. 29pp.

Gutierrez, R.J., M. Z. Peery, D.J. Tempel and W. Berigan. 2012. Population Ecology of the California Spotted Owl in the Central Sierra Nevada: Annual Results 2011. Annual Progress Report; Unpublished Report. Pacific Southwest Region: USDA Forest Service.

Hannah, L., C. Costello, C. Guo, L. Ries, C. Kolstad, and N. Snider. 2009. The impact of climate change on California timberlands. California Energy Commission, PIER Energy-Related Environmental Research Program, CEC-500-2009-045-F, 52pp.

Hansen, A.J., R.P. Neilson, V.H. Dale, C.H. flather, L.R, Iverson, D.J.Currie, S.Shafer, R. Cook, and P. Bartlein. 2001. Global change in forests: responses of species, communities, and biomes. Bioscience 51:765-779.

Harrison, S., E. Damschen & B. M. Going. 2009. Climate Gradients, Climate Change, and Special Edaphic Floras. Northeastern Naturalist, 16, 121-130.

Harrod, R. D. , D.W. Peterson, N.A. Povak, E.K. Dodson. 2009. Thinning and prescribed fire effects on overstory tree and snag structure in dry conifer forests of the interior Pacific Northwest. Forest Ecology and Management: 258. , Pages 712-721.

Howard, Tim and Dana Walsh. 2014. Economic Analysis for the Trestle Forest Health Project. Eldorado National Forest. Camino, CA.

Howard, Tim and Dana Walsh. 2014. Silviculture Report for the Trestle Forest Health Project. Eldorado National Forest. Camino, CA.

Hurteau, M. and M. North. 2009. Fuel treatment effects on tree-based forest carbon storage and emissions under modeled wildfire scenarios. Frontiers in Ecology and the Environment, 7(8), 409-414.

Innes, J. M., Malcolm North, and Nathan Williamson. 2006. Effects of thinning and prescribed fire restoration treatments on woody debris and snag dynamics in a Sierran old-growth, mixed-conifer forest. . Canadian Journal Forest Resources: 36. , Pages 3183-319.

Jackson, Robert J., Thomas L. Jackson, Charles Miksicek, Kristina Roper and Dwight Simons. 1994. Framework for Archaeological Research and Management on the National Forests of the North-Central Sierra Nevada. Prepared for USDA Forest Service by BioSystems Analysis, Inc.

Jones BE, Krupa M, Tate Kenneth. 2013. Aquatic ecosystem response to timber harvesting for the purpose of restoring aspen. PLOS ONE 9(12): e84561. DOI 1.137/journal.pone.0084561.

Joyce, L., G.M. Blate, J.S. Littell, S.G. McNulty, C.I. Millar, S.C. Moser, R.P. Neilson, K. O'Halloran, and D.L. Peterson, D.L. [In press]. National forests. In: Adaptation options for climate-sensitive ecosystems and resources. Synthesis and Assessment Product 4.4. U.S. Climate Change Science Program: Washington, DC:

Klemic, Karin. 2014. Cultural Resources Report. Placerville Ranger District, Eldorado National Forest. Camino, CA.

Kunz, T. H., & Martin, R. A. 1982. Mammalian Species, Plecotus townsendii, Species Account. American Society of Mammologists. 175, 1-6.

Lake Tahoe Basin Management Unit. 2007. Lake Tahoe Basin Management Unit Multi Species Inventory and Monitoring: A Foundation for Comprehensive Biological Status and Trend Monitoring in the Lake Tahoe Basin. Draft Report.

Lamberson, RH, WJ Zielinski, and D. MacFarland. 2000. Preliminary analysis of fisher population viability in the southern Sierra Nevada. Unpublished report. February 2000.

Latham, P., and J. Tappeiner. 2002. Response of add-growth conifers to reduction in stand density in western Oregon Forests. Tree Physiology 22, 137-146.

Laymon, S. 1998. Ecology of the Spotted Owl in the Central Sierra Nevada, California. PhD Dissertation, University of California, Berkley, Berkley.

Lee, D. E., & Tietje, W. D. 2005. Dusky-footed Woodrat Demography and Prescribed Fire in a California Oak Woodland. Journal of Wildlife Management, 69(3), 1211-1220.

Lenihan, J.M., D. Bachelet, R. Drapek, and R.P. Neilson. 2006. The response of vegetation distribution, ecosystem productivity, and fire in California to future climate scenarios simulated by the MC1 dynamic vegetation model. California Energy Commission, PIER Energy-Related Environmental Research Program, CEC-500-2005-191-SF, 25pp.

Lippke, Bruce and Mason, Larry. 2005. Implications of Working Forest Impacts on Jobs and Local Economies. University of Washington, College of Forest Resources, Seattle, Washington.

Lydersen, Jamie, and Malcolm North. 2012. Topographic Variation in Structure of Mixed-Conifer Forests Under an Active-Fire Regime. Ecosystems (15): 1134-1146.

MacCleery, D. W. 1995. The Way to a Healthy Future for National Forest Ecosystems in the West: What Role Can Silviculture and Prescribed Fire Play? USDA Forest Service General Technical Report RM-GTR-267.

MacDonald, Lee H, and John D. Stednick. 2003. Forests and water: a state-of-the-art review for Colorado. Colorado State University, Colorado Water Resources Research Institute Completion Report No. 196.

Mallek, C., and H. Safford. 2010. A summary of current trends and probable future trends in climate and climate-driven processes in the Eldorado and Tahoe National Forests and the neighboring Sierra Nevada. Vallejo, CA: USDA Forest Service, Pacific Southwest Region.USDA Forest Service.

Markman, Steve G. 2014. Trestle Forest Health Project Hydrology Report (Draft). Eldorado National Forest. Camino, CA.

Markman, Steve G., J. Chow, E. Nicita, and M. Brown. 2014a. Trestle Forest Health Project Riparian Conservation Objectives (RCO) Consistency Report. Eldorado National Forest. Placerville, CA.

McKelvey, K.S., and J.D. Johnston. 1992. Historical Perspectives on Forests of the Sierra Nevada and the Transverse Ranges of Southern California: Forest Conditions at the Turn of the Century. USDA Forest Service Gen. Tech Rep. PSW-GTR-133.pp 225-246.

Miller, J. H., H.D. Safford, m. Crimmins, and A.E. Thode. 2009. Quantitative Evidence for Increasing Forest Fire Severity in the Sierra Nevada and Southern Cascade Mountains, California and Nevada, USA. Ecosystems.

Nicita, Eric. 2014. Trestle Forest Health Project Soil Specialist's Report. Eldorado National Forest. Placerville, CA.

North, M. (editor). 2012. Managing Sierra Nevada Forests. USDA Forest Service General Technical Report PSW-GTR237.

North, M., P. Stine, K. O'Hara, W. Zielinski, and S. Stephens. 2009. An ecosystem management strategy for Sierran mixed-conifer forests. Gen. Tech. Rep. PSW-GTR-220. Albany, CA: U.S. Department of Agriculture, Forest Service, Pacific South West Research Station.

North, M.P., J.F. Franklin, A.B. Carey, E.D. Forsman, and T. Harner. 1999. Forest Stand Structure of the Northern Spotted Owl's Foraging Habitat. Forest Science. Vol. 45(4):520-527.

Oliver, W. 1995. Is self-thinning in ponderosa pine ruled by Dendroctonus bark beetles. Forest health through silviculture. Proceedings of the 1995 National Silviculture Workshop, Mescalero, New Mexico, May 8-11, 1995 / National Silviculture Workshop. (pp. 213-218). Fort Collins, CO: USDA Forest Service, Rocky Mountain Forest and Range Experiment Station.

