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Environmental Assessment

Community Protection – Central and West Slope Project

Plumas National Forest

Plumas, Sierra, Yuba, and Butte Counties, California

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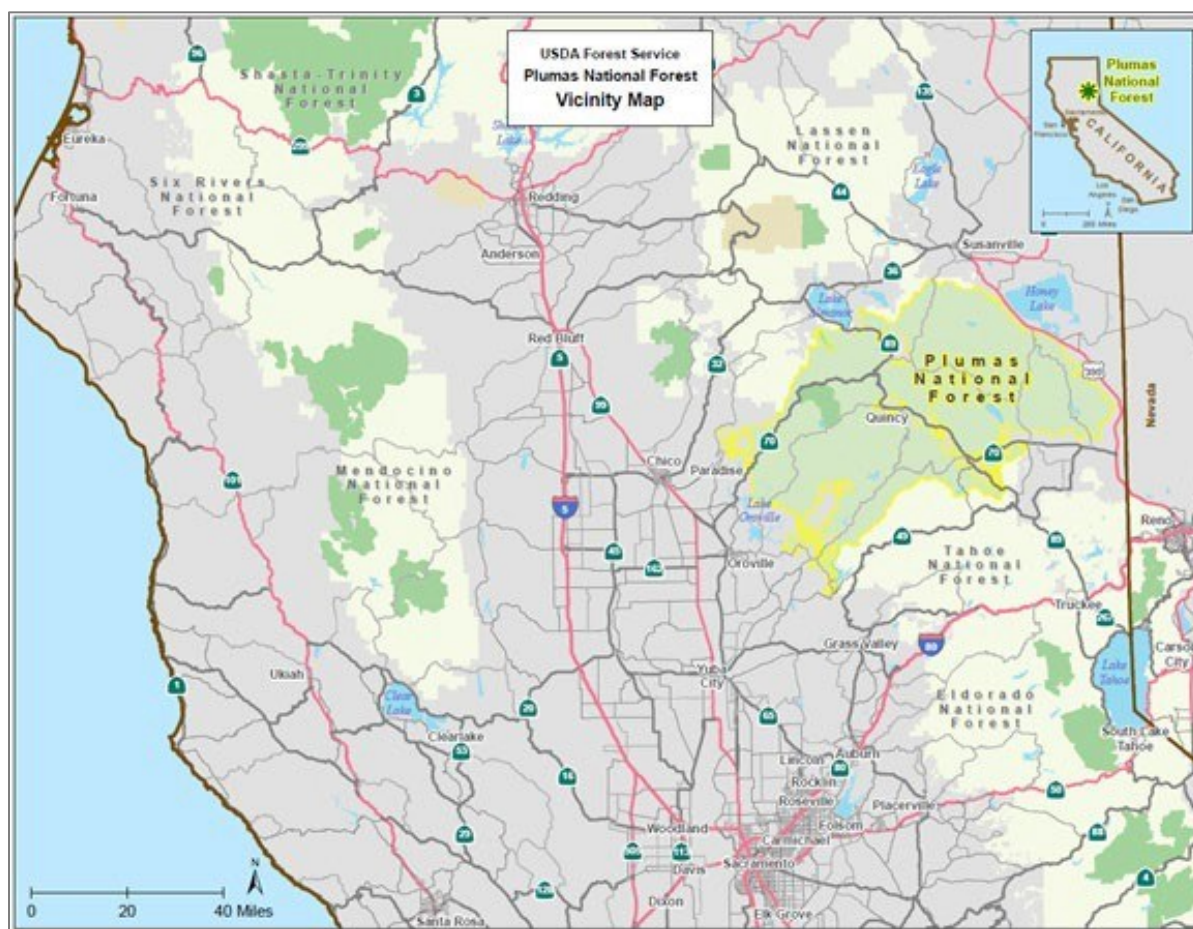
1. INTRODUCTION

1.1. Overview

The U.S. Department of Agriculture (USDA) Forest Service, Plumas National Forest (PNF) is proposing to implement fuels reduction and other vegetation treatments that mitigate the risk to communities and critical infrastructure from wildfire on approximately 217,721 acres throughout the Plumas National Forest. The Community Protection – Central and West Slope Project (Project) is concentrated on several community zones across the forest that have moderate-, high-, or very high-risk wildfire hazard potential. PNF prepared this environmental assessment (EA) to determine whether to prepare an environmental impact statement or a finding of no significant impact.

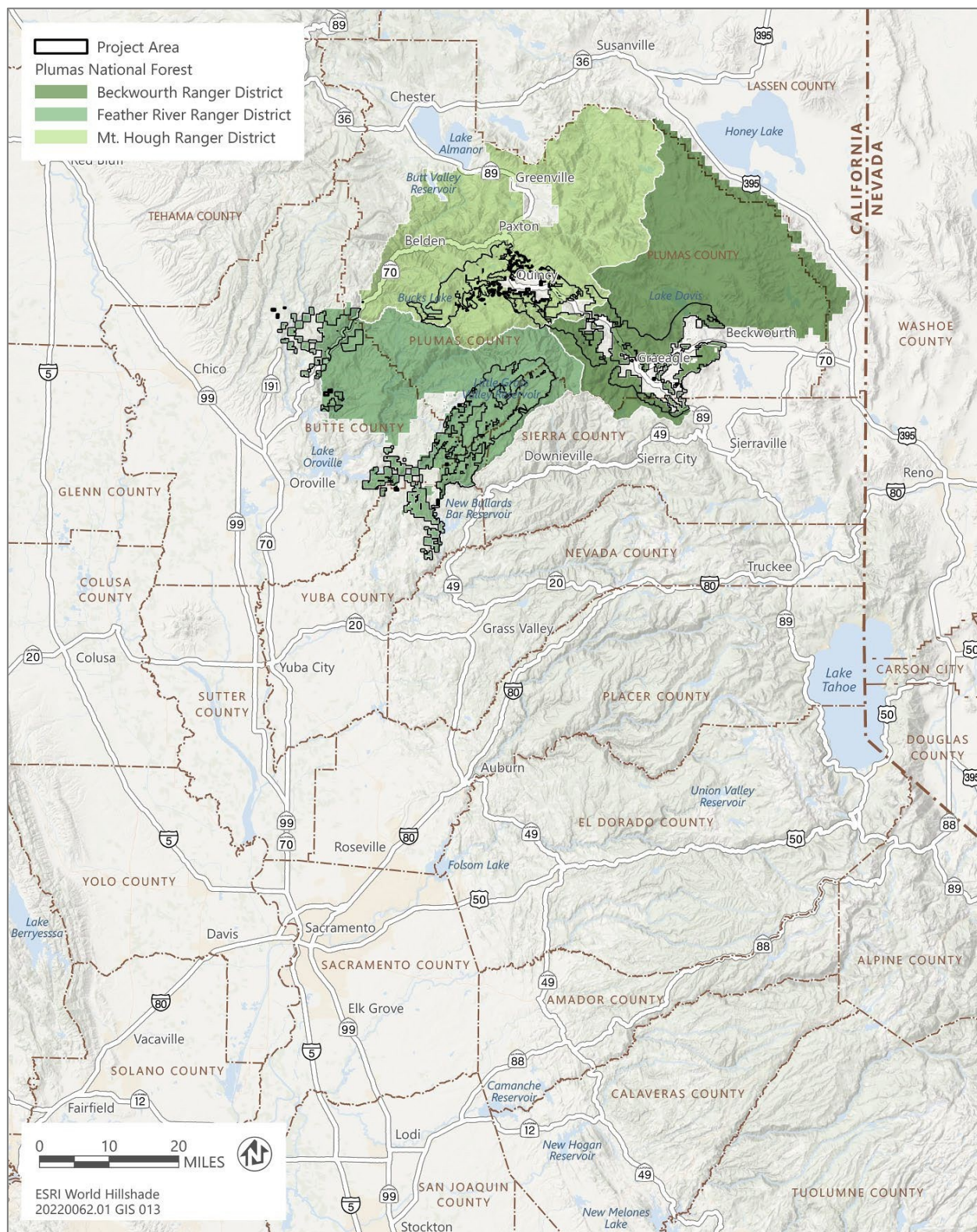
1.1.1. Project Location

The Project is entirely within federal lands administered by the Plumas National Forest in the northern Sierra Nevada (Figure 1-1). It encompasses areas within portions of the Beckwourth, Feather River, and Mt. Hough Ranger Districts (Figure 1-2).



Source: Data provided by the Forest Service in 2022.

Figure 1-1 Plumas National Forest Vicinity Map



Source: Data provided by the Forest Service in 2022.

Figure 1-2 Project Location

1.2. Purpose and Need

Plumas National Forest is in a state of emergency (USFS 2023). Overgrown forests, extended drought, insect and disease infestations, a warming climate, and a growing number of homes in the wildland urban interface (WUI) have all contributed to the current wildfire and forest health crisis. Plumas National Forest has experienced multiple recent years of catastrophic wildfire, with fires affecting 65 percent of the national forest. Nearby communities and forests have been seriously damaged by wildfire. Historic fire suppression combined with climate change have transitioned the project area from a heterogeneous mix of stand types, including open stands characterized by large, fire-resistant trees to a homogenous landscape overstocked with smaller, fire-intolerant trees at serious risk for catastrophic fire and density-induced tree mortality.

In much of the Project area, high densities of small and intermediate-sized trees, combined with a heavy buildup of surface litter, would facilitate rapid wildfire spread. This combination has the potential to result in high-severity wildfire that puts local communities and infrastructure at extreme risk. Climate change is a key driver of the wildfire emergency in the project area. Over the next 20 years, mean summer temperature in the Sierra Nevada is projected to increase by 2° Celsius above a 2010 baseline, and extended droughts are expected to become more common. Within lower elevation portions of the project area, the average high temperature is projected to increase by 5.6° Fahrenheit from the historical baseline (1961-1990) by the mid-century. By the late part of this century (2077 – 2099), average high temperatures in lower elevation portions of the project area are projected to increase by 9.3° Fahrenheit. In higher elevation portions of the project area, the change will be even more pronounced with average high temperatures increasing by 5.9° and 9.6° Fahrenheit by the middle and late part of this century, respectively. (Cal-Adapt 2018). This increase in mean summer temperature, coupled with extended drought, contributes to increased tree mortality and decreased live fuel moisture, which lead to extreme fire behavior. The combined effects of drought and temperature are expressed as the climate water deficit (i.e., the extent to which water demand exceeds soil moisture) (Stephenson 1990). Within the project area, average climatic water deficit is expected to increase by 59 percent by the end of the century (CBI 2020) leading to increased extreme fire behavior.

Protecting communities, evacuation routes, natural resources, and critical infrastructure from future wildfires is a critical priority for PNF. Considering these recent wildfires and their enormous impact, as well as the worsening wildfire risk due to climate change, the need to take action to reduce fire risk to communities and critical infrastructure is urgent. This project involves collaborative planning and an environmental analysis process that allows a meaningful level of threat reduction in time to begin implementation in 2024.

The purpose of this Project is to implement fuels treatments that mitigate the risk to communities and critical infrastructure from wildfire. These fuels treatments are needed to reduce the accumulation of excessive surface fuels and create sustainable, resilient vegetation structure that allows for safer defense of human communities and their associated high-value resources and assets. To accomplish this goal, the Project would address the following needs:

1. Reduce risk of wildfire impacts on communities and critical infrastructure.

Vegetation and fuels treatments are needed on landscapes with a high likelihood of an ignition that could expose homes, communities, and infrastructure to severe wildfire. The general goal of fuels treatments is to modify wildfire behavior to a lower intensity surface fire, with reduced burn severity and diminished crown fire potential that would mimic conditions occurring under

a natural fire regime, as described in General Technical Report (GTR) 220, An Ecosystem Management Strategy for Sierran Mixed-Conifer Forests, and GTR 237, Managing Sierra Nevada Forests (North et al. 2009; North 2012). Vegetation treatments can also reduce wildfire risks by improving forest resilience, which decreases the potential for tree mortality from drought, insects, pathogens, and climate change, (i.e., the conditions that contribute to hazardous fuels accumulation). There is also a need to maintain existing fuel breaks to provide locations with favorable conditions for firefighters, which helps protect nearby communities.

2. Reduce the potential for extreme fire behavior in the wildland-urban interface.

The intermingling of wildland fuels and built structures has made the control of wildfires in the wildland-urban interface (WUI) more difficult, dangerous, and costly. Reducing excessive surface fuels, ladder fuels, and, in some cases, intermediate overstory tree density in the Project area would reduce flame lengths and decrease the potential for extreme wildfire behavior near developed areas. Reducing extreme wildfire behavior improves opportunities for fire suppression resources to safely contain the wildfire in the WUI before it reaches structures and critical infrastructure.

3. Maintain road systems for emergency access and evacuations.

Communities in the Project area may rely on forest roads for emergency access and primary or secondary emergency egress if the community faced a rapidly moving wildfire. Adequate emergency access and egress are critical, to reduce competition between evacuees and first responders. Evacuations save lives and allow responding personnel to focus on emergency response. There is a need to provide emergency access by reducing roadside fuels and hazards and restore existing National Forest System (NFS) roads to the standard of PNF's Road Management Objectives.

4. Foster an all-lands approach to fire and fuels management.

Effective community wildfire protection requires all landowners to work together. Many residents have been proactively thinning and prescriptively burning their private property through a steadily growing collaborative effort. Vegetation treatments on national forest lands are critical to the success of defensible space and forest management activities on nearby private and public lands. There is also a need to maintain permanent fire control lines on public land around communities to support and sustain these efforts into the future. Having permanent fire breaks in place would make implementation of repeatable, cross-boundary prescribed burns easier.

1.3. Consistency with the Forest Plan

The 1988 Plumas National Forest Land and Resource Management Plan (Forest Service 1988), as amended by the Sierra Nevada Forest Plan Amendment (SNFPA) Record of Decision (Forest Service 2004) (collectively referred to throughout this document as the "Forest Plan"), provides the current management direction for land allocations, desired conditions, management intents, objectives, and standards and guidelines. These elements provide direction to land managers for designing and developing fuels and vegetation management projects.

The Project would implement goals and objectives outlined in the Forest Plan and help move the Project area toward desired conditions described in that plan. In particular, the Project furthers Forest Plan Goal 18a, which calls for the application of prescribed fire to reduce wildfire fuels, and Goal 18b, which directs PNF to reduce preventable, human-caused wildfire.

Given existing high forest-stand densities in the Project area and climatic conditions, there is a potential need to amend the Forest Plan (36 Code of Federal Regulations [CFR] 219.13[b][1]) to allow for management actions designed to protect communities from catastrophic wildfire; increase resiliency to environmental stressors, including drought, wildfire, insects, and diseases; and foster ecosystem capacity to adapt to future climate conditions.

As described in greater detail in Section 2.2, below, Alternatives 1 and 4 include a Project-specific plan amendment to the Forest Plan, whereas Alternatives 2 and 3 propose treatments consistent with the existing Forest Plan. The existing Forest Plan specifies basal area and canopy cover requirements in mechanical thinning treatments in mature forest habitats outside of WUI Defense Zones. It also specifies a maximum tree diameter limit of 30 inches diameter at breast height (dbh) for mechanical conifer thinning treatments, with exceptions for safety and operational needs. The basal area, canopy cover, and tree diameter requirements limit the ability to meet forest resiliency objectives (Safford and Stevens 2017; North et al. 2022).

The need to amend the Forest Plan (36 CFR 219.13[b][1]) is driven by the goals of this project combined with a need to perform treatments beyond fuels reduction to address forest resiliency in the Project area. In addition, the current Forest Plan specifies that limited treatment is permissible in California spotted owl Protected Activity Centers (PACs) only when necessary to meet fuels objectives. However, the Forest Plan does not allow for treatments aimed at improving habitat resiliency, promoting fire-resilient conifers, or encouraging growth of large-diameter trees. The *Conservation Strategy for the California Spotted Owl in the Sierra Nevada* (CSO Strategy) recognizes the need to incorporate habitat restoration actions to maintain suitable habitat in the face of climate change and increasing high-severity wildfire risk (Forest Service 2019).

1.4. Public Involvement

The Project was listed in the Schedule of Proposed Actions on September 8, 2022. During a public scoping period from May 5 through June 8, 2022, comments on the Project were received from 19 interested agencies, organizations, and individuals.

1.5. Relevant Issues

PNF reviewed comments received during the scoping period to identify issues. An issue is a point of discussion, dispute, or debate related to the proposed action or a project-related effect on a physical, biological, social, or economic resource.

Relevant issues are defined as those directly or indirectly caused by implementing the proposed action. They do not include topics that are (1) outside the scope of the proposed action; (2) already decided by law, regulation, Forest Plan, or other higher-level decision; (3) irrelevant to the decision to be made; or (4) conjectural and not supported by scientific or factual evidence. The Council on Environmental Quality National Environmental Policy Act (NEPA) regulations state that scoping should “determine the scope (§1508.25) and the significant issues to be analyzed in depth in the environmental impact statement” and “identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (§1506.3), narrowing the discussion of these issues in the statement to a brief presentation of why they will not have a significant effect on the human environment or providing a reference to their coverage elsewhere.” Although these regulations relate specifically to environmental impact statements, they also apply to EAs, in which issue areas must be addressed as a part of the environmental evaluation process.

PNF identified five relevant issue areas raised during the scoping period:

1. **Wildfire and Forest Resilience:** Over 100 years of fire suppression and a changing climate have resulted in millions of acres of dense forests at extreme risk of burning in catastrophic wildfires or dying from drought and forest pests and pathogens (Forest Service 2023). Under a changing climate, undesirably severe wildfire is not the only immediate threat to communities and infrastructure. Increasingly, the WUI of these communities is challenged by complex interacting issues, including drought, overly dense forests, exploding endemic insect populations, and epidemic and landscape-level tree mortality. Although fuel reduction may increase *resistance* to wildfire effects, it does not necessarily promote forest *resilience* to interacting disturbances (e.g., drought, insects, fire) that immediately threaten WUI communities, nor does it necessarily meet forest restoration goals (Stephens et al. 2021, 2016; North et al. 2022).
2. **Special-Status Species:** Project activities could affect individuals, populations, and habitat functions and values for species federally listed as proposed, threatened, or endangered or Region 5 Forest Service Sensitive species.
3. **Hydrology:** Forest management activities have the potential to affect the hydrologic, soil, and aquatic resources by causing soil disturbance, altering vegetative cover, and changing local drainage patterns. Erosion associated with the Project could increase fine sediment in water bodies and impair beneficial uses. Project activities also have the potential to affect wetlands in the Project area.
4. **Air Quality and Climate Change:** Treatment activities, including prescribed burning and the operation of mechanized equipment, would emit smoke, air pollutants, and greenhouse gases, and could result in adverse impacts, such as smoke and reduced air quality locally, and potentially generate greenhouse gas contribution to global climate change. Treatments are also expected to reduce the emission of air pollutants and greenhouse gases associated with future wildfires and wildfire suppression. Carbon sequestration outcomes of treatment activities may also reduce atmospheric carbon.
5. **Designated Land Allocations:** Project activities could affect the characteristics of designated land allocations (e.g., Wilderness, designated or eligible Wild and Scenic Rivers, Special Interest Areas, Protected Activity Centers, and others). Proposed treatments, such as mechanical thinning, could be incompatible with direction provided in the 2001 Roadless Area Conservation Rule, the Wilderness Act, and the Wild and Scenic Rivers Act.

1.6. Decision Framework

The Responsible Official for the Project is the Forest Supervisor for PNF. The Responsible Official will decide whether to implement the Project as described under Alternative 1, 2, 3, or 4, or whether the Project is not implemented at this time. In making this decision, the Responsible Official will consider the following questions:

- How well does an alternative meet the Project purpose and need?
- How well does an alternative move the Project area toward the desired conditions?
- Does a selected alternative minimize potential adverse effects?

The Responsible Official also determines whether the proposed action would have a significant impact on the quality of the human environment. If a determination is made that the impact is not

significant, then a finding of no significant impact would be prepared, and the decision of the Forest Supervisor would be documented in a decision notice (Forest Service Handbook [FSH] 1909.15, 43.2). A determination that significant impacts on the quality of the human environment would occur would require the preparation of an environmental impact statement (40 CFR 1501.4).

1.7. Administrative Review

The draft decision is subject to objection pursuant to 36 CFR 218, Subparts A and B. Objections will only be accepted from those who submitted project-specific written comments during scoping or other designated comment period. Issues raised in objections must be based on previously submitted comments unless based on new information arising after the designated comment opportunities [36 CFR 218.8(c)].

Objections must be submitted within 45 days following the publication of the legal notice in the Mountain Messenger newspaper. The date of the legal notices are the exclusive means for calculating the time to file an objection. Those wishing to object should not rely upon dates or timeframes provided by any other source. It is the objector's responsibility to ensure evidence of timely receipt (36 CFR 218.9).

Objections must be submitted to the Reviewing Officer: Jennifer Eberlien, Regional Forester, USDA Forest Service.

- Objections may be submitted online at:
<https://cara.fs2c.usda.gov/Public//CommentInput?Project=62873>
- Attachments must be submitted in one of the following formats:
 - Microsoft Word (.doc or .docx), rich text format (.rtf), or
 - Adobe Portable Document format (.pdf).

If you are not able to access the online form, objections may be emailed to objections-pacificsouthwestregional-office@usda.gov with subject: Community Protection – Central and West Slope Project or submitted by postal mail to: USDA Forest Service, Regional Forester, 1323 Club Drive, Vallejo, CA 94592, Attn: Community Protection – Central and West Slope Project.

Objections must include [36 CFR 218.8(d)]: (1) name, address and telephone; (2) signature or other verification of authorship; (3) identify a single lead objector when applicable; (4) project name, Responsible Official name and title, and name of affected National Forest(s); (5) reasons for, and suggested remedies to resolve, your objections; and (6) description of the connection between your objections and your prior comments. Incorporation of documents by reference is permitted only as provided in 36 CFR 218.8(b).

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2. PROJECT ALTERNATIVES

This chapter describes and compares the alternatives considered for the Project. The description of the Project identifies desired conditions, planning units, and treatment methods that apply to all alternatives. It then describes the distinct treatment standards and approaches of each alternative. This chapter also compares the alternatives, identifying the differences between each alternative and providing a basis for an informed choice among options by the Responsible Official.

Changes since the final environmental assessment was released on September 2023: a new regional policy for project specific forest plan amendments regarding California spotted owls prompted the Plumas to develop a new alternative (Alternative 4) for the Project.

During the analysis for Alternative 4, the interdisciplinary team came across two data errors. The first was a misclassification of 5,040 acres of Wild, Rec, Scenic, and Wilderness areas. These areas include Eligible Wild River on Frazier Creek near the Graeagle, Eligible Recreational and Scenic Rivers near Mabie, Portola, and Beckwourth, and a small section of the Buck's Lake Wilderness Area. The interdisciplinary team corrected this misclassification and has made changes to treatment intensity and method for these locations.

The other error uncovered was the incorrect calculation of retained suitable habitat within California spotted owl HRCAs (Table 3.2-8) in the original analysis. Alternatives 1, 2, and 3 were all mistakenly calculated with overlapping polygons, thereby double-counting acres. Reanalysis of these areas show a smaller retention of suitable habitat for California spotted owls for Alternatives 1, 2, and 3. The wildlife analysis (Section 3.2) reflects the corrected acreages.

2.1. Overview of the Project

This section provides a summary of the desired conditions, planning units, and treatment units that are common to all action alternatives. Implementing the Project would reduce risk of wildfire impacts on communities, evacuation corridors, critical infrastructure, and natural resources through a combination of actions, including prescribed fire, manual treatments, and mechanical treatments to reduce excessive surface fuels and promote cross-boundary treatments to sustain long-term protection of communities from wildfire. Activities include multiple treatment methods and multiple entries (e.g., hand-cut, hand-pile, pile-burn, prescribed fire) and recurring treatments (e.g., prescribed fire followed several years later by another prescribed fire). Hazard tree removal and road maintenance activities may be implemented to meet Project transportation needs and support emergency access and evacuation capacity. The Project would involve the mechanical removal of forest products (timber, biomass) through thinning treatments that increase pace and scale of achieving desired conditions and promote local and regional economies. Sale of timber (and biomass) would be an approach used to offset treatment costs, where viable and consistent with desired conditions. All alternatives would include design features to minimize or avoid adverse effects (Appendix A).

2.1.1. Desired Conditions

In recent years, fire occurrence and burn area have increased dramatically across California, particularly in the Sierra Nevada. Simultaneously, California has faced increasingly frequent and intense heatwaves attributable to climate change. By 2040 the Sierra Nevada is projected to experience a 2-degree Celsius increase in mean summer temperatures compared to those in the 2010s. This increase, coupled with extended drought, will contribute to a decrease in live fuel moisture, resulting in conditions that lead to extreme wildfire behavior. Researchers estimate that by 2040, the number of summer wildfires in the Sierra Nevada is projected to increase by 19 to 83 percent and burned area is projected to increase by 26 to 92 percent (Gutierrez et al. 2021).

Wildfires like the Dixie, Caldor, Creek, North Complex, and Camp Fires have caused fatalities, devastated communities, and caused significant damage to the natural resources of the region, including water, wildlife habitat, recreational resources, and carbon storage. Designing fuel reduction treatments under 90th percentile fire weather conditions in the WUI does not reflect the existing wildfire threat and anticipates an unacceptable 1 in 10 chance of weather conditions driving large, damaging wildfire. Designing treatment assuming 98th percentile fire weather conditions reflects the reality of wildfire behavior under climate change with the intent to meet the Project's desired conditions for community protection.

The Project area contains overly dense stands that are conducive to large and severe wildfires. Based on current forest conditions and existing wildfire threats, a sequence of vegetation treatments should achieve the following standards within the treatment area:

- Reduce flame lengths from current conditions to an average of 4 feet or less in treated areas under 98th percentile weather conditions.
- Reduce surface, ladder, and crown fuels to facilitate improved fire suppression efficiency, visual contact, structure defense, aerial retardant penetration to ground, and opportunities for contingency line construction and/or burnout operations.
- Reduce surface, ladder, and crown fuels so that less than 20 percent of the treated Project area would have crown fire potential under 98th percentile weather.

2.1.2. Planning Units

The Project area has been divided into separate, noncontiguous planning units. Each planning unit contains portions of the Project area with similar existing vegetation structure and composition or portions of the Project area that have the same designated land allocations under the Forest Plan. Each planning unit may contain areas within the WUI Defense and Threat Zones, as well as areas outside of the WUI. Treatment methods and posttreatment conditions within the Project area may vary depending on the planning unit and location within the WUI or outside of the WUI. Table 2-1a shows the total number of acres within each planning unit used in Alternatives 1,2 and 3, as well as the acres of each planning unit in the WUI Defense and Threat Zones and outside of the WUI. Table 2-1b shows the total number of acres within each planning unit used in Alternative 4. A brief description of each planning unit, definitions of WUI zones, and maps depicting the locations of planning units are included in Appendix B.

Table 2-1a Number of Acres within Each Planning Unit used in Alternatives 1, 2, and 3.

Planning Unit	Total Acres	Defense Zone	Threat Zone	Outside WUI
General Forest				
General Forest Westside	16,297	5,383	9,041	1,874
General Forest Eastside	12,318	8,278	3,927	113
Mature Forest	35,430	14,454	17,098	3,878
Special Habitat Areas				
Protected Activity Centers	37,712	13,413	19,434	4,865
Home Range Core Areas	43,202	15,446	21,427	6,329
Designated Land Allocations¹				
Bucks Lake Wilderness	4,585	1,052	3,423	109
Middle Fork of the Feather River/Eligible Recreational Rivers	9,456	5,228	3,674	555
Middle Fork of the Feather River/Eligible Scenic Rivers	3,515	762	2,687	66
Middle Fork of the Feather River/Eligible Wild Rivers	467	268	199	0
Burned Areas	31,443	8,952	14,056	8,435
Shrub and Early Seral	11,435	4,209	5,539	1,687
Existing Fire Control Lines	4,902	1,525	2,646	731
Other Areas	6,958	3,455	3,243	260
Totals	217,721	82,423	106,395	28,902

¹ Other land allocations within the Project area include Inventoried Roadless Areas, Special Interest Areas, and Research Natural Areas. See Section 3.7, “Special Land Designations,” for more information.

Source: Compiled by Ascent Environmental in 2023; Updated by USFS 2024.

Table 2-1b Number of Acres within Each Planning Unit used in Alternative 4

Planning Unit	Total Acres	Defense Zone	Threat Zone	Outside WUI
General Forest				
General Forest Westside	16,545	5,150	8,987	2,408
General Forest Eastside	11,797	7,864	3,820	113
Mature Forest	25,654	11,372	11,829	2,452
Special Habitat Areas				
Protected Activity Centers	37,712	13,413	19,434	4,865
California Spotted Owl Territories	32,278	12,024	15,965	4,289
Wildlife Corridors	25,357	8,303	12,099	4,955
Designated Land Allocations¹				
Bucks Lake Wilderness	4,585	1,052	3,423	109
Middle Fork of the Feather River/Eligible Recreational Rivers	10,773	5,282	4,936	555
Middle Fork of the Feather River/Eligible Scenic Rivers	4,811	1,042	3,702	66
Middle Fork of the Feather River/Eligible Wild Rivers	467	268	199	0
Burned Areas	24,866	7,632	10,799	6,435
Shrub and Early Seral	11,435	4,209	5,539	1,687

Existing Fire Control Lines	4,483	1,358	2,418	707
Other Areas	6,958	3,455	3,243	260
Totals	217,721	82,423	106,395	28,902

¹ Other land allocations within the Project area include Inventoried Roadless Areas, Special Interest Areas, and Research Natural Areas. See Section 3.7, “Special Land Designations,” for more information.

Source: Compiled by USFS 2024.

2.1.3. Treatment Methods

The Project includes multiple different treatment methods intended to achieve desired conditions and meet the Purpose and Need for the Project. Within each planning unit, one or more treatment methods would be employed. In most cases, multiple different treatment methods could apply to an individual planning unit; that is, in most cases, the same plot of land would be treated with more than one treatment prescription, as described below. By “layering” treatment methods on a treatment site, the Project would meet the Purpose and Need for the Project more effectively. The exact location of each treatment method within a planning unit would be delineated during pre-implementation site layout. To achieve and maintain desired conditions over time, multiple entries could occur within the same site. For example, an initial mechanical treatment could be followed by the application of prescribed fire several years later to maintain desired conditions. The timing of re-entries into the same site for maintenance would depend on several factors including the initial treatment method and intensity. For example, an initial mechanical treatment that substantially reduces stand density would achieve desired conditions for much longer than an initial manual treatment that only reduces ladder fuels.

Thinning for fire hazard reduction and forest resilience improvement is the selective removal of some trees from overstocked forest stands to reduce overall forest density and increase the spacing between tree crowns. Thinning focuses on smaller and medium-sized trees to allow for retention of larger, more fire-resilient trees that provide essential wildlife habitat. Thinning treatments also aim to create more variable tree density consistent with natural, resilient stand patterns.

Thinning can mitigate wildfire and declining forest health in several ways. By reducing ladder fuels and canopy fuels, thinning reduces the potential for crown fire and high-severity fire effects when coupled with treatments that reduce surface fuels such as prescribed fire. Thinning also reduces tree competition for water and other resources, thereby minimizing potential impacts from bark beetle outbreaks. In a recent study, researchers found that forest thinning treatments were effective in reducing drought-related tree mortality during the 2012-2016 severe drought (Forest Service 2023).

The Project would include an uneven-aged thinning technique called variable-density thinning (VDT) (Forest Service 2009). This technique improves forest health by creating a more resilient forest structure and reduces wildfire risk by reducing stand density and breaking up the canopy. VDT is designed to produce a mosaic of individual trees, clumps of trees, and small openings to enhance stand resilience to severe disturbances, create structural heterogeneity, and foster development of diverse tree species. VDT objectives for this project include reducing stand density, reducing ladder fuels, preparing stands for the safe reintroduction of fire, enhancing species composition, preferentially retain shade intolerant, fire resistant species, increasing stand structural heterogeneity, and accelerating the growth of mid-seral forests toward late seral conditions. VDT also allows land managers to maintain habitat linkages that support the needs of old forest associated species.

There are three main elements to VDT thinning: gaps, clumps, and matrix. Gaps would be areas 0.1 to 3 acres in size where conifers less than 30 inches dbh would be removed and may make up approximately 10–20 percent of the Project area. Shade-intolerant healthy conifers that are resilient to wildfire may be retained as seed sources. Planting may occur in gaps greater than 0.5 acre in size to assist the natural regeneration of pine species (e.g., Jeffrey pine and sugar pine).

Clumps are groupings of trees where thinning would be generally avoided. Within these clumps, some thinning may occur, but a multitiered canopy with interlocking crowns is desired. Clumps would include dense pockets of trees 0.1 to 0.25 acre in size and occupy up to 5 percent of the Project area.

The matrix area would make up most of the forest outside of gaps and clumps. Generally, conditions in the matrix would reflect the natural range of variation, which encourages fire-resilient, shade-intolerant tree species, larger-diameter trees, and more open conditions. Trees would generally be healthy and vigorous with full green crowns and be free of pests and pathogens. Spacing between trees would vary within the stand to mimic historic conditions and promote conditions favorable to low to moderate-severity wildfire. Prescriptions would target retention of canopy cover greater than 40% within perennial riparian areas and high elevation ridgetops to address connectivity of habitat for old forest associated species where it is possible to meet wildfire risk reduction objectives as well.

Within the matrix, trees should be thinned to the desired stand density; however, under some alternatives the matrix would reach canopy cover retention or basal area standards and guidelines specified by the Forest Plan before being able to reach desired stand density. Each of the proposed treatment methods described below could be applied to different planning units under each of the alternatives.

Mechanical Thinning

Mechanical thinning generally refers to the felling and removal of trees using heavy machinery. Mechanical thinning could involve whole-tree harvest, cut-to-length methods, cable yarding, and tethered equipment (on steep slopes or difficult terrain). Equipment that could be used for mechanical treatment would include chainsaws, harvesters, forwarders, skid steers, excavators, dozers, loaders, tow chippers, tracked chippers, masticators, feller/bunchers, rubber-tired skidders, as well as tractor-trailer equipment transporters. The duration and rate of these treatments vary depending on the size of the treatment area, terrain, and the vegetation being treated. After the initial disturbance of cutting, log forwarding and biomass removal would continue to occur in treatment units. The duration and intensity of these treatments depend on forwarding method, but within the Project area, whole-tree skidding would be the most common method.

Under a whole tree harvest system, the entire tree would be cut and removed to the landing for processing. Typically, a feller/buncher cuts and bunches a group of trees and leaves them on a skid trail where they are retrieved by a skidder, although larger trees would be felled by chainsaw. A skidder pulls the group of trees back to the landing where they are processed and cut to market length.

Whole-tree yarding can also involve cable yarding to move material to a landing area. Cable yarding is a yarding method used to retrieve cut material from the treatment site either partially or fully suspended in the air. This system requires a yarder that uses a system of cables to pull or fly logs from the stump to the landing. Aerial yarding, which entails lifting cut vegetation from the treatment

site with a helicopter or balloon, would not typically occur, although it could be used in limited circumstances in inaccessible locations.

In cut-to-length operations, a harvester would fell, limb, and buck the tree into manageable logs directly at the stump. Through this process, the tree limbs and slash are scattered throughout the treatment area creating a “slash mat,” which protects the forest floor and reduces erosion and soil compaction. A forwarder would then collect the logs and bring them to the landing area driving over this slash mat where feasible. The harvester and forwarder used in cut-to-length systems are low ground pressure machines with larger rubber tires or tracks.

Preexisting roads, skid trails, and landings would be used where available, feasible, and in a desirable location. Where existing roads and skid trails do not provide sufficient access to a mechanical thinning site, temporary roads may be constructed and restored following treatment of the site.

Residual slash created during harvests would be handled differently depending on treatment type. Slash treatment would include piling and burning, underburning, jackpot burning, and slash chipping. Mechanical treatment units would be evaluated after treatment, and areas that do not meet desired conditions with respect to surface fuels would be treated with underburning, pile burning, or another appropriate method.

To avoid loss of land base productivity, no more than 15 percent of timber stands would be dedicated to landings and permanent skid trails. In areas where preexisting skid trails and landings are not present, construction of such facilities would occur as agreed upon by the Forest Service and purchaser. All landings and skid trails used would conform to the standards and guidelines set forth in the Timber Sale Administration Handbook (FSH 2409.15) and the Forest Plan.

Grapple Piling

Grapple piling involves the use of a tracked or wheeled hydraulic excavator to lift and pile branches, limbs, small-diameter logs, and downed woody material. Grapple piling generally creates tall and well-stacked piles that will shed snow and provide better combustion than hand piles. Grapple piling could be used in conjunction with mechanical treatments or as a primary treatment method in areas containing dense downed material (e.g., jackstraw logs). In general, grapple piles are burned at a later time, after adequate drying.

Mastication

Mastication would be implemented using a mastication head attached to an excavator, small tractor, or other type of machine. The mastication head is used to chip or shred ladder fuels from brush and small trees (up to approximately 10 inches dbh) in place. Shredded material is incorporated into the litter and duff layers during operations, left on-site, or reduced during a subsequent prescribed fire treatment when posttreatment conditions allow. Mastication typically is implemented in areas of high brush cover or areas that need ladder fuel treatment where biomass removal is not feasible. In forested stands, prescribed burning or removal of fuels and vegetation would be favored over mastication.

Manual (Hand) Treatments

In areas where mechanical treatments are not desired because of resource considerations, hand thinning of shrubs and smaller diameter trees (generally up to 10 inches dbh), and limbing of larger trees using chainsaws or other tools may occur. Manual treatments would reduce stand density, ladder fuels, and surface fuels and the potential for extreme fire behavior. Resulting slash is generally

piled and burned on-site but may be scattered or left in place in preparation for prescribed fire. Manual treatments would be designed to avoid impacts within known cultural sites, sensitive resource sites, known avoidance areas, and riparian areas.

Prescribed Fire

Prescribed fire is the planned and carefully managed application of fire to the landscape under specified conditions. Prescribed fires can reduce surface fuels, minimizing the risk for future high-severity fires. Prescribed fire can also be used to safely and effectively reintroduce fire where fire has been excluded, to restore and maintain resilient, fire-adapted landscapes (Forest Service 2023). Prescribed fire, as used in this document, refers to under burning, broadcast burning, or jackpot burning. Pile burning is referred to separately.

Prescribed fire treatments would be applied in forested areas with excessive accumulations of live fuels, in areas with excessive accumulations of dead fuels, and in mature shrub/chaparral stands to create a mosaic of age classes. In areas determined to have fuel loading or a stand structure that would not be conducive to safely and effectively implementing low to moderate surface fire, or where multiple prescribed fire treatments would be necessary to achieve desired conditions, manual or mechanical fuels treatments would be implemented first to create conditions that are conducive to the application of prescribed fire.

All prescribed fire treatments would be implemented in accordance with applicable design criteria under appropriate fuel and weather conditions to move treatment areas toward desired conditions. Prescribed fire would be ignited under conditions conducive to primarily low- to moderate-intensity surface fires. Implementation under these circumstances safely and effectively reduces fuel loading while minimizing adverse effects on other resources. The Project has been designed to provide a range of prescribed fire opportunities that can be prioritized and scheduled as necessary in any given year, allowing for flexibility in implementation. Thus, the annual acreage treated with prescribed fire would vary based on current and predicted fuel and weather conditions, air quality, funding, and other resource conditions. Although prescribed fire would be introduced and maintained on the landscape in fire-adapted ecosystems, some acres would be untreated by prescribed fire.

Methods for applying fire would include ground ignition using a drip torch or similar method, aerial ignition using unmanned aerial vehicles (UAVs) or helicopters, or a combination of both. All prescribed fire treatments would comply with state and federal air quality standards and the approved prescribed fire plan (PMS 484-1), as described in the Interagency Prescribed Fire Planning and Implementation Procedures Guide (PMS 484).

Implementation of prescribed fire treatments may be carried out in partnership or consultation with local tribes integrating Traditional Ecological Knowledge.

Pile Burning

Pile burning would be applied as a secondary treatment to remove existing surface fuels and accumulated slash and limbs after manual or mechanical treatments. Piles would be constructed by hand, grapple piling equipment, or other heavy machinery. Methods for applying fire would include ground ignition using a drip torch or similar method. Piles are required to dry or “cure” before ignition, with pile burning restricted to permissive burn days as dictated by the applicable air quality district. Pile burning typically is used after the fire season in the fall, winter, or spring when rain and snow have made surrounding fuels less likely to ignite. Traditional “burn mix” is used—a combination of gasoline and diesel fuels. All accelerants used are assumed to fully combust during

the ignition phase of pile burning. Pile burning would be conducted in accordance with state and federal air quality standards and applicable elements of the Interagency Prescribed Fire Planning and Implementation Procedures Guide (PMS 484).

Herbicide Application

Seven herbicides are proposed for use to control native and invasive plant infestations within the Project area: aminopyralid, chlorsulfuron, clopyralid, fluazifop, glyphosate, imazapyr, and triclopyr. All seven are registered by the California Department for Pesticide Regulation for use in the state. The specific herbicide selected for application at a site would depend on the size and location of the infestation and/or target plant species to be treated. Application methods for the selected herbicides would include only ground-level application on foot or use of all-terrain vehicles or other similar vehicles with a boom-mounted sprayer. No aerial spraying would occur. The targeted ground-based application of these herbicides may be used to control shrub species, sprouting tanoak, and invasive plant species. All herbicides would be applied consistent with manufacturers' specifications using a backpack sprayer or a pump and spray unit mounted to an off-highway vehicle, truck, trailer, or other vehicle.

Borate Stump Treatment

Heterobasidion root disease (HRD) is one of the most consequential conifer diseases in California. Affected trees have a higher likelihood of mortality during drought, increased susceptibility to bark beetle attack, are more flammable, have an increased susceptibility to windthrow, reduced timber production, and have overall higher mortality. In addition, disease-caused windthrow in recreation areas, powerline and critical infrastructure corridors, boundaries of private property with structures, and administrative sites can be highly hazardous, leading to human injury or even death and damage to permanent infrastructure and property.

Most new infections of stumps by HRD can be prevented by treating freshly cut conifer stumps with a borate compound. Studies indicate at least a 90 percent efficacy. Stumps in treated units would undergo hand application of a borate compound for prevention of HRD.

Hazard Tree Removal

Hazard trees are dead or dying trees, live trees with dead parts, or live trees that are unstable because of structural defects or other factors that are within striking distance of people or property. Hazard trees have the potential to cause property damage, block emergency evacuation routes, or result in personal injury or fatality in the event of a failure. Standing dead and downed trees may also hinder firefighting efforts by limiting firefighter access (Forest Service 2023). Removal of hazard trees would occur within 300 feet of the centerline of all existing roads in the Project area and within 300 feet of a private property line, where that property has an existing or burned structure. Hazard tree removal would occur in both burned and unburned areas and could occur in riparian areas if necessary. Guidelines for removal of hazard trees based on the probability of mortality are included in Appendix B.

Reforestation

In large, high-severity burn patches, natural forest regeneration may be hampered because there are few or no live trees nearby to provide seeds, and any seedlings that do establish may struggle to compete with fast-growing shrubs. Reforestation may be necessary in these areas. Strategic and timely reforestation efforts can greatly improve opportunities for stand recovery while minimizing the potential for long-term conversion of forest to shrublands (Forest Service 2023).

Reforestation would involve the planting of native conifers and, where appropriate, hardwoods to reestablish forests in burned areas. Planting would be carried out by hand crews supported by trucks or similar off-road equipment. Reforestation often requires landscape preparation before replanting, such as manual treatments, mastication, mechanical pull and pile of brush and down woody debris, dead tree removal, pile burning, or herbicide application to control competing vegetation until desired tree species become established. Where natural hardwood postfire regeneration occurs from the root crown of burned trees, multiple stems may be pruned to favor development of the most dominant stem or a few codominant stems. Re-entry into plantations after establishment may be needed for timber stand improvement, competing vegetation and fuels control. This re-entry would use the same methods described in landscape preparation for reforestation.

Road Maintenance

Existing forest system roads within the Project area would be maintained to provide sustainable access for vegetation treatment activities and safer emergency access and evacuation. Maintenance activities would include brushing, regrading existing road surfaces and restoring drainage function. Improvement activities would include replacing undersized culverts, installing rolling dips to improve water quality, widening curves for critical vehicle access where feasible and adding or widening turnouts. Graders, excavators, loaders, compactors, masticators, and trucks for hauling equipment, materials, and water may be used during all road activities. Road maintenance may also include restoring access to, and improving existing roadside water drafting sites, by armoring the drafting pad and installing appropriate erosion control features. Drafting sites are needed for dust control and to support fire suppression. Access within the Project area includes approximately 931.3 miles of NFS roads. Road maintenance and/or improvement may occur on any NFS road segment where it is needed to implement the selected alternative; however, it is not known at present which NFS roads would require maintenance or improvements to implement the Project until on the ground condition surveys are done in the pre-design phase. County and private roads may also require maintenance to support the Project. Road activities that would be carried out in support of the Project are described in detail in Section 3.9, “Roads.”

2.2. Key Differences among the Alternatives

As summarized in Table 2-2, the primary differences among the action alternatives relate to the following topics:

- **General thinning targets.** Each alternative would implement treatment methods to achieve different targets related to relative stand density index (rSDI), as described in Section 2.3.1, or within standards and guidelines related to post treatment canopy cover.
- **Treatments in mature forests.** Each alternative includes different treatment methods and treatment intensity to address fuels and vegetation conditions in California Wildlife Habitat Relationship (CWHR) classes 4M, 4D, 5M, and 5D (see Section 3.2, “Biological Resources”).
- **Treatments in Protected Activity Centers (PACs).** Each alternative includes a different strategy to manage fuels within designated PACs for northern goshawk (American goshawk) or California spotted owl.
- **Treatments in Home Range Core Areas (HRCAs).** Alternatives 1, 2, and 3 include a different approach to manage fuels within designated Home Range Core Areas (HRCAs) for California spotted owl.

- **Treatments in Territories.** Alternative 4 incorporates using 1,000 acre territories to identify and retain key habitat needs for the California spotted owl.
- **Treatments in Wildlife Corridors.** Alternative 4 includes a different treatment approach to retain key habitat features in fuel treatments within mature forests.

Table 2-2 Major Differences in Treatment Approaches among the Action Alternatives

Topic	Alternative 1 – Vegetation Treatments to Protect Communities and Achieve Landscape Resilience	Alternative 2 – Vegetation Treatments to Protect Communities Consistent with the Existing Forest Plan	Alternative 3 – Vegetation Treatments to Protect Communities with Reduced Intensity Treatments	Alternative 4 – Vegetation Treatments to Protect Communities and CSO Territories
General thinning targets	VDT to achieve desired conditions and rSDI targets. This would generally result in stands that are less dense than under Alternatives 2 and 3.	VDT to achieve desired conditions within canopy cover standards and guidelines. This would generally result in stands that are somewhat denser than under Alternative 1.	VDT with a greater proportion of manual treatments to achieve desired conditions within canopy cover standards and guidelines. This would generally result in stands that are denser than under Alternatives 1 or 2.	VDT to achieve desired conditions and rSDI targets. This would result in stands that are similar in density to Alternative 1.
Treatments in mature forests	Allow mechanical treatments in mature forests to achieve rSDI targets.	Allow mechanical treatments in mature forests. General Forest-Westside: Outside of WUI Defense Zone, retain at least 40% canopy cover and 40% existing basal area, and do not reduce canopy cover by more than 30%. General Forest-Eastside: Outside of WUI Defense Zone, retain at least 30% canopy cover.	Allow mechanical treatments in mature forests inside WUI Defense Zone. Use hand thinning only outside of the WUI Defense Zone.	Allow mechanical treatments in mature forests to achieve rSDI targets.
Mechanical Treatments in PACs	Allow mechanical treatments in low- and moderate-productivity PACs consistent with the California spotted owl strategy.	Allow mechanical treatments in PACs in the WUI Defense Zone consistent with existing Forest Plan.	Do not allow mechanical treatments.	Allow mechanical treatments in low- and moderate-productivity PACs consistent with the California spotted owl strategy

Topic	Alternative 1 – Vegetation Treatments to Protect Communities and Achieve Landscape Resilience	Alternative 2 – Vegetation Treatments to Protect Communities Consistent with the Existing Forest Plan	Alternative 3 – Vegetation Treatments to Protect Communities with Reduced Intensity Treatments	Alternative 4 – Vegetation Treatments to Protect Communities and CSO Territories
Mechanical Treatments in HRCAs (Territories and Wildlife Corridors for Alternative 4)	Allow mechanical treatments and retain 40–50% canopy cover.	Same as Alternative 1, allow mechanical treatment, and retain 40–50% canopy cover.	Allow mechanical treatments in WUI Defense Zone and retain 40–50% canopy cover. Use hand thinning only outside of WUI Defense Zone.	Maintain suitable habitat in at least 40-60% of the territory. Allow mechanical treatments and retain at least 40% canopy cover in Wildlife Corridors. Retain at least 50-60% canopy cover in designated areas of CWHR Class 5D (see design features)

Notes: HRCA = Home Range Core Area; PAC = Protected Activity Center; rSDI = relative Stand Density Index; VDT = variable-density thinning; WUI = wildland-urban interface. CWHR Class 5D = stands with an average tree diameter greater than 24 inches and greater than 60 percent canopy cover.

Source: Compiled by Ascent Environmental in 2023; Updated by USFS 2024.