Omi, Philip N., Eric J. Martinson, and Geneva W. Chong. 2006. Effectiveness of Pre-Fire Fuel Treatments. Joint Fire Science Program, Western Fire Research Center, CO State University, CO. Final Report. JFSP Project 03-2-1-07.

Ottmar, R. D., & Hessburg, P. F. 1998. Linking recent historical and current forest vegetation patterns to smoke and crown fire in the Interior Columbia River Basin. In: Weber, R, Chair. Proceedings 13th Conference on Fire and Forest Meteorology. Moran, WY: International Association of Wildland Fire.

Peterson, D. L., M. C. Johnson, J. K. Agree, T. B. McKenzie, and E. D. Reinhardt. 2005. Forest Structure and Fire Hazard in the Western United States. USDA Forest Service General Technical Report PNW-GTR-628.

Petition to List the California Spotted Owl as Threatened or Endangered. 70(118):05-12097. May 24, 2006.

Philpott, W. 1997. Summaries of the Life Histories of California Bat Species. Unpublished document, USDA Forest Service, Pacific Southwest Region, Sierra National Forest, Pineridge Ranger District.

Powell, R. 1982. The Fisher: Life History, Ecology, and Behavior. Minnesota: University of Minnesota Press.

Raymond, Crystal L. and David L. Peterson. 2005. Fuel Treatments Alter the Effects of Wildfire in a Mixed-Evergreen Forest, Oregon, USA, Canadian Journal of Forestry, Volume 35, pp 2981-2995.

Reese, D. A. 1996. Comparative demography and habitat use of western pond turtles in northern California: effects of damming and related alterations [dissertation]. Berkeley (CA): University of California. 253 p.

Reese, D.A., and H. Welsh. 1997. Use of terrestrial habitat by western pond turtles (Clemmys marmorata): Implications for management. Proceedings: Conservation, Restoration, and Management of Tortoises and Turtles. An International Conference, pp. 352-357, held 1997 by the New York Turtle and Tortoise Society.

Riesenhuber, Teresa and Rob Allan. 2014. Draft Air Quality Analysis Trestle Forest Health Project. Georgetown Ranger District, Eldorado National Forest. Georgetown, CA.

Riesenhuber, Teresa. Fuels and Fire Analysis Trestle Forest Health Project-Draft. Placerville Ranger District, Eldorado National Forest. Camino, CA.

Roberts, S. L., van Wagtendonk, J. W., Miles, A. K., & Kelt, D. A. 2010. Effects of fire on spotted owl site occupancy in a late-successional forest. Biological Conservation, in press.

Rorbards, T.A. 2009. Empirical forest growth model evaluations and development of climate-sensitive hybrid models. PhD dissertation. University of California, Berkeley, Berkeley, p. 234.

Safford, H.D.; Stevens, J.T.; Merriam, K.; Meyer, M.D; Latimer, A.M. 2012. Fuel treatment effectiveness in California yellow pine and mixed conifer forest. Forest Ecology and Management. 274:17-28.

Sauer, J. R., J. E. Hines, and J. Fallon. 2007. The North American Breeding Bird Survey, Results and Analysis 1966 - 2006. Version 10.13.2007. USGS Patuxent Wildlife Research Center, Laurel, MD.

Scott, Joe H.; Reinhardt, Elizabeth D. 2001. Assessing crown fire potential by linking models of surface and crown fire behavior. Res. Pap. RMRS-RP-29. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 59 p.

Seamans, M. E. 2005. Population Biology of the California Spotted Owl in the Central Sierra Nevada. Dissertation, University of Minnesota, Minnesota.

Seamans, M. E., & Guiterrez, R. J. 2007. Habitat Selection in a Changing Environment: The Relationship between Habitat Alteration and Spotted Owl Territory Occupancy and Breeding Dispersal. The Condor, 109, 566-576.

Shaw, M.R., L. Pendleton, D. Cameron, B. Morris, G. Bratman, D. Bachelet, K. Klausmeyer, J. MacKenzie, D. Conklin, J. Lenihan, E. Haunreiter, and C. Daly. 2009. The impact of climate change on California's ecosystem services. California Public Interest Energy Research (PIER) Program, CEC-500-2009-025-F

Sherwin, R. 1998. Presentation to the Western Bat Working Group Workshop. Reno, NV.

Sierra Nevada Research Center. 2007. Plumas Lassen Study 2006 Annual Report. USDA Forest Service, Pacific Southwest Research Station, Sierra Nevada Research Center, Davis, California. 182pp.

Sierra Nevada Research Center. 2008. Plumas Lassen Study 2007 Annual Report. USDA Forest Service, Pacific Southwest Research Station, Sierra Nevada Research Center, Davis, California. 310pp. http://www.fs.fed.us/psw/programs/snrc/forest_health/plas_annual_report_2007.pdf

Sierra Nevada Research Center. 2009. Plumas Lassen Study 2008 Annual Report. USDA Forest Service, Pacific Southwest Research Station, Sierra Nevada Research Center, Davis, California. 223pp. http://www.fs.fed.us/psw/programs/snrc/forest_health/plas_annual_report_2008.pdf

Sierra Nevada Research Center. 2010. Plumas Lassen Study 2009 Annual Report. USDA Forest Service, Pacific Southwest Research Station, Sierra Nevada Research Center, Davis, California. 184pp. http://www.fs.fed.us/psw/programs/snrc/forest_health/plas_annual_report_2009.pdf

Sierra Nevada Science Review (SNSR). 1998. unpublished.

Sjostrom, Josh. 2014. Recreation Input for Trestle Forest Health Project. Placerville Ranger District, Eldorado National Forest. Camino, CA.

Spencer, W.D. et al. 2008. ("CBI Fisher Report") Baseline evaluation of fisher habitat and population status, and effects of fires and fuels management on fishers in the southern Sierra Nevada. Conservation Biology Institute. Unpublished report prepared for USDA Forest Service, Pacific Southwest Region. 133 pp + appendices.

Statewide Habitat Relationships System. California Department of Fish and Game. Sacramento, CA.

Stephens, S. L., Moghadds, J. J., Edminster, C., 2009. Fire treatment effects on vegetation structure, fuels, and potential fire severity in western U.S. forests. Ecological Applications, 19(2), pp. 305-320.

Stephens, Scott. 1998. Evaluation of the effects of silvicultural and fuels treatments on potential fire behavior in Sierra Nevada mixed-conifer forests. Forest Ecology and Management 105, 21-35.

Tempel D., R.J. Gutiérrez, S. Whitmore, M. Reetz, R. Stoelting, W. Berigan, M.E. Seamans, and M. Z. Peery. 2014. In press. Effects of Forest Management on California Spotted Owls: Implications for Reducing Wildfire Risk in Fire-prone Forests. Ecological Applications.

Truex, R. L., & Zielinski, W. J. 2005. Short-term Effects of Fire and Fire Surrogate Treatments on Fisher Habitat in the Sierra Nevada Final report, Joint Fire Science Program, Project JFSP 01C-3-3-02. USDA Forest Service

UC Davis Wildlife Health Center: David Bunn, Andrea Mummert, Marc Hoshovsky, Kirsten Gilardi,Sandra Shanks. 2007. California Wildlife: Conservation Challenges California's Wildlife Action Plan

Underwood, Emma C., Joshua Viers, James Quinn, Malcolm North. 2010. Using Topography to Meet Wildlife and Fuels Treatment Objectives in Fire-Suppressed Landscapes. Environmental Management 46 (5): pp 809-819.

USDA Forest Service. 1988. Eldorado national Forest, Land and Resource Management Plan.

USDA Forest Service. 1989. Final Environmental Impact Statement- Eldorado National Forest Land and Resource Management Plan. Eldorado National Forest. Placerville, California.

USDA Forest Service. 1991. Protocol for Surveying for Spotted Owls in Proposed Management Areas and Habitat Conservation Areas. March 12, 1991 (Revised February 1993). San Francisco, CA: Pacific Southwest Region, USDA Forest Service.

USDA Forest Service. 2001. Sierra Nevada Forest Plan Amendment (SNFPA) Final Environmental Impact Statement (FEIS) and Record of Decision (ROD). Pacific Southwest Region, Forest Service.

USDA Forest Service. 2004. Record of Decision for the Sierra Nevada Forest Plan Amendment. Region 5 Pacific Southwest Region, Vallejo, CA.

USDA Forest Service. 2004. Sierra Nevada Forest Plan Amendment (SNFPA) Final Environmental Impact Statement (FEIS) and Record of Decision (ROD). Pacific Southwest Region, Forest Service.

USDA Forest Service. 2004. Sierra Nevada Forest Plan Amendment: Final Supplemental Environmental Impact Statement, Vols. 1-2 and Record of Decision. USDA Forest Service, Pacific Southwest Region, Vallejo, CA.

USDA Forest Service. 2004. *Sierra Nevada Forest Plan Amendment, Final Supplemental Environmental Impact Statement, Record of Decision.* Pacific Southwest Region, R5-MB-046

USDA Forest Service. 2006. Wildlife and Invertebrate Response to Fuel Reduction Treatments in Dry Coniferous Forests of the Western United States: A Synthesis. Environmental Consequences. RMRS-GTR-173.

USDA Forest Service. 2008. Eldorado National Forest TES Species Accounts. Unpublished. Placerville, CA: Eldorado National Forest, Pacific Southwest Region, Forest Service, U.S. Department of Agriculture.

USDA Forest Service. 2008b. Sierra Nevada Forests Bioregional Management Indicator Species (MIS) Report: Life history and analysis of Management Indicator Species of the 10 Sierra Nevada National Forests: Eldorado, Inyo, Lassen, Modoc, Plumas, Sequoia, Sierra, Stanislaus, and Tahoe National Forests and the Lake Tahoe Basin Management Unit. Pacific Southwest Region, Vallejo, CA. January 2008. http://www.fs.fed.us/r5/snfmisa/pdfs/2008_Sierra_Nevada_Forests_MIS_Report_January_2008.pdf

USDA Forest Service. 2010. Cumulative Watershed Effects of Fuel Management in the Western United States. General Technical Report RMRS-GTR-231.

USDA Forest Service. 2010. Sierra Nevada Forests Bioregional Management Indicator Species (MIS) Report: Life history and analysis of Management Indicator Species of the 10 Sierra Nevada National Forests: Eldorado, Inyo, Lassen, Modoc, Plumas, Sequoia, Sierra, Stanislaus, and Tahoe National Forests and the Lake Tahoe Basin Management Unit. Pacific Southwest Region, Vallejo, CA. December 2010. 132pp.

USDI Fish and Wildlife Service. 2004. Endangered and Threatened Wildlife and Plants; 12-month Finding for a Petition to List the West Coast Distinct Population Segment of the Fisher (Martes pennanti). Portland, Oregon. Federal Register 69:18769.

van Mantgem, P. J., Stephenson, N. L. & Keeley, J. E. 2006. Forest reproduction along a climatic gradient in the Sierra Nevada, California. Forest Ecology and Management, 225, 391 – 399.

Verner, J. K., McKelvey, B., Noon, B., Gutierrez, R., Gould, G., & Beck, T. 1992. The California Spotted Owl: a Technical Assessment of its Current Status PSW-GTR-133. Albany, CA: USDA Forest Service, Pacific Southwest Research Station.

Weber, T. 2006. Northern Goshawk (Accipiter gentilis) Nesting Habitat in Northwestern California. An Examination of Three Spatial Scales: the Nest Area, the Post-Fledgling Area, and the Home Range. M.S. Thesis. Humboldt State University, Arcata. CA. 54pp.

Yasuda, Susan. 2014. Biological Evaluation and Assessment For Terrestrial Threatened, Endangered, and Sensitive Wildlife Species. Trestle Forest Health Project. Placerville Ranger District, Eldorado National Forest. Camino, CA.

Yasuda, Susan. 2014a. Management Indicator Species Report for Terrestrial Wildlife. Trestle Forest Health Project. Placerville Ranger District, Eldorado National Forest. Camino, CA.

Yasuda, Susan. 2014b. Migratory Landbird Conservation on the Eldorado National Forest. Trestle Forest Health Project. Placerville Ranger District, Eldorado National Forest. Camino, CA.

Yasuda, Susan. 2014c. Bald Eagle/Gold Eagle NEPA Input for Trestle Forest Health Project. Placerville Ranger District, Eldorado National Forest. Camino, CA.

Zald, H., A. Gray, M. North, and R. Kern. 2008. Initial tree regeneration responses to fire and thinning treatment in a Sierra Nevada mixed-conifer forest, USA. Forest Ecology and Management 256, 168-179.

Zeiner, D., W. Laudenslayer, J., and K. Mayer, eds. 1990. California's Wildlife: Mammals. California

Zielinski W. J., R. L. Truex, N. P. Duncan,and Tom Gaman. 2006. Using Forest Inventory Data to Assess Fisher Resting Habitat Suitability in California. Ecological Applications, 16(3), 2006, pp. 1010–1025

Websites

Cal Fire. Forest Practice Geographical Information System(GIS) ftp://ftp.fire.ca.gov/forest/Placer/Shapefiles/ (visited 1/29/13).

Appendices

A. Maps

B. Best Management Practices

C. Cumulative Effects

Trestle Alternative 2

- New Barrier
- New Gate
- Waterhole
- Restoration_Activities Points

RoadsAlternative_2

- Maintenance
- Obliterate
- Reconstruction
- Temp

Alt_2_Units

- Commercial Thin
- Non-Commercial Mechanical
- Roadside Brushing
- Hand Cut Pile
- FirstPriority Burn Only
- Other Burn Only

N

0 0.25 0.5 1 Miles

Trestle Alternative 4

- New Barrier
- New Gate
- Waterhole
- Restoration_Activities Points

RoadsAlternative4

- Maintenance
- Obliterate
- Reconstruction
- Temp

Alt_4_Units

- Commercial Thin
- Non-Commercial Mechanical
- Roadside Brushing
- Hand Cut Pile
- FirstPriority Burn Only
- Other Burn Only

N

0 0.25 0.5 1 Miles

Trestle Alternative 5

- New Barrier
- New Gate
- Waterhole
- Restoration_Activities Points

RoadsAlternative5

- Maintenance
- Obliterate
- Reconstruction
- Temp

Alt_5_Units

- Commercial Thin
- Non-Commercial Mechanical
- Roadside Brushing
- Hand Cut Pile
- FirstPriority Burn Only
- Other Burn Only