2.3. Alternative 1: Vegetation Treatments to Protect Communities and Achieve Landscape Resilience

Implementing Alternative 1 would reduce risk of wildfire to communities, evacuation corridors, critical infrastructure, and natural resources through a combination of all treatment methods described in Section 2.1.3. Vegetation treatments would include multiple entries that complement each other to achieve desired conditions. For example, mechanical or manual thin treatment would thin a stand, hand or grapple piling would address limbs and slash, pile-burning would remove the piles, and underburning would reduce surface fuels. This alternative also includes recurring maintenance treatments, such as prescribed fire several years after an initial treatment to maintain desired conditions.

The Forest Plan specifies basal area and canopy cover requirements in mechanical thinning treatments in mature forest units outside of WUI Defense Zones. It also limits fuel treatments within California spotted owl PACs and HRCAs. The basal area and canopy cover requirements limit the ability to meet forest resiliency objectives (Safford and Stevens 2017; North et al. 2022), and the fuel treatment limitations in California spotted owl PACs can result in conditions under which California spotted owl habitat is at a high risk for loss from fire and/or drought and insects (Forest Service 2019). This alternative proposes to amend the Forest Plan to allow treatments beyond those specified to be performed to respond to current threats and the effects of climate change to achieve the purpose and need of this project.

2.3.1. Alternative 1 Stand Density Targets

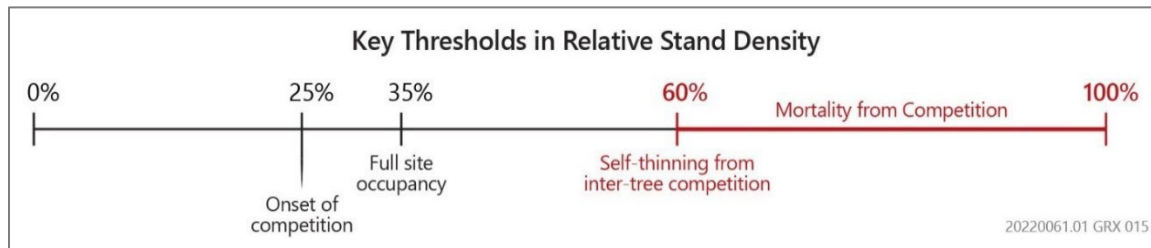
The existing Forest Plan restricts mechanical fuel reduction activities in mature forests (i.e., CWHR classes 4M, 4D, 5M, and 5D) by requiring that fuels treatments retain a minimum of 40 percent canopy cover and 40 percent of existing basal area. Alternative 1 proposes to remove this limitation and instead implement treatments to achieve desired rSDI to better emulate historic tree stand densities, which were much lower than they are in the present day and promote tree vigor by reducing competition (North et al. 2022). Stand density index (SDI) is calculated based on the number of trees per unit area and the diameter at breast height of the tree of average basal area (Reineke 1933).

As a result, SDI reflects the relationship between average tree size and number of trees per acre. The rSDI concept describes a stand's density relative to the maximum possible density (based on observed stands). Different forest types and habitat types would have varying results with the application of rSDI, because stand density would be measured relative to carrying capacity (Figure 2-1). For example, white fir stands may have a maximum rSDI of 560 while eastside pine may have a maximum rSDI of 365. As a result, 25 percent rSDI in a white fir stand would be 140 while in an Eastside Pine stand it would be 91. Depending upon the average dbh of trees in the stand and trees per acre, average stand basal area would most likely be different, though both stands are at the same rSDI. Additional information on rSDI is provided in Appendix B.

Historically, dry western U.S. conifer forests persisted through recurrent fires, periodic severe droughts, and insect/pathogen outbreaks exhibiting resilience to an array of stresses. In contrast, contemporary forests have been prone to large-scale mortality often in areas with heavy fuel loads and high stand densities (Lydersen et al., 2014; Young et al., 2017). Research indicates tree density across California has increased nearly 40 percent since the 1930's, while the number of large trees has decreased. The result is more homogenous landscapes characterized by tightly packed small and medium-sized trees, increased canopy cover, and fewer large-diameter trees (Forest Service 2023). Relative SDI for historical forests was 23–28 percent of maximum, in the ranges considered 'free

of (<25%) to ‘low’ competition (25–34%). In contrast, most (82–95%) contemporary stands were in the range of ‘full competition’ (35–59%) or ‘imminent mortality’ ($\geq 60\%$) (North et al. 2022). Further, recent research by Bernal et al. (2022) supports a convergence between the characteristics of historic forest structure and that which future climatic conditions may favor, specifically low tree density, low live basal area, low biomass, and high pine dominance.

To achieve the desired conditions within the Project area, Alternative 1 would thin stands to achieve a rSDI of 23–28 percent in all units subject to mechanical treatment outside of PACs, HRCAs, and Feather River-Scenic or –Recreational zones (see Table 2-4).



Source: Adapted from Long 1985, Powell 1999, and Long and Shaw 2012.

Figure 2-1 Key Thresholds in Relative Stand Density

2.3.2. Alternative 1 Treatments in Protected Activity Centers (PACs) and Home Range Core Areas (HRCAs)

Given existing high fuel loading and forest stand densities in California spotted owl PACs and HRCAs and northern goshawk (American goshawk) PACs in the Project area, this alternative proposes management actions designed to reduce the risk of extreme wildfire and habitat loss in these areas from wildfire, drought, insects, and diseases. This alternative would implement portions of the CSO Strategy (Forest Service 2019) to achieve the purpose and need of this project and protect California spotted owl habitat that is at a high risk for disturbance-induced loss from fire and/or drought and insects. Consistent with the CSO Strategy, more intensive treatments could occur in low- or moderate-productivity PACs, whereas less intensive treatments would occur in high-productivity PACs. See Section 3.2.5, “Environmental Effects for Wildlife”, for a description of PAC productivity categories. Specifically, this alternative would include the following treatments in PACs and California spotted owl HRCAs:

- Within low- and moderate-productivity PACs:
 - Within up to six separate 10-acre nest and roost sites within each PAC, manually thin up to 6 inches dbh while maintaining approximately the existing canopy cover.
 - Within the remainder of the PAC, allow mechanical thinning to achieve the following posttreatment canopy cover:
 - Maintain 60-percent canopy cover in existing CWHR class 5D areas
 - Maintain 50-percent canopy cover in other areas
- Within high-productivity PACs:
 - Manually thin up to 6 inches dbh except removal of ladder fuels up to 10 inches dbh.
- Within HRCAs:

- Allow mechanical treatment while maintaining 40- to 50-percent canopy cover.

2.3.3. Alternative 1 Treatment Locations and Targets

Under Alternative 1, the treatment methods described in Section 2.1.3 could be applied in individual planning units as shown in Table 2-3. The exact location, extent, and sequence of treatment methods at individual sites would be based on site-specific characteristics and resource considerations.

Vegetation treatments would employ the VDT approach described in Section 2.1.3 to achieve the desired conditions and protect resource values. Multiple treatment methods would be employed that would adhere to the limitations and achieve the posttreatment targets summarized in Table 2-4.

Table 2-3 Treatment Methods Allowed in Each Planning Unit under Alternatives 1 and 2

Planning Unit	Acres	Mechanical Treatments	Manual Treatments	Grapple Piling	Mastication	Prescribed Fire	Pile Burning	Herbicide Application	Reforestation	Hazard Tree Removal
General Forest-Westside	16,297	X	X	X	X	X	X	X		X
General Forest-Eastside	12,318	X	X	X	X	X	X	X		X
Mature Forest	35,430	X	X	X	X	X	X	X		X
Burned Areas	31,443	X	X	X	X	X	X	X	X	X
Shrub and Early Seral	11,435	X	X	X	X	X	X	X	X	X
PACs	37,712	Limited ¹	X	Limited ¹		X	X	X		X
HRCAs	43,202	X	X	X	X	X	X	X		X
Bucks Lake Wilderness	4,585									
Feather River/ Eligible Recreational or Scenic Rivers	12,971	X	X	X	X	X	X			X
Feather River/ Eligible Wild Rivers	467		X			X	X			X
Fire Control Lines	4,902	X	X	X	X	X	X	X	X	X

Notes: HRCAs = Home Range Core Area; PAC = Protected Activity Center.

¹ Mechanical treatment could be used in PACs subject to limitations described in Sections 2.3.2 (Alternative 1), and Section 2.4.2 (Alternative 2).

Source: Compiled by Ascent Environmental in 2023.

The location of planning units and potential treatment methods are shown in Appendix B.

Table 2-4 Alternative 1 Treatment Targets for Planning Units

Planning Unit	Live dbh Limit ¹	rSDI	Canopy Cover	Average Number of Snags per Acre	Other Limitations
WUI Defense Zone: General Forest-Westside, General Forest-Eastside, Burned Areas, Mature Forest ²	<30 inches	23–28%	NA	0	See design features in Appendix A.
Outside the WUI Defense Zone: Mature Forest, General Forest-Westside, Burned Areas	<30 inches	23–28%	NA	4	See design features in Appendix A.
Outside the WUI Defense Zone: General Forest-Eastside	<30 inches	23–28%	NA	3	See design features in Appendix A.
Low- and moderate-productivity PACs	<24 inches	NA	50–60%	4	Maintain at least 60% canopy cover in CWHR class 5D. No more than 100 acres of 4D would be reduced below 60% canopy cover. In 10-acre nest/roost sites, manual thin up to 6 inches dbh and maintain existing canopy cover. See design features in Appendix A.
High-productivity PACs	<10 inches	NA	No more than 5% less than existing and at least 50–60%	6	Manual thinning and prescribed fire only. Maintain at least 60% canopy cover in CWHR 5D. In 10-acre nest/roost sites, manual thin up to 6 inches dbh. In remainder of PAC, generally thin to 6 inches dbh with removal of material up to 10 inches dbh where needed to reduce ladder fuels. See design features in Appendix A.
HRCAs	<30 inches	NA	40–50%	6	See design features in Appendix A.

¹ Live dbh limits are intended to illustrate the difference in tree size removal limits among the various planning units. The Forest Plan provides exceptions to the maximum live dbh trees that can be removed from each of the planning units under specific circumstances, which may differ from the dbh limits identified in this table.

² There would be no live dbh size limit for trees in burned areas. Probability of mortality guidelines (see Appendix B) would be followed.

Planning Unit	Live dbh Limit ¹	rSDI	Canopy Cover	Average Number of Snags per Acre	Other Limitations
Shrub and Early Seral	<30 inches	NA	NA	4	The primary goal is reduction of fire hazard and increasing suppression efficiency, particularly within the WUI Defense Zone. Where both natural regeneration and existing plantations occur in these types, trees would be managed at densities allowing for greater drought resilience and reduced tree-to-tree fire spread.
Bucks Lake Wilderness	No trees removed	NA	NA	NA	No treatments are proposed.
Feather River and Eligible-Recreational or Scenic	<30 inches	NA	40%	4	Mechanical treatments would occur only to maintain or enhance use safety and scenic quality, protect special habitat, or prevent insect or disease epidemic.
Feather River and Eligible Wild	<10 inches	NA	NA	6	No mechanical treatments would be carried out.
Fire Control Lines	<30 inches	NA	0–10%	0	Continuous vegetation under 12 feet tall would be removed to create linear fire control features that do not provide horizontal fuel continuity across the landscape or act as a fire ladder into overstory vegetation. See design features in Appendix A.

Notes: CWHR = California Wildlife Habitat Relationship; dbh = diameter at breast height; HRCA = Home Range Core Area; NA = not applicable; PAC = Protected Activity Center; rSDI = relative Stand Density Index; WUI = wildland-urban interface.

Source: Compiled by Ascent Environmental in 2023.

2.3.4. Alternative 1 Forest Plan Amendment

Alternative 1 includes project-specific plan amendments to the Forest Plan. The existing Forest Plan specifies basal area and canopy cover requirements in mechanical thinning treatments in mature forest habitats (CWHR 4M, 4D, 5M, 5D) outside of WUI Defense Zones. The basal area and canopy cover requirements limit the ability to meet forest resiliency objectives (Safford and Stevens 2017; North et al. 2022). Further, recent research by Bernal et al (2022) supports a convergence between the characteristics of historic forest structure and that which future climatic conditions may favor, specifically low tree density, low live basal area, low biomass, and high pine dominance. This alternative proposes adopting strategies to both meet the purpose and need of this project to reduce fuel loads within the Project area to protect communities and critical infrastructure from wildfire and improve forest resiliency. Specifically, it would remove the requirements in Mature Forest areas outside of the WUI Defense Zone to retain at least 40 percent of the existing basal area and to reduce canopy cover by no more than 30 percent.

The existing Forest Plan specifies that limited treatment is permissible in PACs only when necessary to meet fuels objectives. However, the plan does not allow for treatments aimed at improving habitat resiliency; promoting fire-resilient, shade-intolerant conifers; or encouraging growth of large-diameter trees. The CSO Strategy recognizes the need to incorporate habitat restoration actions to maintain suitable habitat in the face of climate change and increasing high-severity wildfire risk (Forest Service 2019). The need to amend the Forest Plan (36 CFR 219.13[b][1]) is driven by the goals of this project combined with a need to perform treatments beyond fuels reduction to address habitat resiliency in PACs within the Project area. This alternative proposes adopting strategies to improve habitat resiliency while meeting the desired conditions related to community protection.

The proposed Project-specific amendments to the Forest Plan are based on Natural Range of Variation for Yellow Pine and Mixed-Conifer Forests in the Sierra Nevada, Southern Cascades, and Modoc and Inyo National Forests, California, USA (GTR-256) (Safford and Stevens 2017), recent research on forest resilience (North et al. 2022), and the CSO Strategy (Forest Service 2019). The CSO Strategy provides updated management recommendations, based on best available science, that focus on maintaining high-quality spotted owl habitat while increasing habitat resiliency across landscapes. Proposed changes include modifying, removing, and adding specific forest plan components to (1) improve forest resiliency in forest stands; (2) reduce immediate risk of large-scale disturbance and increase long-term resilience of California spotted owl habitat in PACs, thereby providing for the long-term sustainability of spotted owls and their habitat on the landscape; and (3) improve landscape resiliency to meet the objectives for protecting life and property and reducing fire hazards near communities while maintaining spotted owl habitat.

The proposed forest plan amendments would apply only to the Project area. The proposed Project-specific amendments are evaluated in this EA to assess their efficacy in meeting Project objectives (see Appendix C)

Substantive Provisions Directly Related to the Proposed Amendments

In accordance with 36 CFR 219.13, the Responsible Official has determined the following specific substantive requirement(s) within Sections 219.8 through 219.11 are directly related to the plan direction being added, modified, or removed by the proposed amendments:

- 36 CFR 219.8(a)(1) Sustainability, (a) Ecological Sustainability, (1) Ecosystem Integrity;

- 36 CFR 219.9(a)(1)(2) and (b) Diversity of Plant and Animal Communities, (a) Ecosystem Plan Components, (1) Ecosystem Integrity, (2) Ecosystem Diversity, and (b) Additional Species-Specific Plan Components; and
- 36 CFR 219.10(a)(1), (5), (7), and (8) Multiple Use, (a) Integrated Resource Management for Multiple Use, (1) Aesthetic values, cultural and heritage resources, ecosystem services, fish and wildlife species, forage, geologic features, grazing and rangelands, habitat and habitat connectivity, recreation settings and opportunities, riparian areas, scenery, soil, surface and subsurface water quality, timber, trails, vegetation, viewsheds, and other relevant resources and uses; (5) Habitat conditions, subject to the requirements of Section 219.9, for wildlife, fish, and plants commonly enjoyed and used by the public; for hunting, fishing, trapping, gathering, observing, subsistence, and other activities (in collaboration with federally recognized Tribes, Alaska Native Corporations, other Federal agencies, and State and local governments); (7) Reasonably foreseeable risks to ecological, social, and economic sustainability; and (8) System drivers, including dominant ecological processes, disturbance regimes, and stressors, such as natural succession, wildland fire, invasive species, and climate change; and the ability of the terrestrial and aquatic ecosystems on the plan area to adapt to change (Section 219.8).

2.4. Alternative 2: Vegetation Treatments to Protect Communities Consistent with the Existing Forest Plan

Alternative 2 would seek to achieve the Project purpose and need by implementing fuel reduction and forest health treatments consistent with the existing Forest Plan. Like Alternative 1, this alternative includes a combination of actions, including prescribed fire, manual treatments, and mechanical treatments, with multiple entries and reoccurring treatments to achieve the purpose and need and move the Project area toward desired conditions.

The Forest Plan provides direction for the management of the Plumas National Forest, including standards and guidelines applicable to prescribed fire, manual treatments, and mechanical treatments to reduce wildfire risk and promote forest health. The Project would implement prescribed fire, manual treatments, and mechanical treatments consistent with the limits established in the standards and guidelines in the Forest Plan.

2.4.1. Alternative 2 Mature Forest Canopy Cover and Basal Area Targets

The existing Forest Plan does not include standards or guidelines related to rSDI. Instead, it limits mechanical thinning treatments in mature forest units outside of the WUI Defense Zone by requiring that fuels and forest health treatments in these mature forest units (CWHR 4M/4D, 5M/5D) meet the following canopy cover and basal area standards:

- Retain a minimum of 40-percent canopy cover.
- Retain at least 40-percent of existing basal area.
- Reduce existing canopy cover by no more than 30 percent in absolute terms (e.g., 80-percent canopy cover cannot be reduced below 50 percent).
- The standards do not apply in the eastside pine type. In mature forest outside the Defense Zone in eastside pine, retain 30 percent of the existing basal area consisting of the largest-diameter trees. Projects in the eastside pine type have no canopy cover retention standards and guidelines.

2.4.2. Alternative 2 Treatments in Protected Activity Centers and Home Range Core Areas

Given existing high fuel loading and forest stand densities in the Project area's California spotted owl PACs and HRCAs and northern goshawk (American goshawk) PACs, this alternative proposes to implement treatments as allowed under the existing Forest Plan to reduce the risk of catastrophic wildfire and habitat loss in these areas from wildfire, drought, insects, and diseases. This alternative would implement treatments consistent with the existing standards and guidelines, which would include the following treatments in PACs and California spotted owl HRCAs:

- Within PACs in the WUI Defense Zone:
 - No mechanical treatment would occur within 500 feet from an activity center. Manually thinning up to 6 inches dbh can occur within the 500-foot buffer. .
 - Maintain 50-percent canopy cover, or if 50-percent canopy cover cannot be maintained while meeting the purpose and need, then replace an equivalent number of adjacent acres, outside of the WUI Defense Zone where possible.
 - Where possible, avoid mechanical treatment in PACs that have the highest likely contribution to owl productivity.
- Within PACs in the WUI Threat Zone:
 - Manually thin up to 6 inches dbh, removing additional material up to 10 inches dbh only where needed to reduce ladder fuels, while maintaining approximate existing canopy cover.
 - Where necessary to achieve the overall effectiveness of the landscape fire and fuels strategy, mechanically thin while adhering to the following:
 - No mechanical treatment would occur within 500 feet from a nest/roost site.
 - Maintain 50-percent canopy cover.
 - Where possible, avoid mechanical treatment in PACs that have the highest likely contribution to owl productivity.
- Within PACs outside the WUI defense and Threat Zones, manually thin up to 6 inches dbh without substantially changing the existing canopy cover.
- Within HRCAs in the WUI Defense Zone, implement mechanical treatments to achieve desired fuels conditions.
- Within HRCAs outside the WUI Defense Zone, retain 50-percent canopy cover, with 40-percent canopy cover allowed where necessary to adequately reduce ladder fuels, provide sufficient spacing for equipment operations, or minimize reentry.

2.4.3. Alternative 2 Treatment Locations and Targets

Under Alternative 2, the treatment methods described in Section 2.1.3 could be applied in the same planning units as described for Alternative 1 (see Table 2-3, above), except that treatment locations in PACs would be allowed only in the locations described in Section 2.3.2, above. As with Alternative 1, the exact location, extent, and sequence of treatment methods at individual sites would be based on site-specific characteristics and resource considerations. The locations of planning units are shown in Appendix B. Treatments would adhere to the targets and limitations shown in Table 2-5.

Table 2-5 Alternative 2 Treatment Targets for Planning Units

Planning Unit	Live dbh Limit	Canopy Cover	Average Number of Snags per Acre	Other Limitations
WUI Defense Zone: General Forest-Westside, General Forest-Eastside, Mature Forest, HRCAs, Burned Areas	<30 inches	30%	0	See additional mature forest standards in Section 2.3.1. See design features in Appendix A.
Outside the WUI Defense Zone: General Forest-Westside, Burned Areas	<30 inches	30%	4	See design features in Appendix A.
General Forest-Eastside Outside the WUI Defense Zone	<30 inches	30%	3	See design features in Appendix A.
Mature Forest Outside the WUI Defense Zone	<30 inches	40%	4	Retain at least 40% of existing basal area. Reduce existing canopy cover by no more than 30%. See design features in Appendix A.
PACs in the WUI Defense Zone	<30 inches	50%	3	No mechanical treatment would occur within 500 feet from a nest/roost site. See design features in Appendix A.
PACs in the WUI Threat Zone	10 inches	50%	4	See design features in Appendix A.
PACs Outside the WUI	<6 inches	Maintain existing	6	Manual thinning and prescribed fire only. See design features in Appendix A.
HRCAs Outside the WUI Defense Zone	<30 inches	40–50%	6	Target 50% canopy cover with 40% allowed where needed to meet fuels objectives. See design features in Appendix A.
Shrub and Early Seral	<30 inches	NA	4	The primary goal is a reduction of fire hazard and increase in suppression efficiency, particularly within the WUI Defense Zone. Where both natural regeneration and existing plantations occur in these types, trees would be managed at densities allowing for greater drought resilience and reduced tree-to-tree fire spread.

Planning Unit	Live dbh Limit	Canopy Cover	Average Number of Snags per Acre	Other Limitations
Bucks Lake Wilderness	No trees removed	NA	NA	No treatments are proposed.
Feather River and Eligible-Recreational or Scenic	<30 inches	Follow Forest Plan for canopy cover by CWHR type	4	Mechanical treatments would occur only to maintain or enhance use safety and scenic quality, protect special habitat, or prevent insect or disease epidemic.
Feather River and Eligible Wild	<10 inches	NA	6	No mechanical treatments would occur.
Fire Control Lines	<30 inches	0–10%	0	Continuous vegetation under 12 feet tall would be removed to create linear fire control features that do not provide horizontal fuel continuity across the landscape or act as a fire ladder into overstory vegetation. See design features in Appendix A.

Notes: dbh = diameter at breast height; HRCA = Home Range Core Area; PAC = Protected Activity Center; WUI = wildland-urban interface.

Source: Compiled by Ascent Environmental in 2023.

2.5. Alternative 3: Vegetation Treatments to Protect Communities with Reduced Intensity Treatments

Alternative 3 would seek to move the Project area toward desired conditions while implementing less intensive treatment methods and prescriptions to reduce potentially adverse effects from treatment activities. Like Alternatives 1 and 2, this alternative includes a combination of actions, including prescribed fire, manual treatments, and mechanical treatments, with multiple entries and reoccurring treatments to achieve the Project purpose and need. Unlike Alternatives 1 and 2, this alternative would limit the operation of mechanical equipment to slopes no greater than 35 percent, subject to Design features (Appendix A).

This alternative would seek to minimize disturbance associated with mechanical treatments by reducing the amount of mechanical treatment and increasing the amount of manual treatment and prescribed fire relative to Alternatives 1 and 2. In particular, this alternative would avoid mechanical treatments in mature forests, PACs and HRCAs outside of the WUI Defense Zone, and special management areas (Wilderness, Wild and Scenic, Inventoried Roadless Area, citizen roadless area, Research Natural Area, proposed RNA, Special Interest Area, and proposed SIA).

Alternative 3 would also maintain a greater proportion of dense forest habitat with greater canopy cover than Alternative 2. To achieve this, Alternative 3 would include higher targets for posttreatment canopy cover in mature forests, PACs, and HRCAs outside the WUI Defense Zone.

2.5.1. Alternative 3 Mature Forest and Habitat Preservation

This alternative proposes minimal vegetation thinning in mature forests, PACs, and HRCAs outside the WUI Defense Zone. This approach prioritizes preserving existing habitat structure over reducing the risk of habitat loss in these areas from wildfire, drought, insects, and diseases. This alternative would implement treatments that are less intensive than the existing standards and guidelines and would not include a Forest Plan amendment. Within the WUI Defense Zone, treatments would be similar to those under Alternative 2 but would maintain a higher posttreatment canopy cover. Outside of the WUI Defense Zone, mechanical treatments would not occur in mature forest, PACs, HRCAs, designated and proposed RNA, and designated and proposed SIA.