N

0 0.25 0.5 1 Miles

ELDORADO NATIONAL FOREST

PLUMMER RIDGE

PLUMAS NATIONAL FOREST

T10 N R13 E
T9 N R13 E
T10 N R14 E
T9 N R14 E
T9 N R13 E
T8 N R13 E
T9 N R14 E
T8 N R14 E

Appendix B: Best Management Practices

Table B1 Region 5 Best Management Practices

BMP Number	BMP Practice	BMP Objective	Project BMPs
12.12 Timber Management Best Management Practices			
1-1	Timber Sale Planning Process	To incorporate water quality and hydrologic considerations into the TSPP.	EIS Design Criteria: • Hydrology and Aquatic Features criteria • Soils criteria: 1 through 5 TSC FSH 2409.13, Chap. 21-41 R-5 FSH 2409.26, Section 13
1-2	Timber Harvest Unit Design	To ensure that timber harvest unit design will secure favorable conditions of water quality and quantity while maintaining desirable stream channel characteristics and watershed conditions. The design should consider the size and distribution of natural structures (snag and down logs) as a means of preventing erosion and sedimentation.	TSC Prov. C6.601 – R5 TSC Prov. C6.602 – R5 TSC Prov. C6.63 – R5 R5 Soil Quality Standards
1-3	Determination of Surface Erosion Hazard for Timber Harvest Unit Design	To identify high erosion hazard areas in order to adjust treatment measures to prevent downstream water quality degradation.	EHR analysis: Soil Specialist Report (Nicita, 2013) EIS Design Criteria • Soil 1, 2, and 4
1-4	Use of Sale Area Maps (SAM) and/or Project Maps for Designating Water Quality Protection Needs	To ensure recognition and protection of areas related to water quality protection delineated on a SAM or Project Map.	TSC Prov. B1.1 TSC Prov. B6.5 TSC Prov. B6.6 TSC Prov. C6.5 TSC Prov. C6.6 TSC FS2400-3 Standard Provisions 1 and 11
1-5	Limiting the Operating Period of Timber Sale Activities	To ensure that the purchasers conduct their operations, including, erosion control work, road maintenance, and so forth, in a timely manner, within the time specified in the Timber Sale Contract.	TSC Prov. B6.31.5 TSC Prov. B6.31 TSC Prov. B6.6 TSC Prov. C6.65 TSC Prov. C6.3 TSC Prov. 6.313 TSC FS2400-3 Standard Provisions 1 and 11

BMP Number	BMP Practice	BMP Objective	Project BMPs
1-6	Protection of Unstable Lands	To provide special treatment of unstable areas to avoid triggering mass slope failure with resultant erosion and sedimentation.	N/A: No activities will occur in areas with identified unstable areas.
1-7	Prescribing the Size and Shape of Regeneration Harvest Units	To control the physical size and shape of regeneration harvest units as a means of preventing erosion and sedimentation.	N/A: Regeneration units were not part of this project.
1-8	Streamside Management Zone Designation	To designate a zone along riparian areas, streams and wetlands that will minimize potential for adverse effects from adjacent management activities. Management activities within these zones are designed to improve riparian values.	EIS Design Criteria: • Hydrology and Aquatic Features TSC 2400-3 Standard Provision 11 TSC Prov. C5.421 TSC Prov. 6.411 TSC Prov. C6.5 R5 FSH 2409.26 Sec. 12 and 13 R5 FSH 2409.15, Sec. 61.51
1-9	Determining Tractor Loggable Ground	To minimize erosion and sedimentation resulting from ground disturbance of tractor logging systems.	Slope limitations identified during layout and analyzed as part of the proposed alternatives. EIS Design Criteria: • Hydrology and Aquatic Features FSH 2509.15 Soil Specialist Report (Nicita 2013)
1-10	Tractor Skidding Design	By designing skidding patterns to best fit the terrain, the volume, velocity, concentration, and direction of runoff water can be controlled in a manner that will minimize erosion and sedimentation.	R-5 FSH 2409.15 sections 51 R-5 FSH 2409.15, Sec 61.42 TSC Prov. B6.42 TSC Prov. B6.424 TSC Prov. C6.41 TSC Prov. C6.422 TSC Prov. C6.424 Provisions

BMP Number	BMP Practice	BMP Objective	Project BMPs
1-11	Suspended Log Yarding in Timber Harvesting	1. To protect the soil mantle from excessive disturbance. 2. To maintain the integrity of the SMZ and other sensitive watershed areas. 3. To control erosion on cable corridors.	R-5 FSH 2409.15 sections 51, 61.42 TSC Prov. B6.42 TSC Prov. C6.425 TSC Prov. C6.427 TSC Prov. C6.429 TSC 2400-3 Standard Provision 1 and special provisions approved for specific sales.
1-12	Log Landing Location	To locate new landings or reuse old landings in such a way as to avoid watershed impacts and associated water quality degradation.	R-5 FSH 2409.15 sections 61.42 EIS Design Criteria: • Hydrology and Aquatic Features TSC Prov. B6.42 TSC Prov. C6.63 TSC Prov. C9.2 OSHA Regulations TSC 2400-3 Special Provisions
1-13	Erosion Prevention and Control Measures During Timber Sale Operations	To ensure that the purchasers' operations will be conducted reasonably to minimize soil erosion.	R-5 FSH 2409.15 sections 61.41 and 61.42 TSC Prov. B4.225 TSC Prov. C6.6 TSC Prov. C6.422 TSC 2400-3, Special Provisions 10
1-14	Special Erosion-prevention Measures on Disturbed Land	To provide appropriate erosion and sedimentation protection for disturbed areas	EIS Design Criteria: • Soil: 1 and 2 No other special soil stabilization problems were identified. R-5 FSH 2409.15 sections 6.42 FSH 2509.11 TSC Prov. B6.6 TSC Prov C6.6 TSC Prov. C6.602-R5 TSC 2400-3 Special Provisions 9 & 10
N1-15	Revegetation of Areas Disturbed by Harvest Activities	To establish a vegetative ground cover on disturbed sites to prevent erosion and sedimentation.	N/A: Severely disturbed ground needing vegetative recovery is not expected.

BMP Number	BMP Practice	BMP Objective	Project BMPs
1-16	Log Landing Erosion Control	To reduce the impacts of erosion and subsequent sedimentation associated with log landings by use of mitigating measures.	R-5 FSH 2409.15 section 51 TSC Prov. B6.422 TSC Prov. B6.6 TSC Prov. B6.63 TSC Prov. C6.428 TSC Prov. 6.6 TSC Prov. C6.601.R5 TSC Prov. C6.602. R5 TSC Prov. C6.63 TSC 2400-3, Special Provisions 10 & 12
1-17	Erosion Control on Skid Trails	To protect water quality by minimizing erosion and sedimentation derived from skid trails.	EIS Design Criteria: • Soil: 3 R-5 FSH 2409.15 sections 51.46 and 61.42 TSC Prov. B6.6 TSC Prov. B6.66 TSC Prov. C6.601.R5 TSC Prov. C6.64 TSC 2400-3, Special Provisions 10
1-18	Meadow Protection During Timber Harvesting	To avoid damage to the ground cover, soil, and the hydrologic function of meadows.	N/A: No timber harvest activities are proposed within identified meadows and fens.
1-19	Streamcourse and Aquatic Protection	1) To conduct management actions within these areas in a manner that maintains or improves riparian and aquatic values. 2) To provide unobstructed passage of stormflows. 3) To control sediment and other pollutants entering streamcourses. 4) To restore the natural course of any stream as soon as practicable, where diversion of the stream has resulted from timber management activities.	EIS Design Criteria: • Hydrology and Aquatic Features R-5 FSH 2409.15 sections 51.54 and 61 R-5 FSH 2409.26, Sec. 13 R-5 FSH 2509.22, Chap. 30 TSC Prov. B6.5 TSC Prov. B6.6 TSC Prov. C6.427 TSC Prov. C6.5 TSC Prov. C6.6 TSC 2400-3, Special Provision 11
1-20	Erosion Control Structure Maintenance	To ensure that constructed erosion control structures are stabilized and working.	TSC Prov. B4.225 TSC Prov. B6.6 TSC Prov. B6.66 TSC Prov. B2400-3, Special Provision 9