2.5.2. Alternative 3 Treatment Locations

Under Alternative 3, the treatment methods described in Section 2.1.3 could be applied in specific planning units, as shown in Table 2-6. As with Alternatives 1 and 2, the exact location, extent, and sequence of treatment methods at individual sites would be based on site-specific characteristics and resource considerations. Vegetation treatments would employ the VDT approach, described in Section 2.1.3, to achieve the desired conditions and protect resource values. Multiple treatment methods would be employed that would adhere to the limitations and achieve the posttreatment targets summarized in Table 2-7.

Table 2-6 Treatment Methods Allowed in Each Planning Unit under Alternative 3

Planning Unit	Acres	Mechanical Treatments	Manual Treatments	Grapple Piling	Mastication	Prescribed Fire	Pile Burning	Herbicide Application	Reforestation	Hazard Tree Removal
General Forest-Westside	16,297	X	X	X	X	X	X	X		X
General Forest-Eastside	12,318	X	X	X	X	X	X	X		X
Mature Forest	35,430	WUI Defense Zone only	X	X	X	X	X	X		X
Burned Areas	31,443	X	X	X	X	X	X	X	X	X
Shrub and Early Seral	11,435	X	X	X	X	X	X	X	X	X
PACs	37,712		X			X	X	X		
HRCAs	43,202	WUI Defense Zone only	X	WUI Defense Zone only	WUI Defense Zone only	X	X	X		X
Bucks Lake Wilderness	4,585									
Feather River/Eligible Recreational, Scenic, or Wild Rivers	13,438		X			X	X		X	X
Fire Control Lines	4,902	X	X	X	X	X	X	X	X	X

Notes: HRCAs = Home Range Core Area; PAC = Protected Activity Center; WUI = wildland-urban interface.

Source: Compiled by Ascent Environmental in 2023.

The location of planning units and potential treatment methods are shown in Appendix B.

Table 2-7 Alternative 3 Treatment Limitations and Posttreatment Conditions

Planning Unit	Maximum Live dbh Removed	Canopy Cover	Average Number of Snags per Acre	Other Limitations
WUI Defense Zone: General Forest-Westside, General Forest-Eastside, Burned Areas	<30 inches	30%	0	See design features in Appendix A.
Outside the WUI Defense Zone: General Forest-Westside, Burned Areas	<30 inches	40%	4	See design features in Appendix A.
General Forest-Eastside Outside the WUI Defense Zone	<30 inches	40%	3	See design features in Appendix A.
Mature Forest in the WUI Defense Zone	<30 inches	50%	4	Retain at least 40% of existing basal area. Reduce existing canopy cover by no more than 30%. See design features in Appendix A.
Mature Forest Outside the WUI Defense Zone	<10 inches	Maintain existing	6	No mechanical treatments would occur. Retain at least 40% of existing basal area. See design features in Appendix A.
PACs in the WUI Defense Zone	<10 inches	50%	4	No mechanical treatments would occur. See design features in Appendix A.
PACs Outside the WUI Defense Zone	<6 inches	Maintain existing	6	No mechanical treatments would occur. See design features in Appendix A.
HRCAs in the WUI Defense Zone	<30 inches	40%	4	See design features in Appendix A.
HRCAs Outside the WUI Defense Zone	<10 inches	Maintain existing	6	No mechanical treatments would occur. See design features in Appendix A.

Planning Unit	Maximum Live dbh Removed	Canopy Cover	Average Number of Snags per Acre	Other Limitations
Shrub and Early Seral	30 inches	NA	4	The primary goal is a reduction of fire hazard and increase in suppression efficiency, particularly within the WUI Defense Zone. Where both natural regeneration and existing plantations occur in these types, trees would be managed at densities allowing for greater drought resilience and reduced tree to tree fire spread.
Bucks Lake Wilderness	No trees removed	NA	NA	No treatments are proposed.
Feather River and Eligible-Recreational, Wild, or Scenic	<10 inches	NA	6	No mechanical treatments or herbicide application would occur.
Fire Control Lines	<30 inches	0–10%	0	Continuous vegetation under 12 feet tall would be removed to create linear fire control features that do not provide horizontal fuel continuity across the landscape or act as a fire ladder into overstory vegetation. See design features in Appendix A.

Notes: dbh =diameter at breast height; HRCA = Home Range Core Area; NA = not applicable; PAC = Protected Activity Center; WUI = wildland-urban interface.

Source: Compiled by Ascent Environmental in 2022.

2.6. Alternative 4: Vegetation Treatments to Protect Communities and CSO Territories

Implementing Alternative 4 would be similar to Alternative 1 and reduce risk of wildfire to communities, evacuation corridors, critical infrastructure, and natural resources through a combination of all treatment methods described in Section 2.1.3. This alternative also retains mature forest habitat in areas critical for CSO persistence. Vegetation treatments would include multiple entries that complement each other to achieve desired conditions. For example, mechanical or manual thin treatment would thin a stand, hand or grapple piling would address limbs and slash, pile-burning would remove the piles, and underburning would reduce surface fuels. This alternative also includes recurring maintenance treatments, such as prescribed fire several years after an initial treatment to maintain desired conditions.

Similar to Alternative 1, Alternative 4 addresses the existing limitations of the current Forest Plan by proposing amendments that incorporate regional components that were developed in collaboration with the USFWS. These components integrate the 2019 CSO Conservation Strategy with recent BASI focusing on CSO habitat requirements. This alternative balances retention of wildlife habitat with forest resiliency objectives and the fuel treatments.

2.6.1. Alternative 4 Treatments in Protected Activity Centers (PACs), Territories, and Wildlife Corridors

Given existing high fuel loading and forest stand densities in California spotted owl PACs and territories and northern goshawk (American goshawk) PACs in the Project area, this alternative proposes management actions designed to reduce the risk of extreme wildfire and habitat loss in these areas from wildfire, drought, insects, and diseases. This alternative would implement portions of the CSO Strategy (Forest Service 2019) to achieve the purpose and need of this project and protect California spotted owl habitat that is at a high risk for disturbance-induced loss from fire and/or drought and insects. Consistent with the CSO Strategy and regional guidance, more intensive treatments could occur in low- or moderate-productivity PACs, whereas less intensive treatments would occur in high-productivity PACs. See Section 3.2.5, “Environmental Effects for Wildlife”, for a description of PAC productivity categories. Specifically, this alternative would include the following treatments in PACs, California spotted owl territories, and in wildlife corridors:

- Within low- and moderate-productivity PACs:
 - Within up to six separate 10-acre nest and roost sites within each PAC, manually thin up to 6 inches dbh while maintaining approximately the existing canopy cover.
 - Within the remainder of the PAC, allow mechanical thinning to achieve the following posttreatment canopy cover:
 - Maintain 60-percent canopy cover in existing CWHR class 5D areas
 - Maintain 50-percent canopy cover in other areas
- Within high-productivity PACs:
 - Manually thin up to 6 inches dbh except removal of ladder fuels up to 10 inches dbh.
- Within CSO Territories Suitable Habitat Retention Areas and Wildlife Corridors:

- Allow mechanical treatment while maintaining at least 40-percent canopy cover; maintain at least 50- to 60-percent canopy cover in designated areas of CWHR 5D.

2.6.2. Alternative 4 Treatment Locations and Targets

Under Alternative 4, the treatment methods described in Section 2.1.3 could be applied in individual planning units and subunits as shown in Table 2-8. The exact location, extent, and sequence of treatment methods at individual sites would be based on site-specific characteristics and resource considerations. Alternative 4 uses the same approach to achieve desired stand density targets as in Alternative 1 (Section 2.3.1) to emulate historic tree stand densities.

Vegetation treatments would employ the VDT approach described in Section 2.1.3 to achieve the desired conditions and protect resource values. Multiple treatment methods would be employed that would adhere to the limitations and achieve the posttreatment targets summarized in Table 2-9.

Table 2-8 Treatment Methods Allowed in Each Planning Unit under Alternative 4

Planning Unit	Acres	Mechanical Treatments	Manual Treatments	Grapple Piling	Mastication	Prescribed Fire	Pile Burning	Herbicide Application	Reforestation	Hazard Tree Removal
General Forest-Westside	16,545	X	X	X	X	X	X	X		X
General Forest-Eastside	11,797	X	X	X	X	X	X	X		X
Mature Forest	25,654	X	X	X	X	X	X	X		X
Burned Areas	24,866	X	X	X	X	X	X	X	X	X
Shrub and Early Seral	11,435	X	X	X	X	X	X	X	X	X
PACs	37,712	Limited ¹	X	Limited ¹		X	X	X		X
CSO Territories	32,278	X	X	X	X	X	X	X		X
Wildlife Corridors	25,357	X	X	X	X	X	X	X		X
Bucks Lake Wilderness	4,585									
Feather River/ Eligible Recreational or Scenic Rivers	15,584	X	X	X	X	X	X			X
Feather River/ Eligible Wild Rivers	467		X			X	X			X
Fire Control Lines	4,483	X	X	X	X	X	X	X	X	X

Notes: PAC = Protected Activity Center. CSO = California spotted owl.

¹ Mechanical treatment could be used in PACs subject to limitations described in Sections 2.6.1.

Source: Compiled by Ascent Environmental in 2023. Updated 2024.

The location of planning units and subunits and potential treatment methods are shown in Appendix B.

Table 2-9 Alternative 4 Treatments for Planning Units and Subunits

Planning Unit	Planning Subunit	Average Number of Snags per Acre	Live dbh Limit ³	rSDI	Canopy Cover	Other Limitations
General Forest-Westside, Mature Forest, Burned Areas ⁴	WUI Defense Zone	0	<30 inches	23–28%	NA	See design features in Appendix A.
	Outside WUI Defense Zone	4				
General Forest-Eastside	WUI Defense Zone	0	<30 inches	23–28%	NA	See design features in Appendix A.
	Outside WUI Defense Zone	3				
PACs	Low- and moderate-productivity	4	<24 inches	NA	50–60%	Maintain at least 60% canopy cover in CWHR class 5D. No more than 100 acres of 4D would be reduced below 60% canopy cover. In 10-acre nest/roost sites, manual thin up to 6 inches dbh and maintain existing canopy cover. See design features in Appendix A.
	High-productivity	6	<10 inches	NA	No more than 5% less than existing and at least 50–60%	Manual thinning and prescribed fire only. Maintain at least 60% canopy cover in CWHR 5D. In 10-acre nest/roost sites, manual thin up to 6 inches dbh. In remainder of PAC, generally thin to 6 inches dbh with removal of material up to 10 inches dbh where needed to reduce ladder fuels. See design features in Appendix A.

³ Live dbh limits are intended to illustrate the difference in tree size removal limits among the various planning units. The Forest Plan Amendments provides exceptions, up to 40 inches, to the maximum live dbh trees that can be removed from each of the planning units under specific circumstances.

⁴ There would be no live dbh size limit for trees in burned areas. Probability of mortality guidelines (see Appendix B) would be followed.

Planning Unit	Planning Subunit	Average Number of Snags per Acre	Live dbh Limit ³	rSDI	Canopy Cover	Other Limitations
Territories (CSO)	Suitable Habitat Retention Areas	6	<30 inches	NA	At least 40%	Maintain at least 60% of the territory as suitable habitat where moist vegetation types and site conditions exist and at least 50% where dry vegetation types and site conditions exist. Exception: Territories in WUI defense maintain at least 40% of the territory as suitable habitat. Habitat is retained in priority of nesting, roosting, then foraging habitat. CWHR 5D in designated areas will be maintained with 60% canopy cover. See design features in Appendix A
	Other Areas	4	<30 inches	23-28%	NA	Subunits will be treated similarly to General and Mature Forest.
Wildlife Corridors		6	<30 inches	NA	At least 40%	Maintain at least 40% canopy cover where conditions exist, Maintain CWHR 5D with at least 60% canopy cover in designated units. See design features in Appendix A.
Shrub and Early Seral		4	<30 inches	NA	NA	The primary goal is reduction of fire hazard and increasing suppression efficiency, particularly within the WUI Defense Zone. Where both natural regeneration and existing plantations occur in these types, trees would be managed at densities allowing for greater drought resilience and reduced tree-to-tree fire spread.
Bucks Lake Wilderness		NA	No trees removed	NA	NA	No treatments are proposed.
Feather River and Eligible-Recreational or Scenic	CSO Territory	6	<30 inches	NA	At least 40%	Mechanical treatments would occur only to maintain or enhance use safety and scenic quality, protect special habitat, or prevent insect or disease epidemic.
	Non-Territory	4				

Planning Unit	Planning Subunit	Average Number of Snags per Acre	Live dbh Limit ³	rSDI	Canopy Cover	Other Limitations
Feather River and Eligible Wild		6	<10 inches	NA	NA	No mechanical treatments would be carried out.
Fire Control Lines		0	<30 inches	NA	0–10%	Continuous vegetation under 12 feet tall would be removed to create linear fire control features that do not provide horizontal fuel continuity across the landscape or act as a fire ladder into overstory vegetation.

Notes: CWHR = California Wildlife Habitat Relationship; dbh = diameter at breast height; HRCA = Home Range Core Area; NA = not applicable; PAC = Protected Activity Center; rSDI = relative Stand Density Index; WUI = wildland-urban interface.

2.6.3. Alternative 4 Forest Plan Amendment

Alternative 4 includes project-specific plan amendments to the Forest Plan. The existing Forest Plan specifies basal area and canopy cover requirements in mechanical thinning treatments in mature forest habitats (CWHR 4M, 4D, 5M, 5D) outside of WUI Defense Zones. The basal area and canopy cover requirements limit the ability to meet forest resiliency objectives (Safford and Stevens 2017; North et al. 2022). Further, recent research by Bernal et al (2022) supports a convergence between the characteristics of historic forest structure and that which future climatic conditions may favor, specifically low tree density, low live basal area, low biomass, and high pine dominance. This alternative proposes adopting strategies to both meet the purpose and need of this project to reduce fuel loads within the Project area to protect communities and critical infrastructure from wildfire and improve forest resiliency. Specifically, it would remove the requirements in Mature Forest areas outside of the WUI Defense Zone to retain at least 40 percent of the existing basal area and to reduce canopy cover by no more than 30 percent.

This alternative also shifts management approaches designed to retain CSO habitat from a HRCA configuration to a territory. A CSO territory is a 1,000-acre area that surrounds a CSO PAC and includes heterogeneous habitat that promotes CSO persistence. Territories provide a balance for short- and long-term needs of the species by encouraging active management that enhances mature forest habitat while reducing overall wildfire risk.

The existing Forest Plan specifies that limited treatment is permissible in PACs only when necessary to meet fuels objectives. However, the plan does not allow for treatments aimed at improving habitat resiliency; promoting fire-resilient, shade-intolerant conifers; or encouraging growth of large-diameter trees. The CSO Strategy recognizes the need to incorporate habitat restoration actions to maintain suitable habitat in the face of climate change and increasing high-severity wildfire risk (Forest Service 2019). The need to amend the Forest Plan (36 CFR 219.13[b][1]) is driven by the goals of this project combined with a need to perform treatments beyond fuels reduction to address habitat resiliency in PACs within the Project area. This alternative proposes adopting strategies to improve habitat resiliency while meeting the desired conditions related to community protection.

The proposed Project-specific amendments to the Forest Plan are based on regional guidance developed in collaboration with the USFWS that incorporates the CSO Strategy (Forest Service 2019) and recently published scientific information. The new components provide updated management recommendations that focus on maintaining high-quality spotted owl habitat through active management by increasing habitat resiliency across landscapes. Proposed changes include modifying, removing, and adding specific forest plan components to (1) improve forest resiliency in forest stands; (2) reduce immediate risk of large-scale disturbance and increase long-term resilience of California spotted owl habitat in PACs, thereby providing for the long-term sustainability of spotted owls and their habitat on the landscape; and (3) improve landscape resiliency to meet the objectives for protecting life and property and reducing fire hazards near communities while maintaining spotted owl habitat.

The proposed forest plan amendments would apply only to the Project area. The proposed Project-specific amendments are evaluated in this EA to assess their efficacy in meeting Project objectives (see Appendix C)

Substantive Provisions Directly Related to the Proposed Amendments

In accordance with 36 CFR 219.13, the Responsible Official has determined the following specific substantive requirement(s) within Sections 219.8 through 219.11 are directly related to the plan direction being added, modified, or removed by the proposed amendments:

- 36 CFR 219.8(a)(1) Sustainability, (a) Ecological Sustainability, (1) Ecosystem Integrity;
- 36 CFR 219.9(a)(1)(2) and (b) Diversity of Plant and Animal Communities, (a) Ecosystem Plan Components, (1) Ecosystem Integrity, (2) Ecosystem Diversity, and (b) Additional Species-Specific Plan Components; and
- 36 CFR 219.10(a)(1), (5), (7), and (8) Multiple Use, (a) Integrated Resource Management for Multiple Use, (1) Aesthetic values, cultural and heritage resources, ecosystem services, fish and wildlife species, forage, geologic features, grazing and rangelands, habitat and habitat connectivity, recreation settings and opportunities, riparian areas, scenery, soil, surface and subsurface water quality, timber, trails, vegetation, viewsheds, and other relevant resources and uses; (5) Habitat conditions, subject to the requirements of Section 219.9, for wildlife, fish, and plants commonly enjoyed and used by the public; for hunting, fishing, trapping, gathering, observing, subsistence, and other activities (in collaboration with federally recognized Tribes, Alaska Native Corporations, other Federal agencies, and State and local governments); (7) Reasonably foreseeable risks to ecological, social, and economic sustainability; and (8) System drivers, including dominant ecological processes, disturbance regimes, and stressors, such as natural succession, wildland fire, invasive species, and climate change; and the ability of the terrestrial and aquatic ecosystems on the plan area to adapt to change (Section 219.8).

2.7. No Action Alternative

The No Action Alternative serves as a baseline for comparison of environmental effects among the alternatives. Under this alternative, no action would be taken at this time to reduce the risk of wildfire to communities, infrastructure, and resources. Current ongoing activities, such as scheduled road maintenance, fire suppression, vegetation management and fuels projects with a decision or in the planning process, and recreation, would still occur in the Project area. However, new fuel and vegetation treatments designed to reduce the potential for extreme fire behavior in the WUI, modify fire behavior to a lower-intensity surface fire with reduced burn severity and crown fire potential, improve emergency egress, and create a more resilient forest structure and function would not occur. Because forest ecosystems are not static, conditions in the Project area would continue to change as a result of naturally occurring dynamic forces, such as forest succession and wildfires. The current existing condition of high fuel loading, diseased and overstocked stands, and hazardous fuels adjacent to local communities and homes, adjacent to critical infrastructure, and along evacuation routes would not be addressed under the No Action Alternative.

2.8. Design Features Common to All Alternatives

All the action alternatives include the same design features to protect resource values and minimize the adverse effects of the Project. These design features, which must be adhered to during Project implementation, include both (1) measures or constraints to ensure that compliance with laws, regulations, and policies is maintained and (2) additional measures and constraints, where necessary, that provide additional protection beyond what is already established by law, regulation, or policy. The design features are mandatory components of the action alternatives and are implicit

in Project design and execution; therefore, they are considered and evaluated as a part of the Project for the purpose of this analysis. A complete list of design features is included in Appendix A.

2.9. Comparison of Alternatives

This section provides a summary of each alternative. Table 2-2, above, summarizes key differences in treatment approaches among the alternatives. Comparisons of the maximum number of acres subject to each treatment method within the entire Project area, WUI Defense Zone, WUI Threat Zone, and outside the WUI are presented in Tables 2-10, 2-11, 2-12, and 2-13, respectively. It should be noted that the actual acres subject to each treatment would likely be less than shown here, because some portions of the Project area would be inaccessible, inappropriate for certain treatments, or not require treatment. Tables 2-14 and 2-15 compare the modeled post treatment flame length and crown fire classes under the 98th percentile weather conditions for each alternative as a way to demonstrate the relative effectiveness of each alternative in achieving desired conditions.

Table 2-10 Maximum Number of Acres That Could Be Subject to Each Treatment Method for Each Alternative

Treatment Method	No Action Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Mechanical, Manual, and Prescribed Fire Methods ¹	0	175,980	166,456	99,754	175,980
Manual Treatments and Prescribed Fire ²	0	31,682	41,205	97,280	31,682
Prescribed Fire Only	0	5,474	0	10,627	5,474
Herbicide Application ³	0	51,000	51,000	51,000	51,000
Not Treated ⁴	217,721	4,585	10,059	10,059	4,585
Total Project Area	217,721	217,721	217,721	217,721	217,721

¹ These areas could be subject to a combination of treatment methods, including mechanical thinning, mastication, grapple piling, manual thinning, pile burning, and/or prescribed fire.

² These areas could be subject to manual treatments, pile burning, and/or prescribed fire.

³ Acres eligible for herbicide treatment would also be subject to other treatment methods. Herbicide would be applied as needed within a subset of this area to control shrubs and invasive species.

⁴ Area proposed for no treatment include waterbodies, developed or unvegetated areas, rock outcroppings, roadways, and meadows.

Source: Compiled by Ascent Environmental in 2023.

Table 2-11 Maximum Number of Acres in the WUI Defense Zone That Could Be Subject to Each Treatment Method for Each Alternative

Defense Zone Treatment	No Action Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Mechanical, Manual, and Prescribed Fire Methods ¹	0	66,744	71,121	54,551	66,744
Manual Treatments and Prescribed Fire ²	0	12,251	7,875	19,681	12,251
Prescribed Fire Only	0	2,375	0	4,763	2,375
Not Treated	82,423	1,052	3,428	3,428	1,052
Total Defense Zone	82,423	82,423	82,423	82,423	82,423

Notes: WUI = wildland-urban interface.

¹ These areas could be subject to a combination of treatment methods, including mechanical thinning, mastication, grapple piling, manual thinning, pile burning, and/or prescribed fire.

² These areas could be subject to manual treatments, pile burning, and/prescribed fire.

Source: Compiled by Ascent Environmental in 2023.

Table 2-12 Maximum Number of Acres in the WUI Threat Zone That Could Be Subject to Each Treatment Method for Each Alternative

Threat Zone Treatment	No Action Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Mechanical, Manual, and Prescribed Fire Methods ¹	0	85,342	73,953	33,415	85,342
Manual Treatments and Prescribed Fire ²	0	15,064	26,453	61,459	15,064
Prescribed Fire Only	0	2,565	0	5,533	2,565
Not Treated	106,395	3,423	5,988	5,988	3,423
Total Threat Zone	106,395	106,395	106,395	106,395	106,395

Notes: WUI = wildland-urban interface.

¹ These areas could be subject to a combination of treatment methods, including mechanical thinning, mastication, grapple piling, manual thinning, pile burning, and/or prescribed fire.

² These areas could be subject to manual treatments, pile burning, and/or prescribed fire.

³Source: Compiled by Ascent Environmental in 2023.

Table 2-13 Maximum Number of Acres Outside of the WUI That Could Be Subject to Each Treatment Method for Each Alternative

Non-WUI Treatment	No Action Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Mechanical, Manual, and Prescribed Fire Methods ¹	0	23,893	21,382	11,789	23,893
Manual Treatments and Prescribed Fire ²	0	4,366	6,877	16,140	4,366
Prescribed Fire Only	0	533	0	331	533
Not Treated	28,902	109	643	643	109
Total Outside of WUI	28,902	28,902	28,902	28,902	28,902

¹ These areas could be subject to a combination of treatment methods, including mechanical thinning, mastication, grapple piling, manual thinning, pile burning, and/or prescribed fire.

² These areas could be subject to manual treatments, pile burning, and/or prescribed fire.

³Source: Compiled by Ascent Environmental in 2023.

Table 2-14 Percent of Project Area with Flame Lengths of less than Eight Feet after Treatment for Each Alternative

Class	No Action Alternative	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Flame Length: 0 – 8 feet	28%	90%	90%	48%	90%
Flame Length: > 8 feet	72%	10%	10%	52%	10%

Note: Posttreatment flame length was modeled under the 98th percentile weather conditions. See Section 3.1, “Fuels, Fire, and Forest Health,” for more information. Flame lengths in excess of eight feet substantially reduce the effectiveness of ground-based fire suppression.

Source: Compiled by Ascent Environmental in 2023.

Table 2-15 Percent of Project Area within Each Crown Fire Class after Treatment for Each Alternative

Class	No Action	Alternative 1	Alternative 2	Alternative 3	Alternative 4
No Fire	2%	2%	2%	2%	2%
Surface Fire	31%	90%	90%	53%	90%
Torching	37%	1%	1%	8%	1%
Crown Fire	30%	7%	7%	36%	7%

Note: Posttreatment crown fire classes were modeled under the 98th percentile weather conditions. See Section 3.1, “Fuels, Fire, and Forest Health,” for more information.

Source: Compiled by Ascent Environmental in 2023.

2.10. Alternatives Dismissed from Detailed Analysis

NEPA requires federal agencies to evaluate reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). The following alternatives were considered but eliminated from detailed study because they fail to adequately meet the purpose and need of the Project or are infeasible:

Prescribed-fire-only alternative: This alternative would have included only prescribed fire and pile burning as methods to reduce fuels accumulations and mimic a natural fire regime. This alternative was determined to be infeasible because of the length of time that would be needed to accomplish the project objectives. Utilizing prescribed fire alone to reduce fuel loads and restore historic stand structure takes multiple, repeated applications of fire with several years between fires to allow natural processes to take place. At the current rate of Rx fire use it would take 43 to 64 years to complete this approach. If Rx fire use rates were tripled to 30,000 acres/year it would still require roughly two decades to accomplish the project objectives. Some portions of the Project area include such heavy fuels that objectives could not be safely met without some initial mechanical or manual treatments to create conditions conducive to prescribed fire. This alternative was not evaluated in detail because it would be infeasible.

2001 SNFPA framework alternative: An alternative that adheres to the 2001 draft SNFPA was considered. However, the 2001 SNFPA framework was superseded by the adopted 2004 SNFPA, and PNF has no authority to implement the previous draft framework.

Limit cutting and removal of trees to 24 inches dbh in HRCAs: This alternative would limit the size of trees that could be removed in California spotted owl HRCAs to 24 inches dbh or less. This alternative was eliminated from study because it does not adequately meet the purpose and need of the Project to improve forest resilience to drought, insects, pathogens, and climate change. This alternative would not reduce the density of shade-tolerant species to the extent necessary to achieve desired conditions related to forest resilience.

Manual and prescribed fire-only alternative: This alternative would preclude mechanical thinning and instead rely solely on manual thinning and prescribed fire. This alternative would not meet the purpose and need of the Project. Manual thinning treatments do not appreciably improve forest health and resilience. Because of this manual treatments are generally effective for less than 10 years, even when maintained with prescribed fire, and require continued retreatment to deal with ongoing tree mortality resulting from prescribed fires, insects, drought, pathogens, and climate change related stressors. Mechanical thinning is needed in the areas identified under the action

alternatives to achieve desired conditions related to a reduction in the risk of catastrophic wildfire to communities, in particular in the WUI. Therefore, a manual treatment and prescribed fire only alternative was dismissed from detailed evaluation.

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3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

CEQ regulations direct agencies to succinctly describe the environment that may be affected by the alternatives under consideration (40 CFR Section 1502.15). This chapter describes the existing human and biological environments that have the potential to be affected by implementing the Project. The affected environment for each resource is described, followed by an evaluation of the potential effects of implementing the Project. Direct effects are caused by taking an action and occur at the same time and place as that action. Indirect effects are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable (i.e., likely to occur within the duration of the project).

Cumulative effects are the result of the incremental direct and indirect effects of any action when added to other past, present, and reasonably foreseeable future actions, and can result from individually minor but collectively significant actions taking place over a period of time. Impacts of past actions within the project area have been included in the affected environment sections for individual resources in Sections 3.1 through 3.9. Present and reasonably foreseeable future activities on private lands involve timber harvest and management. Present and reasonably foreseeable future activities on public lands include forest management and restoration projects within Plumas and Tahoe National Forests (Table 3-1).

Table 3-1 Cumulative Projects in the Project Vicinity

Project Name	Description	Project size (acres)	Location	Implementation Start Date
Region 5 Post-Disturbance Hazardous Tree Management Project	Hazard tree felling and removal to reduce public safety hazards along portions of certain roads, trails and facilities within nine national forests.	Not available	Forest Service Region 5 Inyo, Klamath, Lassen, Mendocino, Six Rivers, Plumas, Sequoia, Shasta Trinity, and Sierra National Forests	Jul-22
North Yuba Landscape Resilience	Fuels Treatments in areas where existing conditions triggered a need to reduce fuel loading, reduce stand densities, promote large trees, create heterogeneous stand structures, and promote tree species composition aligned with an active fire regime. Vegetation and fuels management treatments proposed include prescribed fire, thinning from below, variable density thinning, creation of 1- to 3-acre openings, strategic tree planting, and sanitation and stand improvement.	146,037	Tahoe National Forest	Apr-22
North Quincy Wildfire Resilience Project	This project would implement fuels reduction and forest restoration treatments across the norther portion of American Valley. The intent is to protect values at risk near the community of Quincy.	8,800	Plumas National Forest Mt. Hough Ranger District	Aug-23
Community Protection - Eastside Project	Use forest fuels treatments to reduce risk of wildfire impacts to communities and critical infrastructure, within Eastside communities with moderate-, high-, or very high-risk wildfire hazard potential.	57,818	Plumas National Forest Beckwourth Ranger District	Aug-23

Project Name	Description	Project size (acres)	Location	Implementation Start Date
PSW Post-Fire Meadow Restoration	Meadow restoration and habitat improvement of McRae Meadows and Middle Creek, both with incised channels and headcuts that rapidly drain the floodplains. Restoration involves instream structures built from natural materials from sites.	43	Plumas National Forest Mt. Hough and Beckwourth Ranger Districts	Aug-22
Goodwin Ranch	A private entity, Goodwin Ranch Inc. will conduct post-fire vegetation management treatments.	Not available	Private land near Beckwourth Ranger District	
Feather Falls Post-Fire Project	To accomplish restoration, FRRD proposes to abate hazard trees, yard trees, salvage cut, hand-cut-and-pile brush, burn piles, plant trees in the ground, masticate brush, prune, dig fire-lines by hand, and replace and repair recreation facilities.	250	Plumas National Forest Feather River Ranger District	Jul-22
Feather Falls Restoration and Resilience Project	Fuels management, reforestation, invasive plant treatments, and TEK implementation.	2,800	Plumas National Forest Feather River Ranger District	Oct-22
French Creek I Hazardous Fuels Reduction	The French Creek I project proposes to reduce hazardous fuels and stand density through commercial and pre-commercial thinning, mastication of brush and prescribed burning using GTR-220 and 237 methods. The project will treat no more than 3,000 acres	3,000	Plumas National Forest Feather River Ranger District. Ten miles north of Berry Creek	Oct-22
Claremont Forest Resiliency Project	This Project is approximately 30,180 acres located near Quincy, CA and will improve forest health, reduce fuels around the wildland urban interface of Quincy and Meadow Valley, treat invasive weeds, and reduce road impacts.	30,180	Plumas National Forest Mt. Hough Ranger District. From Meadow Valley to Quincy to La Porte Road	Apr-23

Project Name	Description	Project size (acres)	Location	Implementation Start Date
Dixie Fire Residential Hazard Tree Removal	The Dixie Fire impacted homes and communities on the Plumas National Forest. This project will remove fire killed hazard trees along adjacent private property where those trees could fall and impact structures.	20	Plumas National Forest Mt. Hough Ranger District. Multiple locations	Aug-22
Butterfly Twain Fuels Reduction and Landscape Restoration Project	Mechanical thinning, grapple piling, mastication, hand thinning, prescribed fire, herbicide application, and dam reconstruction. This project also proposes to decommission system roads, close and/or obliterate non-system roads, reconstruct roads to facilitate fuels and silviculture activities, improve drainage features, and construct or reconstruct and subsequently obliterate temporary roads.	4,642	Plumas National Forest Mt. Hough Ranger District	Sep-17
North Fork Forest Recovery Project	The project has two purposes: 1) Community Protection and Strategic Fire Management, and 2) Forest and Watershed Health and Resilience. The project would authorize prescribed fire, variable density thinning, fuels reduction, hazard tree removal, reforestation, invasive species management, stream and meadow improvements, transportation system maintenance and improvements, and herbicide treatments.	166,889	Plumas National Forest Mt. Hough Ranger District	Mar-25
Tributaries Forest Recovery Project	The intent of this project is to reduce fuel loads to improve forest resilience and initiate conifer regeneration, establish shaded fuel breaks; restore riparian corridors and meadows; enhance recovery of ecological processes, habitats, and specific species; protect cultural resources; and control invasive species.	163,248	Plumas National Forest Beckwourth and Mt. Hough Ranger Districts	Jul-24

3.1. Fuels, Fire, and Forest Resilience

3.1.1. Introduction

This section describes historic fire and land management practices; recent fire history; and the effects of the alternatives on potential fire behavior (flame length), fire type (surface fire, crown fire), and forest health under the Project.

3.1.2. Current Management Direction

Although the current federal management direction with respect to wildfire is suppression, infrequently, wildfires managed for resource benefits have been conducted for beneficial use in national forests over the last 5 years. Over the past 30 years, however, the PNF has regularly used prescribed fire, pile burning, manual (hand) treatments, mechanical thinning, and mastication to manage fuels, forest structure, and composition in the Plumas National Forest.

The Project is designed to fulfill the management direction specified in the National Forest Management Act of 1976, the 1988 LRMP, and the 2004 Record of Decision on the SNFPA final supplemental EIS. Fuel and vegetation management activities under the Project would comply with the standards and guidelines described in the 2004 Record of Decision on the SNFPA final supplemental EIS, except where specific standards and guidelines are proposed for amendment as described in Chapter 2. Implementation of the Project, in combination with other past projects on the Plumas National Forest and adjacent private lands, would aid in the implementation of the Plumas County Communities Wildfire Protection Plan (CWPP) (PCFSC 2019) and the Plumas County Hazardous Fuel Assessment Strategy (Callenberger and Lunder 2006). The Plumas County CWPP was approved by the Plumas County Board of Supervisors on April 19, 2005, and Amended and approved by the Plumas County Office of Emergency Services on September 25, 2019.

3.1.3. Affected Environment

Communities at Risk

The Project area covers portions of Plumas, Yuba, Butte, and Sierra Counties. The Plumas County Fire Safe Council has identified geographic areas containing communities at risk from wildfire. Within or near the Project area, these communities include Portola/Beckwourth, Mohawk Valley, Johnsville, Eureka Ridge Estates, Cromberg, Greenhorn, Spring Garden, Cutler, Massack, Quincy, Keddie, Meadow Valley, Bucks Lake, Faggs Ranch, South Fork, Little Grass Valley, Camel, Slate, and American House (PCFSC 2019). In Yuba and Butte Counties, several Communities are at risk within or near the Project area, including the communities of Challenge, Strawberry Valley, Concow, Feather Falls, Forbestown, and Clipper Mills (CAL FIRE, 2023). These communities have schools, community centers, water systems, critical infrastructure, business districts, and homes. Since 2018, nearly all of these communities have been directly threatened by wildfire and been issued either an evacuation warning or a mandatory evacuation order related to recent wildfires, including the Minerva Fire (2017), Camp Fire (2018) North Complex Fire (2020), Beckwourth Complex Fire (2021), and Dixie Fire (2021). Some communities, including Bucks Lake and Meadow Valley, were evacuated for more than 4 weeks, requiring residents, families, livestock, and family pets to be relocated to temporary shelters, hotels, cars, campgrounds, or the homes of friends or local community members who helped house fire evacuees.

Fire History

Wildfires ignited by both lightning and historically indigenous peoples have been an integral ecological process across the Plumas National Forest and the Project area for millennia. The behavior, effects, and impacts of wildfires across the Sierra Nevada and in this region have changed dramatically since the Gold Rush and more recently as fuels and fire behavior have been affected by climate change in the 21st century, resulting in several megafires in the Sierra Nevada region (Steel et al. 2022).

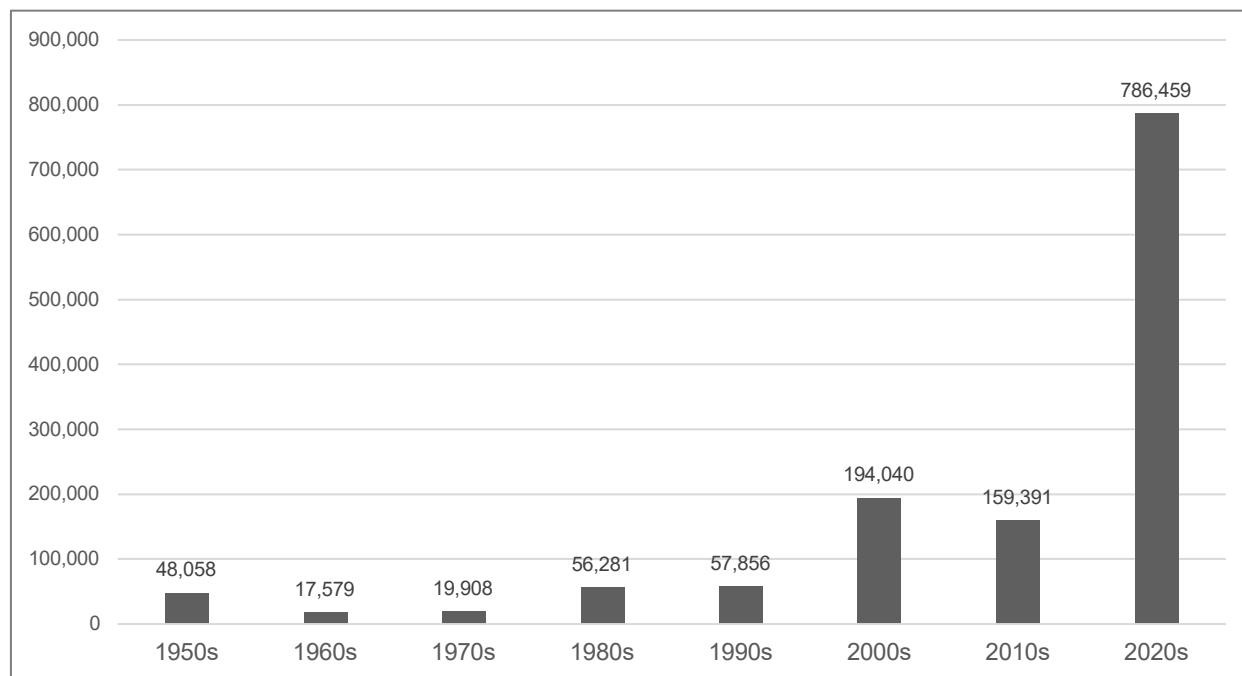
The Project area includes dominant vegetation types of Eastside pine and Sierran mixed conifer on Beckwourth Ranger District; Sierran mixed conifer, red fir, and montane chaparral on the Mount Hough and Feather River Ranger Districts; and mixed hardwood-conifer types, predominantly on the Feather River Ranger District. Red fir, aspen, lodgepole pine, and montane meadows also occur within the project area. These vegetation types historically experienced frequent fires until the Gold Rush Era (Markwith and Paudel 2022), when indigenous burning and fuel wood gathering practices were disrupted by settlers and further affected in the early 20th century, when there was effective suppression of lightning-caused fires (Moody and Stephens 2002). Before effective fire exclusion, the average number of years between fires in the mixed conifer forests within the east Quincy region of the Project area was reported as 8–14 years (Moody et al. 2006). Samples taken near Portola indicate an average fire return interval of 9–17 years (Moody et al. 2006). This fire history includes both fires ignited by the Maidu and lightning-caused fires. In higher-elevation red and white fir–dominated forests present in the Bucks Lake area, the average number of years between fires has been reported as 33.8 years (Beaty and Taylor 2001).

Before fire exclusion and intensive timber harvesting in the early to mid-20th century, the relatively frequent occurrence of fires generally contributed to open stands dominated by large-diameter, fire-resistant trees with relatively low surface fuel loads interspersed with areas of young seral stands (Weatherspoon 1996, Forest Service 2023). In 1902, John Leiberg traversed an area from north Lake Tahoe through Quincy and through the region along the Quincy Oroville Highway. He mapped forest cover and described the surface fuels in similar unharvested forests on the Plumas National Forest as follows: “There is no humus; the forest floor is bare, or at the most is covered with a layer of pine needles rarely exceeding 2 inches in depth, most commonly an inch or less” (Leiberg 1902).

Given the spatial and temporal extent of past fires, well documented in scientific literature (Taylor 2000; Moody et al. 2006; Skinner and Chang 1996), this type of surface fuel loading would have been much more common before fire exclusion than the ubiquitous high surface fuel loading found today in areas that have not experienced prescribed fire, wildfire, or other fuel treatments. Overall, the historical vegetation structure, species composition, and surface fuels reflected, in part, past fire regimes, as well as both the land management practices of the Maidu (Anderson 2005) and the land uses of the thousands of settlers who moved to the Plumas, Yuba, and Butte County regions after the Gold Rush (Young 2003).

Recent Wildfires

The total number of acres burned per decade has steadily increased on the Plumas National Forest since the 1970s (Figure 3.1-1), with dramatic increases in high-severity fire over the last 25 years, a trend seen across the Sierra Nevada and Cascade Range (Steel et al. 2022). In 2017, an arsonist ignited the Minerva Fire, which burned 4,310 acres (CAL FIRE 2017), directly threatening the town of Quincy and its primary water supply infrastructure and watershed lands immediately south of town.



¹ Some burned areas overlap.

Source: CAL FIRE 2021.

Figure 3.1-1 Total Number of Acres Burned by Decade on the Plumas National Forest

Since 2018, the Plumas National Forest has experienced some of the most deadly and damaging wildfires in California. These include the 2018 Camp Fire, ignited by a utility line, which burned 153,000 acres, including the town of Paradise, killing 85 people, and destroying more than 18,000 structures (CAL FIRE 2018, Forest Service 2023). The Camp Fire resulted in more than \$26 billion in insured and uninsured losses and cleanup costs (Troy et al. 2022a, 2022b). The majority of the Camp Fire damage occurred during fewer than 48 hours in early November. In 2019, the Walker Fire ignited in the WUI of Genesee Valley, burning more than 59,000 acres, and although no structures were lost, the fire burned much of the green forest remaining along Indian Creek with high severity effects to vegetation (Table 3.1-1). In 2020, lightning ignited the North Complex and Sheep Fires. The Sheep Fire burned over 29,000 acres, destroying 29 structures north of the project area. The North Complex Fires nearly destroyed residences along the Quincy La Porte Road and made an unprecedented wind-driven run from the area south of Bucks Lake to Lake Oroville. On that run, the fire destroyed the town of Berry Creek, killing 16 people; destroying 2,500 structures at Berry Creek, Feather Falls, and Oroville; and burning 319,000 acres in a single burning period (Forest Service 2023). The town of Berry Creek, with 1,200 residents, was completely destroyed, with only a few houses left standing after the fire burned through this small community. In 2021, the Beckwourth Complex were ignited by lightning. The Sugar Fire (part of Beckwourth Complex) burned 105,607 acres, including structures, in Doyle.

Table 3.1-1 Recent (2018–2024) Large Fires and Resulting Percent of Basal Area Mortality, a Measure of Fire Severity

Fire Name	Fire Year	Unchanged 0% Basal Area Mortality (acres)	Low >0- 25% Basal Area Mortality (acres)	Moderate >25-75% Basal Area Mortality (acres)	High >75% Basal Area Mortality (acres)	Unmappable Acres	Total Acres
Camp Fire	2018	47,913	45,314	27,619	33,109	0	153,955
Walker Fire	2019	11,946	10,003	7,919	29,449	0	59,317
North Complex	2020	52,191	46,871	37,070	183,282	0	319,414
Beckwourth Complex	2021	6,904	13,590	16,701	70,508	1,376	109,079
Dixie Fire	2021	194,742	170,263	133,254	479,576	5,600	983,435
Total Acres		313,696	286,041	222,563	795,924	6,976	1,625,200
Percent of Total Acres		19%	18%	14%	49%	<1%	100%

Source: USFS 2024.

In 2021, the Dixie Fire ignited in the Feather River Canyon, burning almost 1,000,000 acres, destroying 1,329 structures. The communities of Indian Falls, Canyon Dam, and Greenville were almost completely destroyed. Since 2018, nearly 800,000 acres have burned at high severity (Table 3.1-1), with the majority of that high-severity fire occurring on the Plumas National Forest. These high-severity burn areas are trending to reburn with relatively higher frequency and severity than areas that were not burned at high severity (Lydersen et al. 2019). The impacts of these fires go beyond the documented fatalities, structure losses, and deforestation. A community may require decades to recover from wildfires of this magnitude, which can create or exacerbate mental health problems, substance abuse, and poverty, particularly for the elderly, economically disadvantaged groups, and the uninsured. Fire recovery can reduce business opportunities and property tax revenues, in turn affecting all public services, including education, law enforcement, and community health services (Troy et al. 2022a).

Forest Management History and Resulting Contemporary Forest Structure

The past management history of the Project area has strongly influenced stand structure, species composition, fuel loads, and potential fire behavior at both stand and landscape levels. At the landscape level, past management activities have had a marked effect on forest structure and potential fire behavior. As a result of these past management activities, trees and forest stands across the Sierra Nevada have been described as “generally younger, denser, smaller in diameter, and more homogeneous” (McKelvey et al. 1996, Forest Service 2023); this condition is typical of forests in the Project area. As with many areas in the Sierra Nevada, the landscape in this Project area has been heavily influenced over the last 150 years by mining; grazing; timber harvesting; fire exclusion; large, high-severity fires (Young 2003; Beesley 1996); and more recent drought-related mortality (Restaino et al. 2019; Guarin and Taylor 2005).

Past harvest activities on the Project area landscape were focused primarily on overstory removal and sanitation or salvage harvest, with a shift toward even-aged forest management systems in the 1980s. Past use of these harvest systems is consistent with well-documented overall management practices that occurred over vast areas of the Sierra Nevada during the 20th century (UC 1996; Leiberg 1902).

3.1.4. Analytical Approach

Measurement Indicators

The measurement indicators for potential treatment effects on fire behavior and severity are (1) flame length and (2) fire type, modeled under 90th and 98th percentile weather conditions (i.e., fire weather conditions that would be surpassed 10 and 2 percent of the time, respectively). These indicators are described below.

Flame Length

The length of flame is measured in feet. Increased flame lengths can increase resistance to control, generally defined as “the relative difficulty of constructing and holding a control line as affected by resistance to line construction and by fire behavior” (Page et al. 2013). Higher flame lengths increase the likelihood of torching events and crown fires. Flame length is influenced in part by fuel type, potential for crown fire, and weather conditions. Fuel type and crown fire potential, in turn, influence the rates at which fire lines can be constructed by different fire resources, including hand crews and mechanical equipment (Table 3.1-2). Post-treatment desired conditions for this project are shown as fuel model 9 “representative of pine litter”, while fuel models 5, 10, and 11 represent a range of existing fuel accumulations within the project area. As shown in Table 3.1-3, flame lengths similar to the desired conditions for the Project can result in more than a 400-percent increase in the rate of fire line construction compared to untreated fuel accumulation, with at least a fourfold increase in fire line creation shown for fuel model 9 as compared to fuel model 10, “natural fuel accumulation”.

Table 3.1-2 Sustained Line Production Rates for Common Fuel Models in the Project Area

Fuel Model (Rothermel 1983)	Type I^a (chains [66 feet] per hour)	Type II^a (chains [66 feet] per hour)	Type II Dozer^{b,c} (chains [66 feet] per hour)
5–brush	6	4	105
9–representative of pine litter	28	16	85
10–timber (natural fuel accumulation)	6	4	20
11–logging slash, light	15	9	40

Notes: Fuel model 9 is similar to posttreatment desired conditions.

a Type I and Type II consist of 20-person crews.

b A Type II dozer is stationed at Mount Hough Ranger District.

c A Type II bulldozer is used for construction, burnout, and holding and is used on 26- to 40-percent slopes.

Flame lengths above 4 feet will present serious control problems. They are too dangerous to be directly contained by hand crews (NWCG 2004). Flame lengths over 8 feet are generally not controllable by ground-based equipment or aerial retardant and present serious control problems, including torching, crowning, and spotting (Table 3.1-3).

Table 3.1-3 Relationship between Flame Length and Potential for Success of Active Suppression

Flame Length	Description
Less than 4 feet	Fires can generally be attacked at the head or flanks by firefighters using hand tools. A hand line should hold the fire.
4–8 feet	Fires are too intense for direct attack at the head with hand tools. A hand line cannot be relied on to hold the fire. Bulldozers, engines, and retardant drops can be effective.
8–11 feet	Fire may present serious control problems: torching, crowning, and spotting. Control efforts at the head will probably be ineffective.
Greater than 11 feet	Crowing, spotting, and major fire runs are probable. Control efforts at the head of the fire are ineffective.

Source: NWCG 2004.

Fire Type

Fire type reflects the type of fire (surface or crown fire) as predicted by the software FlamMap (Finney et al. 2005). Crown fire includes both active and passive crown fire (Stratton 2004). Fire type will affect the difficulty of controlling a fire, firefighter and public safety, and fire-related tree damage and mortality. Generally, it is more difficult and more expensive to safely contain crown fires because they tend to lead to more tree damage than surface fires. Surface fires with flame lengths less than 4 feet are easier to safely contain by hand crews and result in less tree damage than a crown fire (Table 3.1-3). For this reason, surface fires with flame lengths less than 4 feet within treated stands are the desired posttreatment condition.

Relative Stand Density

The concept of stand density index was first developed for even-aged stands by Reinecke (1933) to compare “the density of stocking of various stands.” The relative density concept describes a stand’s density relative to the maximum possible density and may serve as a proxy for a stand density relative to its carrying capacity. In general, the concept of stand density as a measure has been further developed for forest management applications for both even-aged and uneven-aged stands (Helms and Tappeiner 1996; Woodall et al. 2002).