BMP Number	BMP Practice	BMP Objective	Project BMPs
1-21	Acceptance of Timber Sale Erosion Control Measures Before Sale Closure	To ensure the adequacy of required erosion control work on timber sales.	R-5 FSH 2409.15 sections 15, 51. 54 and 61 TSC Prov. B6.6 TSC Prov. B6.63 TSC Prov. B6.64 TSC Prov. B6.65 TSC Prov. B6.66 TSC Prov. C6.601 TSC Prov. C6.602 TSC Prov. C6.603 TSC Prov. C6.6 TSC Prov. C6.63 TSC Prov. B2400-3, Special Provision 9
1-22	Slash Treatment in Sensitive Areas	To maintain or improve water quality by protecting sensitive areas from degradation which would likely result from using mechanized equipment for slash disposal.	RCO Analysis for exclusion of slash disposal in sensitive areas R5 FSH 2409.15 Sec. 61.5 R5 FSH 2409.15, Sec.15 FSM 1950 TSC Prov. C6.7 TSC Prov. C6.73 TSC Prov. C6.76 TSC Prov. C6.77 TSC Prov. C6.78 TSC 2400-3. Prov. 7&11
1-23	Five-Year Reforestation Requirement	To assure a continuous forest cover and to limit disturbance on areas with limited regeneration potential where there is no assurance that the site can be reforested within the timeframe.	FSH 2409.13, Chap. 21 and 42 FSH 2409.26, Sec. 12 & 13 FSM 2470.3 TSPP
1-24	Non-recurring “C” Provisions that can be used for Water-quality Protection	To use the option of inserting Special “C” provisions in the timber sale contract to protect water quality where standard “B” or “C” provisions do not apply or are inadequate to protect watershed values.	N/A
1-25	Modification of the Timber Sale Contract	To modify the TSC if new circumstances, or conditions indicate that the timber sale will damage soil, water, or watershed values.	TSC Prov. B8.3 TSC Prov. C8.2 TSC Prov. C8.3 CFR 223.113 CFR 223.116 TSC 2400-3, Prov. 3, 18 and 41

BMP Number	BMP Practice	BMP Objective	Project BMPs
12.22 Road and Building Site Construction Best Management Practices			
2-1	Travel Management Planning and Analysis	Roads impact water quality to varying degrees. Use the travel analysis and road management planning processes to develop measures to avoid, minimize, and mitigate adverse impacts to water, aquatic, and riparian resources during road management activities, contribute toward restoration of water quality where needed, and identify the road system which can be effectively maintained.	During field surveys, roads causing environmental degradation were identified. A Transportation analysis for this project was completed as part of the Transportation Report (Errington 2013). A review and design of roads for installation and repair of water drainage features, culvert replacement and cleaning and road resurfacing activities is completed as part of the road engineering package and is included in the Timber Sale Contract.
2-2	General Guidelines for the Location and Design of Roads	Locate roads to minimize problems and risks to water; aquatic, and riparian resources. Incorporate measures that prevent or reduce impacts, through design for construction, reconstruction, and other route system improvements.	Temporary and new roads were identified during the planning process. Roads that could affect aquatic resources were approved during IDT field visits and specialists reports (EIS)
2-3	Road Construction and Reconstruction	Minimize erosion and sediment delivery from roads during road construction or reconstruction, and their related activities.	Road Package FP-03 Sections 105, 107, and 200
2-4	Road Maintenance and Operations	To ensure water-quality protection by providing adequate and appropriate maintenance and by controlling road use and operations.	Timber Sale T800 specifications from Standard road maintenance document.
2-5	Water Source Development and Utilization	To supply water for road construction, maintenance, dust abatement, fire protection, and other management activities, while protecting and maintaining water quality.	Water sources were evaluated by the project aquatics biologist during the project development. EIS Design Criteria: • Aquatics: 1 and 2

BMP Number	BMP Practice	BMP Objective	Project BMPs
2-6	Road Storage	Ensure that roads placed in storage are maintained to so that drainage facilities and runoff patterns function properly, and damage to adjacent resources is prevented. Stored roads are managed to be returned to service, at various intervals.	FSM 7720 FSH 7709.56, Chap. 10 FP-03 Sections 157, 200, 550, 600 Contract Road Package.
2-7	Road Decommissioning	Stabilize, restore, and vegetate unneeded roads to a more natural state as necessary to protect and enhance NFS lands, resources, and water quality. The end result is that the decommissioned road will not represent a significant impact to water quality by: 1. Reducing erosion from road surfaces and slopes and related sedimentation of streams; 2. Reducing risk of mass failures and subsequent impact on water quality; 3. Restoring natural surface and subsurface drainage patterns; 4. Restoring stream channels at road crossings and where roads run adjacent to	EIS Proposed Action items for • Transportation System and Restoration
2-8	Stream Crossings	Minimize water, aquatic, and riparian resource disturbances and related sediment production when constructing, reconstructing, or maintaining temporary and permanent water crossings.	FSH 2409.15 EIS Proposed Action items for Transportation System EIS Design Criteria: • Hydrology and Aquatic Features Road Package
2-9	Snow Removal and Storage	Prevent or reduce erosion, sedimentation, and chemical pollution that may result from snow removal and storage activities.	N/A
2-10	Parking and Staging Areas	Construct, install, and maintain an appropriate level of drainage and runoff treatment for parking and staging areas to protect water, aquatic, and riparian resources.	FSH 2409.15. Typically landings. Road plan/package

BMP Number	BMP Practice	BMP Objective	Project BMPs
2-11	Equipment Refueling and Servicing	Prevent fuels, lubricants, cleaners, and other harmful materials from discharging into nearby surface waters or infiltrating through soils to contaminate groundwater resources	EIS Design Criteria: • Hydrology and Aquatic Features FSH 2409.15
2-12	Aggregate Borrow Areas	Minimize disturbance to water, aquatic, and riparian resources when developing and using aggregate borrow sites	N/A: No borrow pits will be used in the project area
2-13	Erosion Control Plan	Effectively limit and mitigate erosion and sedimentation from any ground-disturbing activities, through planning prior to commencement of project activity, and through project management and administration during project implementation.	ID Team project design.
12.31- Mining BMPs			No Mining Best Management Practices apply to this Project
12.41 - Recreation BMPs			
4-1 – 4.6, 4.8, and 4.10	N/A – do not apply to project proposal or design features		
4.7	BMP 4.7 - Best Management Practices for Off-Highway Vehicle Facilities and Use (BMPs 4.7.1 to 4.7.9	Over the past few decades, the availability and capability of off-highway vehicles (OHV) have increased tremendously, as has the intensity of OHV use on NFS lands. While these vehicles have provided new recreational opportunities and access to otherwise remote locations, this increase in OHV use has the potential to impact water resources.	Project activities have been designed to relocate and close portions of OHV trails that are currently causing unwanted watershed, vegetation and soil damage.
4.9	Protection of Water Quality within Developed and Dispersed Recreation Areas	To protect water quality by regulating the discharge and disposal of potential pollutants.	Proposed construction and closure of dispersed recreation sites currently impacting or potentially impacting water quality were included in project design
12.52 Vegetation Manipulation Best Management Practices			
5-1	Soil-disturbing Treatments on the Contour	To decrease sediment production and stream turbidity, while mechanically treating slopes.	EIS Proposed Action: • Thinning: 1