A relative density of between 55 and 60 percent has been described as the lower limit of the “Zone of Imminent Competition Mortality” above which trees begin to die because of competition-related stress (Jack and Long 1996). Fifty five percent relative density was used as a conservative measure of the onset of competition-related mortality because stress induced by competition increases tree susceptibility to drought, insects, disease, and fire. This threshold serves as an appropriate measure for forest health because stands managed below this threshold are less likely to incur mortality as a result of the agents mentioned above. The desired relative densities immediately post treatment are between 23 and 28 percent, which is consistent with stand densities quantified in 1911, which facilitated low tree to tree competition and related mortality (North et al. 2022). These levels are substantially below the 55-percent threshold of imminent competition mortality. Treatments that achieve the desired range should maintain forest health for at least 20–30 years before reaching densities at which competition mortality is expected to occur, particularly with ongoing prescribed fire or other maintenance treatments.

Methods and Assumptions

The following analytical methods and assumptions informed the analysis of the alternatives.

Fire Weather

Fire behavior was assessed under the 90th and 98th percentile fire weather conditions using local data from Plumas Remote Automated Weather Stations (RAWS). Percentile weather was computed using Fire Family Plus (Main et al. 1990) for the years 2003–2022 for June 15–October 15, reflecting contemporary fire weather as influenced by climate change. Percentile weather is shown in Table 3.1-4.

Table 3.1-4 90th and 98th Percentile Weather Scenarios Calculated from Local Plumas National Forest RAWS Stations

Data Years	Percentile	1-hour	10-hour	100-hour	Herbaceous	Woody	Wind Speed (mph)	Wind Direction	Gust Speed (mph)
Fuel Moisture Percent									
2003–2022	90th	2.4	3.1	5.4	8.7	66.3	9.1	SW	20.4
2003–2022	98th	2.0	2.7	4.8	3.9	65.7	10.4	SW	23.1

Source: Calculated by Spatial Informatics Group from data from Plumas Remote Access Weather Stations.

Fire Modeling

The software FlamMap (Finney et al. 2005) was used to predict current condition and post treatment flame length and fire type (surface or crown fire) spatially at a landscape scale. FlamMap has been used to assess landscape-level fire hazard in published studies (Stratton 2004). It is important to note that results were based on outputs of an empirical fire model. The output data reflect fire modeling assumptions (weather, fuel model characteristics, and spatial variability) and variability within the Forest Inventory Analysis plots. Weather data used in fire modeling were obtained from the local RAWS weather stations, which are located in the analysis area. Gridded winds (Butler et al. 2004), which generate spatially explicit wind speeds based on local topography, were used for modeling in FlamMap. Gridded winds assume an approximately 10-mile-per-hour 20-foot ridgetop wind speed. Dead fuel moistures were adjusted in FlamMap based on the topography, shading, weather, and conditioning period length (Finney et al. 2005).

3.1.5. Environmental Consequences

Direct and Indirect Effects

No Action Alternative

Under the No Action Alternative, flame lengths would generally be at least 12–25 feet under 90th and 98th percentile weather conditions in more than 54 percent of the area in the Defense and Threat Zones. Fire management’s ability to safely suppress and contain fires, both in initial attack and during extended fire suppression operations, would not be improved and would continue to decline over time from current conditions as future fuel accumulation and mortality occur.

The current predicted fire behavior and the dominant fire type (torching and crown fire) would lead to high tree mortality in forested areas in the Project area during a wildfire, including in general forest, riparian areas, California spotted owl and northern goshawk Protected Activity Centers (PACs), and California spotted owl Home Range Core Areas (HRCAs). Fire behavior and postfire effects experienced during both the Dixie Fire and the North Complex fires would be expected under similar wind and weather conditions across forest areas in the Project area.

Predicted fire behavior would likely lead to future evacuations of local communities at risk, as well as potential loss of human life and loss or degradation of structures, infrastructure, and resources.

Under the No Action Alternative, stand densities would remain at a high density, and tree mortality related to drought, insects, and disease would be expected to continue into the future. Species composition would be expected to continue to shift toward shade-tolerant species, including fir and cedar species. The landscape would continue to be dominated by mid-seral closed-canopy forests, resulting in a homogeneous landscape with an increased susceptibility to large-scale drought, insects and diseases, and fires with high tree mortality.

Existing stand conditions in the Project area would persist and develop unaltered by active management, with the exception of continued fire suppression activities. Wildfire, drought, disease, and insect-related mortality and recruitment would continue to occur. Stands would remain dense, particularly in the smaller-diameter classes in terms of trees per acre and basal area. High stand densities and heavy surface, ladder, and canopy fuels would not be modified from existing conditions. These conditions can facilitate fire behavior and effects similar to those seen in the 2020 North Complex fires and 2021 Dixie Fire, which both burned in forests immediately adjacent to the Project area.

The current canopy cover can reduce retardant penetration through tree crowns to surface fuels. A high percentage of retardant is intercepted by tree crowns before it reaches the ground, which makes the use of retardant less effective for suppressing and holding fires burning through surface fuels (Alexander 2000). This decreased penetration of retardant in untreated stands, and the contrasting penetration in an adjacent treated area, was witnessed on the Bell Fire on the Plumas National Forest in September 2005 (Moghaddas and Craggs 2007). In addition, the use of aerial retardant is generally less effective at suppressing crown fires or fires with high flame lengths. These factors greatly hinder the overall ability of fire managers to safely suppress and contain fires, leading to increased suppression intensity and cost. This increased suppression intensity can lead to a greater potential for community, infrastructure, and resource damage during the fire and long-term hazard tree removal and reforestation costs.

More than 60 percent of the area in the Defense and Threat Zones has modeled flame lengths exceeding 12 feet, and most of this area has modeled flame lengths exceeding 25 feet under 98th percentile weather conditions (Tables 3.1-5 through 3.1-8; Appendix D). Under 90th percentile weather conditions, the area estimated to have flame lengths exceeding 25 feet decreases by 5 percent but remains in more than 54 percent of the area in the Defense and Threat Zones. These trends are reflected in the modeled fire type, with 67 percent of the Project area, including most of the area in the Defense and Threat Zones, being susceptible to torching and crown fire. These fire types and flame lengths pose a danger to firefighters working to control fires in the WUI, increase the potential of fire spread through spotting, and can result in areas of high fire severity (tree mortality) after a fire. The area susceptible to torching and crown fire (67 percent) is consistent with postfire conditions quantified on fires reported since 2018, including the Dixie and Sugar Fires, that occurred under similar weather conditions.

Table 3.1-5 No Action Alternative Acres and Percentage by Flame Length Categories Modeled under 98th Percentile Weather Conditions for the Defense, Threat, and Non-WUI Areas of the Project Area

Flame Length Categories	0 feet		1–4 feet		4–8 feet		8–12 feet		12–25 feet		>25 feet		Total Sum of Acres	Total % Total Acres
WUI	Sum of Acres	% Total Acres	Sum of Acres	% Total Acres	Sum of Acres	% Total Acres	Sum of Acres	% Total Acres	Sum of Acres	% Total Acres	Sum of Acres	% Total Acres		
Defense Zone	5,245	2%	13,740	6%	4,879	2%	3,818	2%	8,301	4%	46,425	21%	82,409	38%
Defense Zone - Evacuation Route	387	<1%	184	<1%	162	<1%	122	0%	222	<1%	603	<1%	1,680	1%
Threat Zone	4,571	2%	15,941	7%	4,497	2%	3,186	1%	9,160	4%	69,040	32%	106,395	49%
Outside WUI	786	<1%	9,765	5%	1,739	1%	733	<1%	2,341	1%	11,026	5%	26,390	12%
Grand Total	10,989	5%	39,630	18%	11,277	5%	7,859	4%	20,024	9%	127,094	59%	216,873	100%

Note: WUI = wildland-urban interface.

Source: Spatial Informatics Group 2022.

Table 3.1-6 No Action Alternative Acres and Percentage by Flame Length Categories Modeled under 90th Percentile Weather Conditions for the Defense, Threat, and Non-WUI Areas of the Project Area

Flame Length Categories	0 feet		1–4 feet		4–8 feet		8–12 feet		12–25 feet		>25 feet		Total Sum of Acres	Total % of Total Acres
WUI	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres		
Defense Zone	5,616	3%	14,712	7%	6,159	3%	4,338	2%	9,816	5%	41,768	19%	82,409	38%
Defense Zone - Evacuation Route	403	<1%	221	<1%	191	<1%	120	<1%	232	<1%	513	<1%	1,680	1%
Threat Zone	4,935	2%	17,642	8%	5,043	2%	4,091	2%	10,562	5%	64,122	30%	106,395	49%
Outside WUI	916	<1%	10,522	5%	1,599	1%	890	<1%	2,701	1%	9,762	5%	26,390	12%
Grand Total	11,870	5%	43,096	20%	12,992	6%	9,438	4%	23,311	11%	116,165	54%	216,873	100%

Note: WUI = wildland-urban interface.

Source: Spatial Informatics Group 2022.

Table 3.1-7 No Action Alternative Acres and Percentage by Fire Type (Nonburnable, Surface Fire, Crown Fire) Categories Modeled under 98th Percentile Weather Conditions for the Defense, Threat, and Non-WUI Areas of the Project Area

Fire Type	Non-burnable		Surface Fire		Torching		Crown Fire		Total Sum of Acres	Total % of Total Acres
WUI	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres		
Defense Zone	2,229	1%	26,360	12%	32,885	15%	20,948	10%	82,423	38%
Defense Zone - Evacuation Route	246	<1%	527	<1%	630	<1%	276	<1%	1,680	1%
Threat Zone	1,583	1%	27,571	13%	38,552	18%	38,688	18%	106,395	49%
Outside WUI	99	<1%	12,543	6%	8,625	4%	5,123	2%	26,390	12%
Grand Total	4,158	2%	67,001	31%	80,693	37%	65,035	30%	216,887	100%

Note: WUI = wildland-urban interface.

Source: Spatial Informatics Group 2022.

Table 3.1-8 No Action Alternative Acres and Percentage by Fire Type (Nonburnable, Surface Fire, Crown Fire) Categories Modeled under 90th Percentile Weather Conditions for the Defense, Threat, and Non-WUI Areas of the Project Area

Fire Type	Non-burnable		Surface Fire		Torching		Crown Fire		Total Sum of Acres	Total % of Total Acres
WUI	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres		
Defense Zone	2,229	1%	28,042	13%	37,825	17%	14,327	7%	82,423	38%
Defense Zone - Evacuation Route	246	<1%	573	<1%	671	<1%	190	<1%	1,680	1%
Threat Zone	1,583	1%	29,572	14%	45,945	21%	29,294	14%	106,395	49%
Outside WUI	99	<1%	13,242	6%	9,332	4%	3,717	2%	26,390	12%
Grand Total	4,158	2%	71,429	33%	93,773	43%	47,527	22%	216,887	100%

Note: WUI = wildland-urban interface.

Source: Spatial Informatics Group 2022.

Most of the burn area classified as having 50–75 percent or 75–100 percent basal area mortality occurred in these areas (USDA 2022), and these areas posed control problems to firefighters for weeks. After a wildfire, high-severity burned areas with dead trees interspersed with human development pose a long-term hazard tree issue (Troy et al. 2022b); pose a snag threat to firefighters (Riley et al. 2022); and increase the potential for communities to be exposed to a more frequent, high-severity shrub fire regime over time as forests are converted to shrubs (Lydersen et al. 2019).

The No Action Alternative would not facilitate low-density reforestation in areas deforested by previous wildfires, not allow more effective shrub control in established fuel treatments and plantations, nor reduce future hazard tree risk along roads and private-public property lines.

Alternative 1: Vegetation Treatments to Protect Communities and Achieve Landscape Resilience

Under Alternative 1, flame lengths would generally be less than 4 feet under 90th and 98th percentile weather conditions in more than 80–83 percent of the area in the Defense and Threat Zones (Table 3.1-9 and 3.1-10; Appendix D). Fire management’s ability to safely suppress and contain fires, both in initial attack and during extended fire suppression operations, would be substantially improved from current conditions.

The reduced predicted fire behavior and the dominant fire type (surface fire) would lead to reduced tree mortality in forested areas in the Project area, including in treated areas of general forest, riparian zones, PACs, and HRCAs. Reduced predicted fire behavior would potentially facilitate safer future evacuations of local communities at risk and reduce the risk to structures, infrastructure, and resources.

Under this alternative, high stand densities would be reduced, and future tree mortality related to drought, insects, and disease would be expected to be reduced from current conditions. Existing stand conditions in the Project area would be modified by active management that would reduce surface, ladder, and crown fuels using common fuel reduction treatments, including mechanical thinning, manual treatments, mastication, pile burning, and prescribed fire. These commonly used treatments have been shown to reduce flame lengths and burn severity both under modeled conditions and in real wildfires (Moghaddas et al. 2018). Fuel treatments may better protect residual forest carbon stocks (Stephens et al. 2012) and reduce potential future wildfire emissions (Vaillant et al. 2013). Wildfire-, drought-, disease-, and insect-related mortality and recruitment would be reduced (Restaino et al. 2019). In a recent study, researchers found that forest thinning treatments were effective in reducing drought-related tree mortality during the 2012-2016 severe drought (Restaino et al. 2019).

With implementation of Alternative 1, 80 percent of the area in the Defense and Threat Zones would have modeled flame lengths under 4 feet under 98th percentile weather conditions (Table 3.1-9; Appendix D). Under 90th percentile weather conditions, the area estimated to have flame lengths under 4 feet increases by 4 percent, to 83 percent of the area in the Defense and Threat Zones (Table 3.1-10; Appendix D). These trends are reflected in the modeled fire type, with 90 percent of the Project area, including most of the area in the Defense and Threat Zones, being susceptible to surface fire, rather than crown fire or torching, under 98th percentile weather conditions (Tables 3.1-11 and 3.1-12; Appendix D). These reduced flame lengths and less severe fire types would improve firefighters’ ability to manage future wildfires and prescribed fires within the WUI, and would allow greater flexibility in managing future wildfires in the backcountry.

Alternative 1 proposes allowing the use of prescribed fire in the Bucks Lake Wilderness. The use of prescribed fire in the Bucks Lake Wilderness would allow more effective reduction of naturally accumulated fuels and fuels accumulated after recent and future wildfires, when integrated with the current allowed “jackpot burning” of down or otherwise piled woody debris. Prescribed fire within the Bucks Lake Wilderness would be implemented under an approved Burn Plan and Smoke Management Plan, within current prescribed fire-relevant policies and procedures. Where safe and feasible, natural barriers to fire spread, such as rock fields, water features, or other barren areas, would be used for burn unit containment lines. These natural barriers may be linked with constructed handline, as needed to allow complete and effective containment of burn units.

As with Alternatives 2 and 3, this alternative would facilitate low-density reforestation in areas deforested by previous wildfires, allow more effective shrub control in established fuel treatments and plantations, and reduce future hazard tree risk along roads and private-public property lines.

Table 3.1-9 Alternative 1 Acres and Percentage by Flame Length Categories Modeled under 98th Percentile Weather Conditions for the Defense, Threat, and Non-WUI Areas of the Project Area

Flame Length Categories	0 feet		1–4 feet		4–8 feet		8–12 feet		12–25 feet		>25 feet		Total Sum of Acres	Total % Total Acres
WUI	Sum of Acres	% Total Acres	Sum of Acres	% Total Acres	Sum of Acres	% Total Acres	Sum of Acres	% Total Acres	Sum of Acres	% Total Acres	Sum of Acres	% Total Acres		
Defense Zone	10,815	5%	55,553	26%	8,979	4%	1,930	1%	584	<1%	4,561	2%	82,423	38%
Defense Zone - Evacuation Route	561	<1%	760	<1%	155	<1%	55	<1%	42	<1%	106	<1%	1,680	1%
Threat Zone	12,578	6%	70,721	33%	10,755	5%	2,200	1%	904	<1%	9,236	4%	10,6395	49%
Outside WUI	3,494	2%	18,462	9%	1,498	1%	381	<1%	273	<1%	2,296	1%	26,403	12%
Grand Total	27,449	13%	145,496	67%	21,387	10%	4,565	2%	1,803	1%	16,200	7%	216,901	100%

Note: WUI = wildland-urban interface.

Source: Spatial Informatics Group 2022.

Table 3.1-10 Alternative 1 Acres and Percentage by Flame Length Categories Modeled under 90th Percentile Weather Conditions for the Defense, Threat, and Non-WUI Areas of the Project Area

Flame Length Categories	0 feet		1–4 feet		4–8 feet		8–12 feet		12–25 feet		>25 feet		Total Sum of Acres	Total % of Total Acres
WUI	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres		
Defense Zone	10,990	5%	58,306	27%	8,012	4%	1,464	1%	479	<1%	3,173	1%	82,423	38%
Defense Zone - Evacuation Route	561	<1%	808	<1%	142	<1%	58	<1%	32	<1%	78	<1%	1,680	1%
Threat Zone	12,939	6%	74,732	34%	9,391	4%	1,671	1%	755	<1%	6,908	3%	106,395	49%
Outside WUI	3,619	2%	19,109	9%	1,359	1%	317	<1%	239	<1%	1,760	1%	26,403	12%
Grand Total	28,109	13%	152,955	71%	18,903	9%	3,509	2%	1,506	1%	11,919	5%	216,901	100%

Note: WUI = wildland-urban interface.

Source: Spatial Informatics Group 2022.

Table 3.1-11 Alternative 1 Acres and Percentage by Fire Type (Nonburnable, Surface Fire, Crown Fire) Categories Modeled under 98th Percentile Weather Conditions for the Defense, Threat, and Non-WUI Areas of the Project Area

Fire Type	Nonburnable		Surface Fire		Torching		Crown Fire		Total Sum of Acres	Total % of Total Acres
WUI	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres		
Defense Zone	2,220	1%	74,788	34%	1,185	1%	4,230	2%	82,423	38%
Defense Zone - Evacuation Route	246	<1%	1,287	1%	55	<1%	93	<1%	1,680	1%
Threat Zone	1,583	1%	94,678	44%	1,222	1%	8,912	4%	106,395	49%
Outside WUI	99	<1%	23,732	11%	354	<1%	2,218	1%	26,403	12%
Grand Total	4,148	2%	194,485	90%	2,815	1%	15,453	7%	216,901	100%

Note: WUI = wildland-urban interface.

Source: Spatial Informatics Group 2022.

Table 3.1-12 Alternative 1 Acres and Percentage by Fire Type (Nonburnable, Surface Fire, Crown Fire) Categories Modeled under 90th Percentile Weather Conditions for the Defense, Threat, and Non-WUI Areas of the Project Area

Fire Type	Nonburnable		Surface Fire		Torching		Crown Fire		Total Sum of Acres	Total % of Total Acres
WUI	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres		
Defense Zone	2,220	1%	76,138	35%	1,213	1%	2,853	1%	82,423	38%
Defense Zone - Evacuation Route	246	<1%	1,315	1%	53	<1%	65	<1%	1,680	1%
Threat Zone	1,583	1%	96,913	45%	1,343	1%	6,555	3%	106,395	49%
Outside WUI	99	<1%	24,232	11%	402	<1%	1,670	1%	26,403	12%
Grand Total	4,148	2%	198,599	92%	3,012	1%	11,143	5%	216,901	100%

Note: WUI = wildland-urban interface.

Source: Spatial Informatics Group 2022.

Alternative 2: Vegetation Treatments to Protect Communities Consistent with the Existing Forest Plan

Under Alternative 2, the posttreatment effects on flame length and crown fire would be similar to those described for Alternative 1 (Tables 3.1-13 through 3.1-16; Appendix D). A key difference is residual stand densities, which would remain higher than those under Alternative 1, leading to potentially higher levels of drought-related future mortality.

Table 3.1-13 Alternative 2 Acres and Percentage by Flame Length Categories Modeled under 98th Percentile Weather Conditions for the Defense, Threat, and Non-WUI Areas of the Project Area

Flame Length Categories	0 feet		1–4 feet		4–8 feet		8–12 feet		12–25 feet		>25 feet		Total Sum of Acres	Total % Total Acres
WUI	Sum of Acres	% Total Acres	Sum of Acres	% Total Acres	Sum of Acres	% Total Acres	Sum of Acres	% Total Acres	Sum of Acres	% Total Acres	Sum of Acres	% Total Acres		
Defense Zone	10,596	5%	55,693	26%	9,024	4%	1,933	1%	589	<1%	4,587	2%	82,423	38%
Defense Zone - Evacuation Route	561	<1%	759	<1%	155	<1%	55	<1%	42	<1%	107	<1%	1,680	1%
Threat Zone	13,514	6%	70,428	32%	10,306	5%	2,178	1%	894	<1%	9,076	4%	106,395	49%
Outside WUI	3,766	2%	18,342	8%	1,432	1%	379	<1%	274	<1%	2,209	1%	26,403	12%
Grand Total	28,438	13%	145,222	67%	20,917	10%	4,546	2%	1,799	1%	15,978	7%	216,901	100%

Note: WUI = wildland-urban interface.

Source: Spatial Informatics Group 2022.

Table 3.1-14 Alternative 2 Acres and Percentage by Flame Length Categories Modeled under 90th Percentile Weather Conditions for the Defense, Threat, and Non-WUI Areas of the Project Area

Flame Length Categories	0 feet		1–4 feet		4–8 feet		8–12 feet		12–25 feet		>25 feet		Total Sum of Acres	Total % of Total Acres
WUI	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres		
Defense Zone	10,777	5%	58,480	27%	8,034	4%	1,467	1%	482	<1%	3,184	1%	82,423	38%
Defense Zone - Evacuation Route	562	<1%	808	<1%	142	<1%	58	<1%	32	<1%	78	<1%	1,680	1%
Threat Zone	13,913	6%	74,194	34%	9,113	4%	1,661	1%	749	<1%	6,765	3%	106,395	49%
Outside WUI	3,906	2%	18,955	9%	1,321	1%	316	<1%	237	<1%	1,668	1%	26,403	12%
Grand Total	29,157	13%	152,437	70%	18,610	9%	3,502	2%	1,500	1%	11,696	5%	216,901	100%

Note: WUI = wildland-urban interface.

Source: Spatial Informatics Group 2022.

Table 3.1-15 Alternative 2 Acres and Percentage by Fire Type (Nonburnable, Surface Fire, Crown Fire) Categories Modeled under 98th Percentile Weather Conditions for the Defense, Threat, and Non-WUI Areas of the Project Area

Fire Type	Non-burnable		Surface Fire		Torching		Crown Fire		Total Sum of Acres	Total % of Total Acres
WUI	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres		
Defense Zone	2,220	1%	74,753	34%	1,198	1%	4,253	2%	82,423	38%
Defense Zone - Evacuation Route	246	<1%	1,287	1%	55	<1%	93	<1%	1,680	1%
Threat Zone	1,583	1%	94,856	44%	1,199	1%	8,756	4%	106,395	49%
Outside WUI	99	<1%	23,820	11%	347	<1%	2,137	1%	26,403	12%
Grand Total	4,148	2%	194,715	90%	2,798	1%	15,239	7%	216,901	100%

Note: WUI = wildland-urban interface.

Source: Spatial Informatics Group 2022.

Table 3.1-16 Alternative 2 Acres and Percentage by Fire Type (Nonburnable, Surface Fire, Crown Fire) Categories Modeled under 90th Percentile Weather Conditions for the Defense, Threat, and Non-WUI Areas of the Project Area

Fire Type	Non-burnable		Surface Fire		Torching		Crown Fire		Total Sum of Acres	Total % of Total Acres
WUI	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres		
Defense Zone	2,220	1%	76,122	35%	1,220	1%	2,862	1%	82,423	38%
Defense Zone - Evacuation Route	246	<1%	1,315	1%	53	<1%	65	<1%	1,680	1%
Threat Zone	1,583	1%	97,071	45%	1,317	1%	6,423	3%	106,395	49%
Outside WUI	99	<1%	24,327	11%	396	<1%	1,581	1%	26,403	12%
Grand Total	4,148	2%	198,835	92%	2,987	1%	10,931	5%	216,901	100%

Note: WUI = wildland-urban interface.

Source: Spatial Informatics Group 2022.

Alternative 3: Vegetation Treatments to Protect Communities with Reduced Intensity Treatments

Implementing Alternative 3 would result in a substantially lower percentage of the landscape with expected flame lengths of less than 4 feet. Under 90th and 98th percentile conditions, 27–30 percent of the landscape is modeled to have flame lengths less than 4 feet, and 43–51 percent of the landscape would continue to have flame lengths exceeding 8 feet, which would hinder future fire suppression activities and put local communities at risk (Tables 3.1-17 and 3.1-18). Similar trends are seen with crown fire potential with 55–64 percent of the landscape conducive to surface fire and the remaining area vulnerable to torching and crown fire (Tables 3.1-19 and 3.1-20). Relative stand density would remain higher in manually treated units, leading to potential higher levels of drought-related future mortality.