BMP Number	BMP Practice	BMP Objective	Project BMPs
5-2	Slope Limitations for Mechanical Equipment Operation	To reduce gully and sheet erosion and associated sediment production by limiting tractor use.	EIS Proposed Action: • Thinning: 1
5-3	Tractor Operation Limitation in Wetlands and Meadows	To limit turbidity and sediment production resulting from compaction, rutting, runoff concentration, and subsequent erosion by excluding the use of mechanical equipment in wetland and meadows except for the purpose of restoring wetland and meadow function.	N/A: No mechanical activities are planned within wetlands or meadows
5-4	Revegetation of Surface-disturbed Areas	To protect water quality by minimizing soil erosion through the stabilizing influence of vegetation foliage and root network.	N/A: No areas of unstable soil were identified that required seeding for stabilization.
5-5	Disposal of Organic Debris	To prevent gully and surface erosion with associated reduction in sediment production and turbidity during and after treatment.	EIS Design Criteria: • Soil: 1-1, 2 and 5 • Road Plan/Package • Seeding and planting are included in restoration treatments where deep ground disturbance would occur.
5-6	Soil Moisture Limitations for Mechanical Equipment Operations	To prevent compaction, rutting, and gullying, with resultant sediment production and turbidity.	• Wet Weather plan for Operations – part of contract when wet weather operations are agreed upon
5-7	Pesticide Use Planning Process	To introduce water quality and hydrologic considerations into the pesticide use planning process.	N/A – Pesticide use is not included as part of the project proposal
5-8	Pesticide Application According to Label Directions and Applicable Legal Requirements	To avoid water contamination by complying with all label instructions and restrictions for use.	N/A – Pesticide use is not included as part of the project proposal

BMP Number	BMP Practice	BMP Objective	Project BMPs
5-9	Pesticide Application Monitoring and Evaluation	1) To determine whether pesticides have been applied safely, restricted to intended target areas, and have not resulted in unexpected non-target effects. 2) To document and provide early warning of possible hazardous conditions resulting from possible contamination of water or other non-target areas by pesticides. 3) To determine the extent, severity and possible duration of any potential hazard that might exist.	N/A – Pesticide use is not included as part of the project proposal
5-10	Pesticide Spill Contingency Planning	To reduce contamination of water by accidental pesticide spills.	N/A – Pesticide use is not included as part of the project proposal
5-11	Cleaning and Disposal of Pesticide Containers and Equipment	To prevent water contamination resulting from cleaning, or disposal of pesticide containers.	N/A – Pesticide use is not included as part of the project proposal
5-12	Streamside Wet Area Protection During Pesticide Spraying	To minimize the risk of pesticide inadvertently entering waters, or unintentionally altering the riparian area, SMZ, or wetland.	N/A – Pesticide use is not included as part of the project proposal
5-13	Controlling Pesticide Drift During Spray Application	To minimize the risk of pesticide falling directly into water, or non-target areas.	N/A – Pesticide use is not included as part of the project proposal
12.62 Fire Suppression and Fuels Best Management Practices			
6-1	Fire and Fuels Management Activities	To reduce public and private losses and environmental impacts which result from wildfires and/or subsequent flooding and erosion by reducing or managing the frequency, intensity, and extent of wildfire.	EIS Purpose and Need
6-2	Consideration of Water Quality in Formulating Fire Prescriptions	To provide for water quality protection while achieving the management objectives through the use of prescribed fire.	EIS Design Criteria: • Hydrology and Aquatic Features • Soils: 1 and 2
6-3	Protection of Water Quality from Prescribed Burning Effects	To maintain soil productivity, minimize erosion, and minimize ash, sediment, nutrients, and debris from entering water bodies.	EIS Design Criteria: • Hydrology and Aquatic Features • Soils: 2

BMP Number	BMP Practice	BMP Objective	Project BMPs
6-4	Minimizing Watershed Damage from Fire-suppression Efforts	To avoid watershed damage in excess of that already caused by the wildfire.	N/A
6-5	Repair or Stabilization of Fire-suppression-related Watershed Damage	To stabilize all areas that have had their erosion potential significantly increased, or their drainage pattern altered by suppression-related activities.	N/A
6-6	Emergency Rehabilitation of Watersheds Following Wildfires	Objective: To minimize as far as practicable: a. Loss of soil and onsite productivity; b. Overland flow, channel obstruction, and instability; and c. Threats to life and property, both on-site and off-site.	N/A
12.72 Watershed Management Best Management Practices			
7-1	Watershed Restoration	To repair degraded watershed conditions, and improve water quality and soil	Restoration proposed action items.
7-2	Conduct Floodplain Hazard Analysis and Evaluation	To avoid, where possible, the long- and short-term adverse impacts to water quality associated with the occupancy and modification of floodplains.	N/A:
7-3	Protection of Wetlands.	To avoid adverse water-quality impacts associated with destruction, disturbance, or modification of wetlands.	N/A: Implementation of mechanical activities is not planned in wetlands.
7-4	Forest and Hazardous Substance Spill Prevention Control and Countermeasure (SPCC) Plan	To prevent contamination of waters from accidental spills.	The SPCC plan is developed and maintained at the Forest Level.
7-5	Control of Activities under Special Use Permit	To protect surface and subsurface water quality from physical, chemical, and biological pollutants resulting from activities that are under special use permit.	N/A
7-6	Water Quality Monitoring	To collect representative water data to determine base line conditions for comparison to established water-quality standards that are related to beneficial uses for that particular watershed.	EIS Monitoring: • Water Quality and Soils

BMP Number	BMP Practice	BMP Objective	Project BMPs
7-7	Management by Closure to Use (Seasonal, Temporary, and Permanent	To exclude activities that could result in damages to either resources or improvements, such as roads and trails, resulting in impaired water quality.	EIS project proposal for Transportation
7-8	Cumulative Off-Site Watershed Effects	To protect the identified beneficial uses of water from the combined effects of multiple management activities which individually may not create unacceptable effects but collectively may result in degraded water quality conditions.	Project hydrology report.
12.81 - Range Management BMPs			No Range Management BMPs are necessary for this project

Table 2 National BMPs applicable to and used in project planning and design

BMP	Objective	Compliance
Plan-1. Forest and Grassland Planning	Use the land management planning and decision making processes to incorporate direction for water quality management consistent with laws, regulation, and policy into land management plans.	Applicable to Land Management Plan. Direction from the Land Management Plan is tiered to in project planning and through Regional BMPs
Plan-2. Project Planning and Analysis	Use the project planning, environmental analysis, and decision making processes to incorporate water quality management BMPs into project design and implementation.	Interdisciplinary team project planning and effects analysis. Analysis of Riparian Conservation Objectives (RCO). Regional BMPs (12.12 1-1; 12.22 2-1 and 2-13; 12.52 5-7)
Plan-3 Aquatic Management Zone Planning	To maintain and improve or restore the condition of land around and adjacent to waterbodies in the context of the environment in which they are located, recognizing their unique values and importance to water quality while implementing land and resource management activities.	RCO analysis and Interdisciplinary team development of proposed action items for improvement of aquatic ecosystems including reduced fire hazard and transportation improvements. Regional BMP 12.12 1-19.
AqEco-1. Aquatic Ecosystem Improvement and Restoration Planning	Reestablish and retain ecological resilience of aquatic ecosystems and associated resources to achieve sustainability and provide a broad range of ecosystem services.	Identification of project activities such as transportation improvements and rehab of areas to improve hydrologic and aquatic functioning. RCO planning and analysis process.

AqEco-2. Operations in Aquatic Ecosystems	Avoid, minimize, or mitigate adverse impacts to water quality when working in aquatic ecosystems.	RCO analysis and Interdisciplinary team development of design criteria to protect aquatic ecosystems. Regional BMP 12.12 1-19.
AqEco-3. Ponds and Wetlands	Design and implement pond and wetlands projects in a manner that increases the potential for success in meeting project objectives and avoids, minimizes, or mitigates adverse effects to soil, water quality, and riparian resources	N/A. Project does not include creation or improvement of a pond or wetland.
AqEco-4. Stream Channels and Shorelines	Design and implement stream channel and lake shoreline projects in a manner that increases the potential for success in meeting project objectives and avoids, minimizes, or mitigates adverse effects to soil, water quality, and riparian resources.	N/A. Project does not include in channel work.
Chem-1. Chemical Use Planning	Use the planning process to develop measures to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources from chemical use on NFS lands.	N/A. Chemical use is not a proposed action in this project.
Chem-2. Follow Label Directions	Avoid or minimize the risk of soil and surface water or groundwater contamination by complying with all label instructions and restrictions required for legal use.	N/A. Chemical use is not a proposed action in this project.
Chem-3. Chemical Use Near Waterbodies	Avoid or minimize the risk of chemical delivery to surface water or groundwater when treating areas near waterbodies.	N/A. Chemical use is not a proposed action in this project.
Chem-4. Chemical Use in Waterbodies	Avoid, minimize, or mitigate unintended adverse effects to water quality from chemical treatments applied directly to waterbodies.	N/A. Chemical use is not a proposed action in this project.
Chem-5. Chemical Handling and Disposal	Avoid or minimize water and soil contamination when transporting, storing, preparing and mixing chemicals; cleaning application equipment; and cleaning or disposing chemical containers.	N/A. Chemical use is not a proposed action in this project.
Chem-6. Chemical Application Monitoring and Evaluation	1. Determine whether chemicals have been applied safely, have been restricted to intended targets, and have not resulted in unexpected nontarget effects. 2. Document and provide early warning of possible hazardous conditions resulting from potential contamination of water or other nontarget resources or areas by chemicals.	N/A. Chemical use is not a proposed action in this project.

Facilities and Nonrecreation Special Uses BMPs (FAC 1-10)	The purpose of this set of Best Management Practices (BMPs) is to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources that may result from development, use, maintenance, and reclamation of facilities located on National Forest System (NFS) lands.	N/A. Facility use and Special Uses are not included in this project.
Fire-1 Wildland Fire Management Planning	Use the fire management planning process to develop measures to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources during wildland fire management activities.	This project is part of a management plan to reduce potential for adverse effects of a wildfire on the landscape and potentially eventually facilitate wildland fire management to some extent.
Fire-2. Use of Prescribed Fire	Avoid, minimize, or mitigate adverse effects of prescribed fire and associated activities on soil, water quality, and riparian resources that may result from excessive soil disturbance as well as inputs of ash, sediment, nutrients, and debris.	Design criteria and project design features including compliance with Regional BMPs 12.62 6-1, 6-2, and 6-3 has been developed to minimize potential for negative effects resulting from prescribed fire implementation.
Fire-3. Wildland Fire Control and Suppression	Avoid or minimize adverse effects to soil, water quality, and riparian resources during fire control and suppression efforts.	Not directly applicable to this project, however with implementation of this project potential for adverse effects from control and suppression of wildfire would be reduced.
Fire-4. Wildland Fire Suppression Damage Rehabilitation	Rehabilitate watershed features and functions damaged by wildland fire control and suppression related activities to avoid, minimize, or mitigate long-term adverse effects to soil, water quality, and riparian resources	N/A. Not a fire rehabilitation project.
Minerals Management Activities (Min-1-8)	The purpose of this set of Best Management Practices (BMPs) is to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources that may result from various mineral exploration, development, operation, and reclamation activities.	N/A. Mineral management is not included in this project.
Rangeland Management Activities (Range-1-3)	The purpose of this set of Best Management Practices (BMPs) is to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources that may result from rangeland management activities.	N/A. Rangeland management is not included in this project except to restrict use where thinning of vegetation may increase accessibility to sensitive areas.

Rec – 1 Recreation Planning	Use the applicable recreation planning process to develop measures to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources during recreation activities.	The ID team reviewed damage from recreational use in the project area and proposed actions as part of the project to facilitate recreation while mitigating further damage to Forest Resources.
Rec – 2 Developed Recreation Sites	N/A	Management or modification of developed recreation use is not part of the project proposal.
Rec-3 Dispersed Use Recreation	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources by managing dispersed activities and undeveloped sites to maintain ground cover, maintain soil quality, control runoff, and provide needed sanitary facilities to minimize the discharge of nonpoint source pollutants and maintain streambank and riparian area integrity.	Project proposal to close and constrict dispersed use areas identified as negatively impacting or potentially negatively impacting Forest Resources.
Rec-4 Motorized and Nonmotorized Trails	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources by controlling soil erosion, erosion of trail surface materials, and water quality problems originating from construction, maintenance, and use of motorized and nonmotorized trails.	Trail reroutes are proposed as part of this project to reduce impact from system trails currently resulting in negative impacts to Forest resources. Closure of non-system trails is proposed as part of project activities.
Rec-5 Motorized Vehicle Use Areas	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources at motorized vehicle use areas by managing activities to maintain ground cover, maintain soil quality, and control runoff to minimize discharge of nonpoint source pollutants and maintain streambank and riparian area integrity.	Activities within the Motorized Vehicle use area have been designed to reduce current damage and minimize future damage.
Rec-6, Rec-7, Rec-8, Rec-9, Rec-10, Rec-11, Rec-12	N/A	Not involved in project activities.
Road-1. Travel Management Planning and Analysis	Use the travel management planning and analysis processes to develop measures to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources during road management activities.	Included in the NEPA ID team analysis of the project.
Road-2. Road Location and Design	Locate and design roads to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources.	Design and placement of new roads was evaluated and planned as part of the ID team process for project design. Regional BMP 12.22 2-1.
Road-3. Road Construction and Reconstruction	Avoid or minimize adverse effects to soil, water quality, and riparian resources from erosion, sediment, and other pollutant delivery during road construction or reconstruction.	Compliance with Regional BMP 2-3 and contract road package requirements.

Road-4. Road Operations and Maintenance	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources by controlling road use and operations and providing adequate and appropriate maintenance to minimize sediment production and other pollutants during the useful life of the road.	Regional BMP 12.22 2-3. Maintenance and appropriate use of roads used during the project is built into the timber sale and stewardship contracts.
Road-5. Temporary Roads	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources from the construction and use of temporary roads.	Temporary road construction, use, and management are dealt with through compliance with contract provisions for timber sale and stewardship projects and FSH 2409.15. Regional BMPs 12.22 2-2, and 2-8
Road-6. Road Storage and Decommissioning	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources by storing closed roads not needed for at least 1 year (Intermittent Stored Service) and decommissioning unneeded roads in a hydrologically stable manner to eliminate hydrologic connectivity, restore natural flow patterns, and minimize soil erosion.	Compliance with Regional BMPs (12.22 2-6 and 2-7) and contract provisions for a timber sale or stewardship contract. Additionally opportunities for road decommissioning were reviewed as part of the ID Team planning and project design process.
Road-7. Stream Crossings	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources when constructing, reconstructing, or maintaining temporary and permanent waterbody crossings.	ID Team project design and evaluation for road work activities, project design criteria, and compliance with Regional BMP 12.22 2-8.
Road-8. Snow Removal and Storage	Avoid or minimize erosion, sedimentation, and chemical pollution that may result from snow removal and storage activities.	N/A.
Road-9. Parking and Staging Areas	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources when constructing and maintaining parking and staging areas.	Compliance with Regional BMP 12.22 2-10. Parking and staging is usually connected to landing development and use or is dealt with in road plans.
Road-10. Equipment Refueling and Servicing	Avoid or minimize adverse effects to soil, water quality, and riparian resources from fuels, lubricants, cleaners, and other harmful materials discharging into nearby surface waters or infiltrating through soils to contaminate groundwater resources during equipment refueling and servicing activities.	Compliance with Regional BMP 12.22-11 and project design features.