Table 3.1-17 Alternative 3 Acres and Percentage by Flame Length Categories Modeled under 98th Percentile Weather Conditions for the Defense, Threat, and Non-WUI Areas of the Project Area

Flame Length Categories	0 feet		1–4 feet		4–8 feet		8–12 feet		12–25 feet		>25 feet		Total Sum of Acres	Total % Total Acres
WUI	Sum of Acres	% Total Acres	Sum of Acres	% Total Acres	Sum of Acres	% Total Acres	Sum of Acres	% Total Acres	Sum of Acres	% Total Acres	Sum of Acres	% Total Acres		
Defense Zone	5,657	3%	15,727	7%	19,893	9%	5,083	2%	5,225	2%	30,838	14%	82,423	38%
Defense Zone - Evacuation Route	359	<1%	322	<1%	386	<1%	116	<1%	94	<1%	402	<1%	1,680	1%
Threat Zone	4,655	2%	20,674	10%	20,917	10%	3,609	2%	5,048	2%	51,492	24%	10,6395	49%
Outside WUI	809	<1%	11,205	5%	3,890	2%	644	<1%	1,152	1%	8,704	4%	26,403	12%
Grand Total	11,481	5%	47,927	22%	45,086	21%	9,451	4%	11,520	5%	91,437	42%	216,901	100%

Note: WUI = wildland-urban interface.

Source: Spatial Informatics Group 2022.

Table 3.1-18 Alternative 3 Acres and Percentage by Flame Length Categories Modeled under 90th Percentile Weather Conditions for the Defense, Threat, and Non-WUI Areas of the Project Area

Flame Length Categories	0 feet		1-4 feet		4-8 feet		8-12 feet		12-25 feet		>25 feet		Total Sum of Acres	Total % of Total Acres
WUI	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres		
Defense Zone	6,026	3%	16,712	8%	26,850	12%	5,076	2%	4,871	2%	22,888	11%	82,423	38%
Defense Zone - Evacuation Route	370	<1%	349	<1%	440	<1%	114	<1%	81	<1%	325	<1%	1,680	1%
Threat Zone	4,993	2%	22,290	10%	29,350	14%	4,188	2%	4,768	2%	40,805	19%	106,395	49%
Outside WUI	939	<1%	11,753	5%	4,982	2%	745	<1%	1,113	1%	6,870	3%	26,403	12%
Grand Total	12,327	6%	51,105	24%	61,623	28%	10,124	5%	10,834	5%	70,889	33%	216,901	100%

Note: WUI = wildland-urban interface.

Source: Spatial Informatics Group 2022.

Table 3.1-19 Alternative 3 Acres and Percentage by Fire Type (Nonburnable, Surface Fire, Crown Fire) Categories Modeled under 98th Percentile Weather Conditions for the Defense, Threat, and Non-WUI Areas of the Project Area

Fire Type	Non-burnable		Surface Fire		Torching		Crown Fire		Total Sum of Acres	Total % of Total Acres
WUI	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres		
Defense Zone	2,220	1%	46,453	21%	9,522	4%	24,228	11%	82,423	38%
Defense Zone - Evacuation Route	246	<1%	941	<1%	164	<1%	329	<1%	1,680	1%
Threat Zone	1,583	1%	51,657	24%	6,390	3%	46,765	22%	106,395	49%
Outside WUI	99	<1%	16,840	8%	1,861	1%	7,603	4%	26,403	12%
Grand Total	4,148	2%	115,890	53%	17,938	8%	78,925	36%	216,901	100%

Note: WUI = wildland-urban interface.

Source: Spatial Informatics Group 2022.

Table 3.1-20 Alternative 3 Acres and Percentage by Fire Type (Nonburnable, Surface Fire, Crown Fire) Categories Modeled under 90th Percentile Weather Conditions for the Defense, Threat, and Non-WUI Areas of the Project Area

Fire Type	Non-burnable		Surface Fire		Torching		Crown Fire		Total Sum of Acres	Total % of Total Acres
WUI	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres		
Defense Zone	2,220	1%	53,834	25%	9,881	5%	16,488	8%	82,423	38%
Defense Zone - Evacuation Route	246	<1%	1,021	<1%	161	<1%	251	<1%	1,680	1%
Threat Zone	1,583	1%	61,583	28%	7,606	4%	35,623	16%	106,395	49%
Outside WUI	99	<1%	18,543	9%	1,977	1%	5,784	3%	26,403	12%
Grand Total	4,148	2%	134,981	62%	19,626	9%	58,147	27%	216,901	100%

Note: WUI = wildland-urban interface.

Source: Spatial Informatics Group 2022.

Alternative 4: Vegetation Treatments to Protect Communities, Achieve Landscape Resilience, and Preserve Habitat for California Spotted Owl

Flame lengths and fire type would be similar under Alternative 4 to the fire behavior seen under Alternatives 1 and 2. A key difference is that Alternative 4 would allow greater protection of habitat for California spotted owl (*Strix occidentalis*), in addition to maintaining benefits for community protection.

Table 3.1-21 Alternative 4 Acres and Percentage by Flame Length Categories Modeled under 98th Percentile Weather Conditions for the Defense, Threat, and Non-WUI Areas of the Project Area

Flame Length Categories	0 feet		1–4 feet		4–8 feet		8–12 feet		12–25 feet		>25 feet		Total Sum of Acres	Total % Total Acres
WUI	Sum of Acres	% Total Acres	Sum of Acres	% Total Acres	Sum of Acres	% Total Acres	Sum of Acres	% Total Acres	Sum of Acres	% Total Acres	Sum of Acres	% Total Acres		
Defense Zone	10,584	5%	56,845	26%	9,695	4%	1,136	1%	574	<1%	4,679	2%	83,513	38%
Defense Zone - Evacuation Route	398	<1%	357	<1%	84	<1%	52	<1%	33	<1%	56	<1%	981	<1%
Threat Zone	11,955	6%	70,782	33%	11,898	5%	1,629	1%	737	<1%	9,208	4%	106,209	49%
Outside WUI	3,399	2%	17,819	8%	2,030	1%	327	<1%	250	<1%	2,376	1%	26,202	12%
Grand Total	26,336	12%	145,803	67%	23,707	11%	3,144	1%	1,594	1%	16,319	8%	216,905	100%

Note: WUI = wildland-urban interface.

Source: Spatial Informatics Group and Christal Johnson 2024.

Table 3.1-22 Alternative 4 Acres and Percentage by Flame Length Categories Modeled under 90th Percentile Weather Conditions for the Defense, Threat, and Non-WUI Areas of the Project Area

Flame Length Categories	0 feet		1–4 feet		4–8 feet		8–12 feet		12–25 feet		>25 feet		Total Sum of Acres	Total % of Total Acres
WUI	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres		
Defense Zone	10,916	5%	59,324	27%	8,094	4%	1,313	1%	474	<1%	3,393	2%	83,513	38%
Defense Zone - Evacuation Route	400	<1%	373	<1%	91	<1%	53	<1%	25	<1%	38	<1%	981	<1%
Threat Zone	11,948	6%	74,960	35%	9,619	4%	1,484	1%	729	<1%	7,469	3%	106,209	49%
Outside WUI	3,460	2%	19,028	9%	1,391	1%	314	<1%	221	<1%	1,788	1%	26,202	12%
Grand Total	26,724	12%	153,685	71%	19,195	9%	3,164	1%	1,449	1%	12,688	6%	216,905	100%

Note: WUI = wildland-urban interface.

Source: Spatial Informatics Group and Christal Johnson 2024.

Table 3.1-23 Alternative 4 Acres and Percentage by Fire Type (Nonburnable, Surface Fire, Crown Fire) Categories Modeled under 98th Percentile Weather Conditions for the Defense, Threat, and Non-WUI Areas of the Project Area

Fire Type	Non-burnable		Surface Fire		Torching		Crown Fire		Total Sum of Acres	Total % of Total Acres
WUI	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres		
Defense Zone	2,299	1%	75,648	35%	1,217	1%	4,347	2%	83,513	38%
Defense Zone - Evacuation Route	166	<1%	728	<1%	39	<1%	47	<1%	981	<1%
Threat Zone	1,582	1%	94,264	43%	1,715	1%	8,649	4%	106,209	49%
Outside WUI	100	<1%	23,529	11%	255	<1%	2,317	1%	26,202	12%
Grand Total	4,147	2%	194,169	90%	3,226	1%	15,360	7%	216,905	100%

Note: WUI = wildland-urban interface.

Source: Spatial Informatics Group and Christal Johnson 2024.

Table 3.1-24 Alternative 4 Acres and Percentage by Fire Type (Nonburnable, Surface Fire, Crown Fire) Categories Modeled under 90th Percentile Weather Conditions for the Defense, Threat, and Non-WUI Areas of the Project Area

Fire Type	Non-burnable		Surface Fire		Torching		Crown Fire		Total Sum of Acres	Total % of Total Acres
WUI	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres	Sum of Acres	% of Total Acres		
Defense Zone	2,299	1%	76,845	35%	1,276	1%	3,092	1%	83,513	39%
Defense Zone - Evacuation Route	166	<1%	744	<1%	38	<1%	33	<1%	981	<1%
Threat Zone	1,582	1%	96,040	44%	1,560	1%	7,028	3%	106,209	49%
Outside WUI	100	<1%	24,001	11%	403	<1%	1,697	1%	26,202	12%
Grand Total	4,148	2%	197,630	91%	3,277	2%	11,850	5%	216,905	100%

Note: WUI = wildland-urban interface.

Source: Spatial Informatics Group and Christal Johnson 2024.

Cumulative Effects

No Action Alternative

High stand densities would persist under the No Action Alternative, thereby reducing growth rates and tree vigor and increasing risk of mortality related to intertree competition and increased incidence of insect activity. High densities of small trees may cause competition for soil moisture and nutrients, which could contribute to increased stress on larger, older trees. Over time, stands currently at high stand density or near maximum stand density would continue to increase beyond 55 percent of maximum density and begin to die from intertree competition. This threshold is referred to as the “lower limit of the zone of imminent competition mortality.” The increasing stand density and consequent mortality from intertree competition and increased incidence of insect activity may have a major adverse effect on forest health by decreasing tree vigor and growth; increasing susceptibility to insects, disease, and drought; and increasing susceptibility to intense fire behavior (Restaino et al. 2019; Powell 1999). When drought related mortality occurs, the dead material, including branches and tree boles, will fall to the ground, accumulate at surface fuels, and increase potential fire hazard (flame length) (Reed et al. 2023), contributing to an increase in fire severity and greater difficulty in suppressing wildfires within the project area.

Current and increasing high-density, high fuel load, and high flame length conditions would 1) reduce the production rates for line construction by hand crews and mechanical equipment (Table 3.1-3), 2) compromise the safety of firefighters and the public, and 3) decrease the effectiveness of aerially applied retardant. In addition, burning embers from burning trees and standing dead trees could be blown to unburned areas outside the main fire, which could potentially increase the fire size. These direct and indirect effects would not reflect the influence of extreme, plume-dominated fire behavior as seen on the recent Dixie, North Complex, and Camp Fires (Gabbert 2021). At the landscape level, increased spotting and the fire’s influence on local weather tend to increase erratic fire behavior, resulting in increased fire size with higher tree mortality, especially when area weather patterns become warmer with increased winds and lower atmospheric stability (Prein et al. 2022). As already observed by firefighters and scientists, the factors described above would decrease the effectiveness of initial attack and extended fire suppression operations, leading to a greater potential for large, high-severity megafires (Steel et al. 2022).

Under the No Action Alternative, over time, the ability to safely suppress and contain fires, both in the initial attack and during extended fire suppression operations, would not be improved and would continue to decline over time from current conditions because of continued stand densification and surface fuel buildup. The fire line handbook (NWCG 2004) notes that with 8-foot flame lengths, “[f]ire may present serious control problems: torching, crowning, and spotting; control efforts at the head will probably be ineffective.” As flame lengths exceed 11 feet, “crowning, spotting, and major fire runs are probable; control efforts at the head of the fire are ineffective.” Under current fuel loadings and stand densities, the rates of line construction are relatively slow for both hand crews and tractors when compared with the posttreatment desired conditions (NWCG 2004). Selecting the No Action Alternative would result in no implementation of additional fuel treatments in the wildland urban interface within the Project area. Wildfire emissions from burning forests left untreated in their current condition (Stephens et al. 2012) would continue to occur unmitigated into the reasonably foreseeable future. These emissions, when combined with other wildfires in the region will cumulatively contribute to smoke and

particulate matter, leading to potential negative respiratory health impacts to local and regional human populations (Heaney et al. 2022)

Overall, it is predicted that selecting the No Action Alternative could lead to a greater potential for large, high-severity fires in forested areas during a wildfire under 90th and 98th percentile or worse future weather conditions. These conditions could decrease the effectiveness of existing and future adjacent fuels treatment projects on both public and private lands and increase the overall risk to surrounding communities. Beyond the immediate fire threat, wildfires that burn homes and communities result in long-term cleanup and rebuilding costs. These costs have been documented to be more than 10 times higher than suppression costs. Beyond burned forests and homes, communities affected by wildfire can suffer long-term mental health issues, homelessness, and pollution impacts (Troy et al. 2022b). Forests that burn with high severity can convert to shrub-dominated systems, which can reburn with high severity again on relatively shorter frequencies than the forests they replaced (Lydersen et al. 2019). Extensive high-severity burn areas may also have limited regeneration, reducing the potential for forests to return in the future (Collins et al. 2013).

Alternative 1: Vegetation Treatments to Protect Communities and Achieve Landscape Resilience

High stand densities, surface fuel loads, and canopy fuels would be generally reduced under Alternative 1, with the greatest reductions in stand densities occurring in combined mechanical plus prescribed fire treatments. These combined treatments (mechanical thinning from below followed by prescribed fire), have shown to be effective at moderating fire behavior and severity in numerous studies (Moghaddas et al. 2018; Stephens and Moghaddas 2005). In mechanically treated areas, reduced stand densities would facilitate tree vigor and improve overall stand resilience in treated areas (Restaino et al. 2019). Mechanical plus fire treatments on the Plumas National Forest have been documented to be effective for 15-20 years before needing maintenance treatments (Low et al. 2023; Chiono et al. 2012). Alternative 1 proposes up to 34,850 acres of hand thinning (Table 2-8), which may result in higher post treatment density, leading to increased drought related mortality and surface fuel accumulation (Reed et al. 2023), when compared post treatment with lower density mechanically treated stands. When combined with the effects of nearby fuel treatment projects, including the Claremont and North Quincy Project, reduced future mortality across the broader landscape would lead to potentially reduced surface fuel loading from dead and dying trees, improving fire suppression efficiency and reducing risk of snags to firefighters.

Reduced surface fuel loads, canopy fuel loads, and stand densities and corresponding reduced flame length conditions under Alternative 1, in combination with other existing completed and planned projects in or adjacent to the Project Area, would 1) increase the production rates for line construction by hand crews and mechanical equipment (see Table 3.1-3), 2) improve the safety of firefighters and the public, and 3) increase the effectiveness of aerially applied retardant in treated areas across the Project Area. As already observed by firefighters on recent wildfires and by scientists, these factors can increase the effectiveness of initial attack and extended fire suppression operations, leading to a greater potential for more effectively managing large wildfires (Steel et al. 2022). Wildfire emissions from treated forests are expected to be lower than those from untreated stands (Stephens et al. 2012).

Implementation of Alternative 1 would establish fuel treatments across the Project Area. Overall, it is predicted that implementing this alternative would lead to a reduced potential for large, high-

severity fires in forested areas during a wildfire under 90th and 98th percentile future weather conditions. The effectiveness of this alternative would be enhanced by implementing adjacent fuel treatments under the North Quincy, Claremont, and other future fuels reduction projects. Treatments that use mechanical thinning in combination with prescribed fire had the greatest reduction in fire risk and density in previous studies (Stephens and Moghaddas, 2005). On the Plumas National Forest, treatments that combine mechanical treatment with prescribed fire have been effective for 15-20 years after completion (Low et al. 2023; Chiono et al. 2012). Over time, reduced flame lengths and fire severity would lessen potential future fire-related impacts on local communities. These impacts include potential losses of structures and critical infrastructure, as well as a potential decrease in the postfire recovery, rehabilitation, and reforestation costs typically seen after communities and ecosystems are affected by wildfire (Troy et al. 2022b).

Low-density reforestation of burned areas under Alternative 1 would allow for more rapid establishment of forest cover. Management of hazard trees along roads and public-private property lines under this alternative would reduce the potential impacts of hazard trees on road networks, private property owners, and individuals. This would increase the safety of roadways for emergency evacuation and fire suppression efforts within and near the project area. Shrub management using herbicide in fuel treatments would improve the longevity of existing and newly established fuel treatments. Hazard tree and shrub management would reduce the potential fire hazard in areas treated and enhance the protection provided by nearby defensible space and fuel reduction efforts.

Alternative 2: Vegetation Treatments to Protect Communities Consistent with the Existing Forest Plan

Individual treatment type effects (i.e., manual thinning, mechanical thinning plus prescribed fire, prescribed fire only, and mastication) for Alternative 2 would have effects similar to those described for Alternative 1. The intensity of mechanical treatments would be reduced under this alternative, resulting in potential decreased drought resiliency over time compared with those mechanical treatments implemented under Alternative 1. Alternative 2 proposes up to 44,926 acres (Table 2-7) of manual thinning, which may result in higher post treatment density, leading to increase drought related mortality and surface fuel accumulation (Reed et al. 2023), when compared to post treatment lower density mechanically treated stands. These manually thinned, relatively higher-density stands would remain more susceptible to drought-related mortality into the foreseeable future. Future drought-related mortality would lead to standing dead trees, which would shed branches and bark and eventually fall, leading to increased fuel loads. These loads would contribute to future increased fire hazard. Wildfire emissions from treated forests are expected to be lower than those from untreated stands (Stephens et al. 2012).

Alternative 3: Vegetation Treatments to Protect Communities with Reduced Intensity Treatments

Individual treatment type effects (i.e., manual thinning, mechanical thinning plus prescribed fire, prescribed fire only, and mastication) for Alternative 3 would have effects similar to those described for Alternative 2. A key difference with Alternative 3 is that the extent of manual treatment areas would be larger under this alternative. Alternative 3 proposes up to 100,574 acres (Table 2-7) of manual thinning, which may result in higher post treatment density, leading to increase drought related mortality and surface fuel accumulation (Reed et al. 2023), when

compared post treatment lower density mechanically treated stands. These manually thinned areas would likely remain at high stand density. These high-density stands would remain susceptible to drought-related mortality into the foreseeable future over a larger area when compared with Alternative 1 and Alternative 2. Future drought-related mortality would lead to standing dead trees that would shed branches and bark and eventually fall, leading to increased fuel loads. These loads would contribute to future increased fire hazard, shortening the potential duration of fuel treatment effectiveness compared with more intensive treatments implemented under Alternatives 1 and 2. Because this alternative would have substantially more manually treated area, more of the project area would remain at risk of future drought-related mortality.

Alternative 4: Vegetation Treatments to Protect Communities, Achieve Landscape Resilience, and Preserve Habitat for California Spotted Owl

Individual treatment type effects (i.e., manual thinning, mechanical thinning plus prescribed fire, prescribed fire only, and mastication) for Alternative 4 would have effects similar to those described for Alternative 1. Areas with only manual treatments would be reduced under this alternative, covering only 25,464 acres compared to 34,850 acres in Alternative 1 and 44,926 acres in Alternative 2. This means more acres with mechanical treatments, allowing greater resistance to drought and potentially greater treatment longevity for reducing fire behavior. This alternative will also do more to protect and preserve habitat for California spotted owls, allowing a greater chance for this species to survive on the Plumas and across California into the future in the face of habitat losses from fire.

3.2. Biological Resources

3.2.1. Introduction

This section analyzes the potential effects of the Project on special-status wildlife and plant species known to occur or with potential to occur in the Project area. Special-status species evaluated consist of botanical (vascular plants, lichens, and mosses) and wildlife species listed under the federal Endangered Species Act (ESA) as threatened or endangered, species that are proposed or candidate species for listing under the ESA, and plant and animal species listed as Forest Service sensitive by the Pacific Southwest Region (Region 5) Regional Forester and that are known or have potential to occur on PNF. Additionally, program effects related to invasive plant risk, migratory birds, and PNF Management Indicator Species (MIS) are analyzed. Federal regulations and policies related to biological resources are also summarized. The effects on waters of the United States are addressed in Section 3.4, “Hydrology and Soils.”

A list of all Region 5 sensitive plant species and wildlife species known or with potential to occur in the Project area is provided in Appendices E1 and E2, respectively, along with descriptions of each species’ typical habitat, geographic range, elevation range, an effect determination, and rationale for the effect determination. To evaluate habitat conditions and determine habitat suitability for sensitive plant and animal species in the Project area, Ascent biologists and a Great Basin Institute botanist conducted field reconnaissance surveys during October–December 2022, consulted with PNF botanists and wildlife biologists, and reviewed several existing data sources. The data review included: California Natural Diversity Database (CNDDDB) (CNDDDB 2022); California Wildlife Habitat Relationships (CWHR) Life History Accounts (CDFW 2022a); Forest Service Region 5 Regional Forester’s Sensitive Wildlife List (Forest Service 2013a); U.S. Fish and Wildlife Service (USFWS) Information for Planning and Consultation (IPaC) tool (USFWS 2023); PNF sensitive plant and wildlife occurrence records (PNF 2022); and the Forest Service’s Classification and Assessment with Landsat of Visible Ecological Groupings existing vegetation maps.

This analysis is also based substantially on information, detailed analysis, and conclusions presented in the following specialist report prepared for the program:

- Biological Assessment for Wildlife and Plants (hereinafter referred to as the “Wildlife and Plant BA”)

This document is hereby incorporated by reference, as part of the Project record, and is available for review on the PNF website.

As part of the NEPA process, it is Forest Service policy to review programs and activities through a Biological Evaluation (BE) to determine the potential effect of these programs and activities on Forest Service sensitive species (FSM 2670.32). Required contents of a BE are included in this section of the EA.

3.2.2. Affected Environment

Habitat

Full descriptions of each habitat type within the Project area can be found in Appendix E3, Tables 1 and 2. Table 3.2-1 provides a list of habitat types present in the Project area and the approximate acreage of each type. The distribution and extent of each habitat type are shown in Appendix E4,

Figure 1 and Figure 2. Forest Service Existing Vegetation (EVEG) mapping was used to identify the habitat/vegetation types within the Project area. The CWHR habitat types are described in terms of vegetation and are grouped according to vegetative dominance or distinguishing characteristics to which California wildlife are thought to respond.

Table 3.2-1 Habitat Types in the Project Area

Habitat Type	Acres in Project Area
Sierran Mixed Conifer	115,047
White Fir	32,934
Eastside Pine	15,568
Montane Chaparral	11,226
Montane Hardwood-Conifer	10,981
Montane Hardwood	7,473
Ponderosa Pine	6,305
Red Fir	3,446
Lacustrine	2,835
Annual Grassland	2,651
Barren ¹	2,556
Sagebrush	2,111
Mixed Chaparral	1,412
Montane Riparian	883
Jeffrey Pine	745
Perennial Grassland	466
Blue Oak-Foothill Pine	254
Lodgepole Pine	234
Cropland	219
Wet Meadow	120
Low Sage	79
Urban ¹	65
Douglas Fir	54
Aspen	36
Subalpine Conifer	16
Closed-Cone Pine-Cypress	7
Riverine	< 0.1
Total	217,721

¹ Most urban and barren habitats would not be targeted for treatment; however, due to the scale of the habitat mapping, some areas mapped as urban or barren may contain habitats that would be treated (e.g., forested areas close to urban development).

Source: Forest Service EVEG vegetation data, compiled by USDA Forest Service in 2024.

Riparian and aquatic habitats as mapped by EVEG within the Project area are (in order of decreasing acreage) lacustrine, montane riparian, wet meadow, and riverine (Table 3.2-1; Appendix E4, Figure 1). Approximately 307.5 miles of perennial streams, 595.6 miles of intermittent streams, and 1,486.2 miles of ephemeral streams, as well as 2,546.7 acres of non-stream waterbodies are present in the project area (PNF 2022). More refined aquatic habitat mapping within the Project area includes lakes (e.g., portions of Lake Oroville, Little Grass Valley Reservoir, Lake Davis, Bucks Lake), rivers (e.g., portions of North Fork Feather River, South Fork Feather River, Slate Creek, Camp Creek, Greenhorn Creek, Spanish Creek, Jackson Creek, and Big Grizzly Creek), and wet meadows (PNF 2022; Appendix E4, Figure 2).