Road-11. Road Storm-Damage Surveys	Monitor road conditions following storm events to detect road failures; assess damage or potential damage to waterbodies, riparian resources, and watershed functions; determine the causes of the failures; and identify potential remedial actions at the damaged sites and preventative actions at similar sites.	Monitoring would apply during project implementation until final acceptance of work items and contract and water quality waiver termination.
Veg-1. Vegetation Management Planning	Use the applicable vegetation management planning processes to develop measures to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources during mechanical vegetation treatment activities.	ID team planning process and compliance with Regional BMP 12.12 1-1.
Veg-2. Erosion Prevention and Control	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources by implementing measures to control surface erosion, gully formation, mass slope failure, and resulting sediment movement before, during, and after mechanical vegetation treatments.	ID team planning process and Regional BMPs 12.12 1-2, 1-3, 1-6, 1-9, 1-10, 1-12, 1-13, 1-14, 1-15, 1-16, 1-17, 1-20, 1-21; and 12.52 5-1, 5-2, 5-4, and 5-6.
Veg-3. Aquatic Management Zones	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources when conducting mechanical vegetation treatment activities in the AMZ.	RCO analysis and Regional BMPs 12.12 1-8, and 1-19; 12-52 5-3, and 5-12
Veg-4. Ground-Based Skidding and Yarding Operations	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources during ground-based skidding and yarding operations by minimizing site disturbance and controlling the introduction of sediment, nutrients, and chemical pollutants to waterbodies.	Regional BMPs 12.12 1-9, 1-10, 1-11, 1-13, 1-17, and 1-20.
Veg-5. Cable and Aerial Yarding Operations	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources during cable and aerial yarding operations by minimizing site disturbance and controlling the introduction of sediment, nutrients, and chemical pollutants to waterbodies.	ID team planning process and evaluation was used to develop design criteria to minimize or mitigate potential adverse effects. Regional BMPs 12.12 and 12.52 FSH 2409.15.
Veg-6. Landings	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources from the construction and use of log landings.	Regional BMPs 12.12 1-12 and 1-16
Veg-7. Winter Logging	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources from winter logging activities	Regional BMP 12.12 1-5 and 12.52 5-6
Veg-8. Mechanical Site Treatment	Avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources by controlling the introduction of sediment, nutrients, chemical, or other pollutants to waterbodies during mechanical site treatment.	National BMPs Veg-2 and Veg-3 and Regional BMPs 12.12 1-19 and 12.52 5-1, 5-2, 5-3, and 5-4.

Water Uses Management Activities	The purpose of this set of Best Management Practices (BMPs) is to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources from development and operation of infrastructure to collect, impound, store, transmit, and distribute water for uses on and off National Forest System (NFS) lands.	N/A. Not a part of this project.

Appendix C – Cumulative Effects

According to the Council on Environmental Quality (CEQ) NEPA regulations, "cumulative impact" is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions (40 CFR § 1508.7).

In order to understand the contribution of past actions to the cumulative effects of the Proposed Action and alternatives, this analysis, with the exception of hydrology 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 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. Additionally, focusing on the impacts of past human actions may ignore the important residual effects of past natural events, which 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. Third, the Council on Environmental Quality issued an interpretive memorandum on June 24, 2005 regarding analysis of past actions, which 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." For these reasons, the analysis of past actions in this section is based on current environmental conditions.

Current Management and Ongoing Activities

Even if no activities were being proposed under the Trestle project, certain management would continue in the area because of past decisions and current land management policies. Such activities that may be considered as appropriate in the cumulative effects analysis include:

- Fuels Reduction and forest health projects including: the Raintree Forest Health Project and prescribed burning under the Last Chance Fuels Reduction Project;
- Personal use firewood gathering consisting of salvage of individual dead trees by the public under a firewood permit system;
- Recreation including hiking, motorized recreation on designated trails (including Elkins Flat OHV trail system), dispersed camping, fishing, and hunting, and dispersed camping;
- Activities on private lands within the assessment area;

- Standard levels of maintenance on Forest Service roads and trails;
- Suppression of human-caused fire starts and wildfires under the jurisdiction of the U.S. Forest Service or CalFire.
- Management of Noxious Weeds – Weed Eradication and Control on the Eldorado National Forest is intended to direct priorities for treatment of noxious weeds across the Forest with a variety of treatment methods including hand treatments and herbicide treatments.

Reasonably Foreseeable Activities

The following reasonably foreseeable actions and management are considered in the cumulative effects analysis in this chapter, as appropriate for each resource analyzed. Timber harvest on private lands – No known Timber Harvest Plans (THPs), are currently under preparation in the area (http://www.fire.ca.gov/resource_mgt/resource_mgt_forestpractice_thpstatus.php last visited 05/01/2015).

Table C 1. Present and future foreseeable projects within the project planning area.

Project Name	Activity
Fuelwood Gathering	Gathering of dead trees less than 10 inches diameter at eye level and downed material
Invasive Plant Eradication	A combination of herbicide and hand treatments to reduce non-native invasive plants. Areas across the Forest are expected to be prioritized by invasive treatment priority.
Timber Harvest on Non-Forest System lands	Preparation of THPs on private lands is expected to continue. Approximately 100 acres of timber harvest on private land near Grizzly Flat would occur within the next few years.

Past Activities

Past vegetation management activities, on both public and private land since 1995, are summarized in the tables below. These include activities that occurred within the seven-HUC 7 watersheds (36,744 acres) that overlap with the Trestle Project area.

Table C 2. Forest Service Vegetation Management Project Activities by project since 1995; within watersheds that overlap with the Trestle project area

Description	Years	Approximate Acres
Raintree Forest Health Project – Understory thinning in natural stands and plantations	2012-2014	**225 acres** 200 acres (natural stands); 25 acres (plantations)
Henry's Prescribed Burn	2010	**400 acres**
Marshall Mine Fuels Reduction Project – Prescribed burning	2009	**1400 acres**
Caldor Thinning and Mastication – Understory thinning and mastication within plantations	2007	**140 acres** 50 acres (understory thinning); 90 acres (mastication)
Last Chance Fuels Reduction Project – Understory thinning, prescribed burning, and mastication	2005-2007	**1,020 acres** 560 acres (understory thinning); 340 acres (prescribed burning); 120 acres (mastication)
Last Ridge Fuels Reduction – Hand cut, pile, and burn	2005-2007	**980 acres**
Pretty Quick Fuels Reduction – Mastication within plantations	2006	**320 acres**
Simpson Fuels Reduction Project – Understory thinning, pile and burn, and prescribed understory burning	2002-2006	**1,030 acres**
Lincoln Log Forest Health Project – Understory thinning following CASPO Interim Guidelines and follow up prescribed burning	1999, 2003, and 2005	**1,000 acres**
Ridgerunner Fuels Reduction Project – Undestory thinning following CASPO Interim Guidelines, biomass removal, and prescribed burning.	2001 to 2003	**1600 acres**
2nd Fiddle Forest Health Project – Understory thinning following CASPO interim guidelines	2000-2001	**950 acres**
Tie Die Forest Health Project – Understory	1999-2001	**1,700 acres**

Description	Years	Approximate Acres
thinning following CASPO Interim Guidelines		
Nelly Forest Health Project – Understory thinning following CASPO Interim Guidelines	2000	**140 acres**
Sciaroni Forest Health Project – Understory thinning following CASPO Interim Guidelines	1998	**65 acres**
Roadside Hazard Tree Removal	1995-1996	**310 acres**

Table C 3. Private Land Timber Harvest Activities since 1995; within watersheds that overlap with the Trestle project area

Activity	Clearcut	Commercial Thin	Group Selection	Sanitation Salvage	Seed Tree Removal Cut	Selection	Shelterwood Removal	Grand Total
1995		59		120	20	103	135	
1996					65	43	23	
1997						20	25	
1999						15	10	
2000					335		45	
2003				6		74	27	
2005						61		
2014	122							
Grand Total	**122**	**59**	**0**	**126**	**420**	**316**	**245**	