Mature Forest Habitat

Mature forest habitat is preferred or required by a large number of wildlife species, including several sensitive wildlife species (e.g., northern goshawk, California spotted owl, Pacific marten, fisher). Mature forests contain large trees and a high degree of canopy cover, and these habitats are classified under the CWHR classification system based on these features (CDFW 2022b). Habitats with small trees (i.e., 11–24 inches diameter at breast height (dbh), 12–24 feet crown diameter) are designated as CWHR size class 4, and habitats with medium/large trees (i.e., greater than 24 inches dbh, greater than 24 feet crown diameter) are designated at CWHR size class 5 (CDFW 2022b). Within each of these classifications, habitats can be further described based on forest canopy cover as “moderate (M)” (40- to 59-percent canopy cover) or “dense (D)” (60- to 100-percent canopy cover). In the Sierra Nevada Forest Plan Amendment mature forest is defined as CWHR types 4M, 4D, 5M, 5D, and 6. While CWHR offers a metric to measure the amount of suitable habitat present in an area, the metric has limitations and can be both over inclusive and under inclusive in characterizing suitable habitat (USDA Forest Service 2019, p.23). Therefore, the amount of habitat (acreage) proposed for treatments in any analysis using CWHR classification system is approximate. The Project area contains approximately 134,544 acres of high-quality mature forest habitat, including approximately 34,766 acres of 4M habitat, 39,777 acres of 4D habitat, 16,054 acres of 5M habitat, and 43,947 acres of 5D habitat within several different forest habitat types (i.e., Sierran mixed conifer, white fir, montane hardwood conifer, montane hardwood, Douglas fir, Jeffrey pine, eastside pine, ponderosa pine, red fir, blue oak-foothill pine, and subalpine conifer; Table 3.2-2). Mature forest mapped in the project area that burned at high severity (Class 4 which is greater than 75% basal area mortality) in the last five years was removed from mature forest acreage totals because it no longer contributes components that meet the definition of mature forest as described above. While high severity burn areas, especially in large patches may contain large/tall snags, they lack other important characteristics of mature forest that species depend upon for nesting, roosting, cover, and microclimate control over the long term, especially over time as post-fire tree mortality continues to degrade the stand. Important characteristics lost to high-severity fire include dense canopy cover, large down woody debris, horizontal and vertical complexity. High-severity fire can lead to significant canopy loss and structural simplification by reducing both horizontal and vertical complexity (Kane et al. 2013). Low and moderate severity fire areas are categorized as 0-25% and 25-75% basal area mortality respectively and tend to maintain many of these components since low to moderate fire severity typically do not kill all large trees, allowing these essential structures to remain intact.

As the USFS CSO Conservation Strategy (2019) points out, wildfires vary greatly in their characteristics, and so does the way spotted owls respond to them (Rockweit et al., 2017). Each

fire is influenced by a unique combination of factors such as the condition of the habitat before the fire, how long it has been since the last burn, the overall intensity of the fire, and fire size. Researchers also use different methods to assess owl responses, including studies on occupancy, population dynamics, and habitat use. In some cases, high-severity burns, especially in smaller patches, can increase forest diversity and structural complexity by leaving behind more remnant live trees and stands that are suitable for owls (e.g., Lee and Bond, 2015). However, other fires may produce more uniform, severely burned areas that negatively affect owl-preferred habitats (e.g., Jones et al., 2016b) especially if the high fire severity occurs in large patches. Spotted owls typically forage on the edge of and within areas burned at a range of severities (Bond et al. 2009, Eyes et al. 2017) but they show avoidance of larger (greater than approximately 238 acres) high-severity patches (Eyes et al. 2017, Jones et al. 2016a, 2020). In addition, CSOs rarely traveled further than 100 meters (328 feet) into severe fire patches (Jones et al. 2020, Kramer et al. 2021) Spotted owls show use of smaller and more complex patches of high fire severity burn (Jones et al. 2020). In summary, owls seem to use heterogeneous forest stands caused by mixed fire severity including small high-severity burn patches especially for foraging but tend to avoid more homogenous stands created by large patches of high-severity burn. Large-scale, intense wildfires—often referred to as megafires—can significantly harm the spotted owl and its habitat. These fires are typically defined as burning more than 10,000 hectares with canopy mortality rates between 75% and 100% (Jones et al. 2016a, Linley et al. 2022). Such extreme events can severely degrade or completely destroy critical spotted owl habitat by incinerating large trees and eliminating the forest canopy.

As stated in the Project Draft Decision Notice (Forest Service 2025), the combined total area burned by recent wildfires on PNF was 1,635,200 acres, of which nearly 800,000 acres (roughly 49%) burned at high severity. On the Plumas National Forest, high severity wildfire resulted in the loss of 241,776 acres of suitable mature forest wildlife habitat, which is roughly 43% of the total available forest-wide before 2018 (Forest Service 2022a). These fires resulted in impacts to 151 of the 295 California spotted owl Protected Activity Centers (PACs) that existed within Plumas National Forest prior to 2018. Fifty-one of those PACs were rendered unsuitable due to a total loss of available habitat that previously met the definitions and parameters describing high quality and best available nesting, roosting and foraging habitat within a PAC, and the remaining 100 were revised to exclude patches that burned at high severity and may now consist of lower quality habitat in a less compact configuration.

High severity areas occur in and outside of the Post-Wildfire Area planning unit. In some areas mapped as moderate severity, which makes up 7,178 acres of the project area, suitable habitat may not exist anymore. Mature forest mapped in the Existing Fuel Break planning unit was also removed. These calculations are done for planning purposes only. Due to the scale of the project area and inherent limitations in remote sensing data, the exact area of mature forest habitat in the project area may be slightly different than presented herein.

Mature forest habitat in the Project area is present within Protected Activity Center (PAC), Home Range Core Area (HRCA), as well as throughout the Project area in other land allocation (e.g., mature forest, general forest, Territories, Wildlife Corridors). Within these other land allocations, mature forest (25,655 acres) and general forest – eastside (10,107 acres) have the predominant amount of mature forest (i.e., 4M, 4D, 5M, 5D).

Table 3.2-2 Mature Forest Habitat Acreage in the Project Area

Habitat Type	Size/Density	Acres
Blue Oak-Foothill Pine	4M	77.1
Blue Oak-Foothill Pine	4D	19.4
Blue Oak-Foothill Pine	5M	18.8
Blue Oak-Foothill Pine	5D	33.4
Douglas Fir	4M	0.0
Douglas Fir	4D	31.8
Douglas Fir	5M	0.0
Douglas Fir	5D	6.8
Eastside Pine	4M	8,136.1
Eastside Pine	4D	1,381.1
Eastside Pine	5M	1,445.6
Eastside Pine	5D	524.0
Jeffrey Pine	4M	261
Jeffrey Pine	4D	0.0
Jeffrey Pine	5M	0.0
Jeffrey Pine	5D	0.0
Lodgepole Pine	4M	80.6
Lodgepole Pine	4D	3.4
Lodgepole Pine	5M	0.0
Lodgepole Pine	5D	0.0
Montane Hardwood	4M	345.3
Montane Hardwood	4D	1830.6
Montane Hardwood	5M	32.2
Montane Hardwood	5D	207.4
Montane Hardwood-Conifer	4M	622.6
Montane Hardwood-Conifer	4D	3,627.6
Montane Hardwood-Conifer	5M	351.5
Montane Hardwood-Conifer	5D	2,193.0
Montane Riparian	4M	0.0
Montane Riparian	4D	3.4
Montane Riparian	5M	0.0
Montane Riparian	5D	0.0
Ponderosa Pine	4M	385.4
Ponderosa Pine	4D	1,331.7

Habitat Type	Size/Density	Acres
Ponderosa Pine	5M	53.8
Ponderosa Pine	5D	1,741.1
Red Fir	4M	901.3
Red Fir	4D	743.2
Red Fir	5M	630.0
Red Fir	5D	117.8
Sierran Mixed Conifer	4M	17,917.6
Sierran Mixed Conifer	4D	25,468.6
Sierran Mixed Conifer	5M	8,592.1
Sierran Mixed Conifer	5D	34,044.2
Subalpine Conifer	4M	0.0
Subalpine Conifer	4D	0.0
Subalpine Conifer	5M	15.5
Subalpine Conifer	5D	0.0
White Fir	4M	6039.1
White Fir	4D	5,336.0
White Fir	5M	4,914.4
White Fir	5D	5,079.5
Total 4M		34,766.2
Total 4D		39,776.7
Total 5M		16,054.0
Total 5D		43,947.1
Total Mature Forest Habitat in the HRCA Land Allocation		33,308.2
Total Mature Forest Habitat in the Territory Land Allocation		23,889.4
Total Mature Forest Habitat in the Wildlife Corridor Land Allocation		24,255.4
Total Mature Forest Habitat in the PAC Land Allocation		32,829.6
Total Acreage of Mature Forest Habitat		134,544.1

Notes:

4M: 11.0–23.9 inches average dbh; 40- to 59.9-percent canopy cover.

4D: 11.0–23.9 inches average dbh; 60-percent and greater canopy cover.

5M: 24 inches and greater average dbh; 40- to 59.9-percent canopy cover.

5D: 24 inches and greater average dbh; 60-percent and greater canopy cover.

Source: EVEG; adapted by USDA Forest Service 2024.

California Spotted Owl and Northern Goshawk

California Spotted Owl and Northern Goshawk Protected Activity Centers

California spotted owl and northern goshawk PACs are delineated surrounding each territorial activity center based on most recent documented nest sites, the most recent known roost site when a nest location is not known, and a central point based on repeated daytime detections when neither nest nor roost locations are known (Appendix E4; Figure 3, Figure 4). PACs are delineated to include known and suspected nest stands and to contain the following in as compact a unit as possible:

- presence of at least two tree canopy layers;
- dominant and co-dominant trees average at least 24 inches dbh;
- area within the PAC has at least 60 to 70 percent canopy cover;
- snags with dbh of greater than 45 inches are present; and
- greater than average levels of snags and downed woody material.

The Project area contains approximately 27,894 acres of California spotted owl PACs and 14,224 acres of northern goshawk PACs (California spotted owl PACs may overlap with northern goshawk PACs; therefore, total acres of PAC allocation is less than the sum of the two). PACs are mapped around the best available suitable habitat. After a stand-replacing event, habitat conditions are evaluated spatially and field-verified for re-mapping opportunities as components required for successful nesting described in the Mature Forest Habitat section above may no longer exist. High severity fire typically removes most live trees, reduces canopy cover substantially, and leads to a vegetation type conversion. These changes are detrimental for species that require dense canopy cover, late seral forest, large trees, and prey species associated with late seral, multi-layered canopy forests to persist long term on the landscape (Temple, et. al 2015, Kramer et al. 2021, Jones et al, 2019).

California Spotted Owl Home Range Core Areas

California spotted owl HRCAs are established surrounding each territorial California spotted owl PAC and encompass the best available habitat for this species in the closest proximity to the PAC (Appendix E4; Figure 3). The best available contiguous habitat incorporates the following:

- presence of at least two tree canopy layers;
- dominant and co-dominant trees that are at least 24 inches dbh;
- a number of very large, old trees (greater than 45 inches dbh);
- at least 50 to 70 percent canopy cover; and
- greater than average levels of snags and downed woody material.

The Project area contains approximately 52,557 acres of HRCAs.

California Spotted Owl Territories

California spotted owl Territories are 1,000-acre areas established surrounding each California spotted owl PAC and includes a mix of habitat types. At least 40-60 percent of the Territory is maintained as suitable habitat in priority of nesting, roosting, then foraging habitat; the remainder of the Territory promotes forest heterogeneity by managing for many different structure and canopy classes at the stand level and territory level.

The Project area contains approximately 70,024 acres of Territories (including PACs).

Invasive Plants

An Invasive Plant Risk Assessment for the Project was prepared pursuant to PNF Forest Plan requirements, which includes a description of known invasive plants in the Project area, the potential effects of Project implementation on introduction or spread of invasive plants in the Project area, applicable design features to prevent the introduction or spread of invasive plants, and a determination

of the risks for weed spread (high, moderate, low) associated with different management activities. The Invasive Plant Risk Assessment for the Project is included in Appendix E5.

Special Interest Areas

The Project area contains approximately 4,824 acres of designated or proposed Special Interest Areas (SIAs), including the Butterfly Valley Botanical Area, Fowler Lake, Little Volcano, McNab Cypress, McRae Meadow, Mount Fillmore, and Valley Creek (Appendix E4; Figure 5). Treatments within SIAs would be designed to maintain the “integrity and suitability” for which the SIAs were proposed pursuant to Design Feature BOTANY-6 (Appendix A). Many special-status plant species are known to occur within these SIAs.

Serpentine and Bedrock Outcrops

The Project area contains approximately 8,657 acres of shallow serpentine and bedrock outcrop habitats (Appendix E4; Figure 6). These habitats represent preferred habitat for many special-status plant species known to occur in the Project area.

Burned Areas

As described above in Section 2.1.2, “Planning Units,” the Project area contains approximately 31,478 acres of land burned during the Dixie, North Complex, Camp, and Sugar fires. Within these burned areas, several populations of special-status plant species were burned. Special-status plant species and specific occurrences within these burned areas are provided in Appendix E6 and shown in Figure 8 in Appendix E4.

3.2.3. Design Features

Standard design features and best management practices (BMPs) for treatment activities have been developed and would be implemented for the Project. Several design features have been incorporated into the Project to minimize, avoid, and reduce potential adverse effects on biological resources and other resources. Riparian Conservation Areas (RCAs), which are described in detail in Section 3.4, “Hydrology and Soils,” would be implemented. Design features specific to species listed as endangered or threatened under the ESA and species that are proposed or candidate species for listing under the ESA (i.e., California red-legged frog, foothill yellow-legged frog, Sierra Nevada yellow-legged frog, gray wolf, Layne’s butterweed) are included in the Project BA, incorporated by reference, and included in Appendix A of this EA.

3.2.4. Analytical Approach for Wildlife

Life history and occurrence information for species listed as endangered or threatened under the ESA, species that are proposed or candidate species for listing under the ESA, or Forest Service sensitive wildlife species (Appendix E7) was assembled from the following sources:

- CNDDDB (CNDDDB 2022);
- CWHR Life History Accounts (CDFW 2022a);
- Wildlife and Plant BA;
- Natural Resource Information System (NRIS) Species Occurrence Data Provided by PNF (PNF 2022);
- Forest Service Region 5 Regional Forester’s Sensitive Wildlife List (Forest Service 2013a);
- USFWS IPaC tool (USFWS 2023); and
- other pertinent literature regarding these species.

Wildlife Species Evaluated

A total of 18 species listed as endangered or threatened under the ESA, species that are proposed or candidate species for listing under the ESA, or Forest Service sensitive wildlife species could occur in the Project area (Table 3.2-3). Four of these wildlife species were evaluated further in the Project BA. Distribution and documented CNDDDB and NRIS occurrences, habitat, and current threats to these species are summarized in species accounts included in Appendix E7.

Table 3.2-3 Forest Service Sensitive and Federally Listed Wildlife Species with Potential to Occur in the Project Area

Common Name	Scientific Name	Status
Birds		
Northern Goshawk	<i>Accipiter gentilis</i>	Forest Service Sensitive
Willow Flycatcher	<i>Empidonax traillii</i>	Forest Service Sensitive
Greater Sandhill Crane	<i>Grus canadensis tabida</i>	Forest Service Sensitive
Bald Eagle	<i>Haliaeetus leucocephalus</i>	Forest Service Sensitive
California Spotted Owl	<i>Strix occidentalis occidentalis</i>	Forest Service Sensitive; Proposed Threatened
Amphibians		
California Red-Legged Frog	<i>Rana draytonii</i>	Threatened
Foothill Yellow-Legged Frog	<i>Rana boylei</i>	Proposed Threatened;
Sierra Nevada Yellow-Legged Frog	<i>Rana sierrae</i>	Endangered
Reptiles		
Western Pond Turtle	<i>Emys marmorata</i>	Forest Service Sensitive
Mammals		
Pallid Bat	<i>Antrozous pallidus</i>	Forest Service Sensitive
Gray Wolf	<i>Canis lupus</i>	Endangered
Townsend's Big-Eared Bat	<i>Corynorhinus townsendii</i>	Forest Service Sensitive
Pacific Marten (Sierran Marten)	<i>Martes caurina (Martes caurina sierrae)</i>	Forest Service Sensitive
Fringed Myotis	<i>Myotis thysanodes</i>	Forest Service Sensitive
Fisher	<i>Pekania pennanti</i>	Forest Service Sensitive
Invertebrates		
Western Bumble Bee	<i>Bombus occidentalis</i>	Forest Service Sensitive
Monarch	<i>Danaus plexippus</i>	Candidate for Listing
Fish		
Hardhead	<i>Mylopharodon conocephalus</i>	Forest Service Sensitive

Sources: CDFW 2022a; CNDDDB 2022; Forest Service 2013a; USFWS 2023.

Wildlife Species Considered but Not Evaluated Further

Nine additional wildlife species were initially evaluated but were determined to be unlikely to be affected by the Project. These species were not evaluated further for the reasons described in Appendix E7, Table 1.

Impact Analysis Approach

Treatment methods that will be implemented under the Project are described in Section 2.1.3, “*Treatment Methods*.” Eleven different treatment methods are proposed: mechanical thinning, grapple piling, mastication, manual treatments, prescribed fire, pile burning, herbicide application, borate stump treatment, hazard tree removal, reforestation, and road maintenance. While the details of each treatment, as described in Section 2.1.3, differ, similarities between these treatment methods drive the potential impact mechanisms for wildlife. For example, mechanical thinning, grapple piling, mastication, hazard tree removal, reforestation, and road maintenance would all involve the use of heavy equipment; thus, the impact mechanisms for wildlife would be similar for these treatments. All treatment methods would involve potential use of vehicles and presence of personnel, so impacts related to these mechanisms would also be similar for wildlife. Treatments that would use herbicides or pesticides, including herbicide application and borate stump treatment, would likely not adversely affect most wildlife species in this analysis because they will be used according to their label and provisions for herbicide transportation, handling, application, and emergency spill response and reporting will be followed. Where impacts could occur (e.g., western bumble bee, monarch), additional analysis is included. For the purposes of this analysis, potential impacts are based on the impact mechanism (e.g., loud equipment, heavy machinery) rather than the individual treatment methods.

3.2.5. Environmental Effects for Wildlife

Federally Listed Wildlife Species

The Wildlife and Plant BA analyzed the proposed action under Alternative 1: Vegetation Treatments to Protect Communities and Achieve Landscape Resilience. The Wildlife and Plant BA analyzed potential direct, indirect, and cumulative effects on California red-legged frog, foothill yellow-legged frog, Sierra Nevada yellow-legged frog, and gray wolf, as well as USFWS-designated critical habitat for California red-legged frog and Sierra Nevada yellow-legged frog resulting from Project implementation. The Wildlife and Plant BA is hereby incorporated by reference and is available for review on the PNF website. An analysis of direct and indirect impacts for Alternatives 2, 3, and 4 for these species is provided below. Determinations for federally listed wildlife species or species proposed for listing under the ESA, as described in detail in the Wildlife and Plant BA, are provided below under Section 3.2.6, “Determination for Wildlife.”

California Red-Legged Frog, Foothill Yellow-Legged Frog, and Sierra Nevada Yellow-Legged Frog (No Action and Alternatives 2 and 3)

Direct Impacts

No Action Alternative

Under the No Action Alternative, no fuels treatments would occur. As a result, there would be no direct impacts on California red-legged frog, foothill yellow-legged frog, and Sierra Nevada yellow-legged frog due to project activity.

Alternatives 2, 3 and 4

Potential impacts on California red-legged frog, foothill yellow-legged frog, and Sierra Nevada yellow-legged frog are similar across Alternatives 1 (as described in the Wildlife and Plant BA), 2, 3 and 4, because the differences between these alternatives largely pertain to forest habitats (e.g., PACs, HRCAs, mature forest), where these species are not present. Under all alternatives, Riparian Conservation Area (RCA) requirements will apply, which include implementation of Equipment Exclusion Zones (EEZs). Standards and Guidelines for RCAs as well as Riparian Conservation Objectives (RCOs) that are considered when designing RCAs (Forest Service 2004). Within RCAs, project-specific EEZs for mechanized equipment have been established within a minimum 25 feet on each side of all perennial streams, intermittent streams, and Special Aquatic Features (SAFs; reservoirs, wetlands, fens, and springs) at a slope of 35 percent or less except for ephemeral streams where these activities would be excluded within 15 feet of these features (Table 3.2-4). Pre-implementation surveys for listed amphibians would occur in all suitable habitat and EEZs for these aquatic features would be extended to at least an 82-foot exclusion buffer where habitat is occupied by California red-legged frog, foothill yellow-legged frog, or Sierra Nevada yellow-legged frog. EEZs also apply within 25 feet on each side of all Other Riparian Features (ORFs; dry meadows, seasonal wetlands) at a slope of 35 percent or less when wet soil conditions are present. When slope is between 35 and 65 percent EEZs apply within 82 feet on each side of all aquatic features except ephemeral streams which would have a 25-foot EEZ. On slopes greater than 50 percent, mechanized harvest equipment would be allowed only where soil conditions permit. Within EEZs only hand treatments would be allowed and exclusion buffers for pile burning would be applied. For the underburn treatment and minimum distance to burn piles the same exclusion buffers will apply regardless of slope. Fire may be allowed to back into these exclusion buffers; however, no active ignition would be implemented within buffers other than within ephemeral stream channels. For manual treatments there is no exclusion buffer for treatment except where occupied California red-legged frog breeding habitat exists (see below). For active landings the EEZ designation applies within 150 feet on each side of all aquatic features.

The Project Area contains approximately 80,737 acres of designated RCA. Manual treatments could occur in approximately 47,213 acres (58 percent) of designated RCAs, mechanical treatments could occur in approximately 33,524 acres (42 percent) of designated RCAs and 0 acres of designated RCAs would remain untreated. All RCA acres are eligible for underburning, however, active ignitions would be limited to outside the EEZ.

Table 3.2-4 Riparian Conservation Area Operating and Equipment Specifications¹

Hydrologic Feature	Mechanical Thinning, Yarding, Mastication and Machine Piling Slash ^{1, 2, 3}			Active Landings	Underburn ^{3, 4}	Hand Cut ⁵	Minimum Distance to Burn Piles
	(A) Slope <35%	(B) Slope 35-50%	(C) Slope >50%				
Perennial Streams	25 or 82 feet	82 feet	Where soil conditions permit: Same as (B)	150 feet	25–82 feet	No buffer	25–82 ¹ feet
Intermittent Streams	25 or 82 feet				25–82 feet	No buffer	25–82 ¹ feet
Ephemeral Streams	15 feet	25 feet			No buffer	No buffer	15 feet
Special Aquatic Features (ponds, lakes, wetlands, fens, and springs)	25 or 82 feet	82 feet			25–82 feet	Perimeter of feature	25–82 ² feet
Other Riparian Features (dry meadows, seasonal wetlands)	0 to 25 feet ⁷				25 feet	Perimeter of feature	25 feet

¹ Minimum distance to burn pile buffers are 300 feet for sites occupied by California Red-Legged Frog. Refer to Design Feature CRLF-1.

² Fell trees away from streams.

³ For streams and SAFs, default EEZ buffers are 25 feet; however, if special-status aquatic species are present, the EEZ buffer would be 82 feet.

⁴ Prescribed burning is allowed in RCAs, but ignitions are not. Prescribed fire may back into this zone.

⁵ In surveyed, occupied habitat for special status amphibians, the minimum exclusion distance is increased to 82 feet.

⁶ No hand cutting of riparian vegetation or vegetation that provides stream bank stabilization. The minimum distance for burning piles must be adhered to. Hand cutting within SAFs, and other riparian features is allowed if marked by a designated hydrologist or biologist.

⁷ Minimum buffers for meadow features vary depending on soil conditions (e.g., when dry soil conditions are present there would be a smaller buffer).

Further, design features will be implemented, including general hydrology, soil, and aquatic resources design features; general amphibian design features; and conservation measures for California red-legged frog, foothill yellow-legged frog, and Sierra Nevada yellow-legged frog (Appendix A). These requirements would provide some protection for these species, especially from mechanical treatments and herbicide application; however, direct impacts could still occur as a result of project implementation because all frogs may not be detected during pretreatment surveys and because manual treatments could result in frogs being crushed if present in the treatment area.

Indirect Impacts

No Action Alternative

Under the No Action Alternative, new fuel treatments designed to reduce the potential for high-intensity wildfire in the Project area would not occur. Without implementation of these treatments, it is likely that periodic high-intensity wildfires would continue to occur in the Project area. High-intensity wildfire exhibiting moderate to high soil burn severities would also likely generate substantially increased runoff and erosion that would measurably affect water quality in streams within and near burned areas, which could result in adverse effects on riparian and aquatic habitats suitable for California red-legged frog, foothill yellow-legged frog, and Sierra Nevada yellow-legged frog.

Alternatives 2, 3 and 4

Potential impacts on California red-legged frog, foothill yellow-legged frog, and Sierra Nevada yellow-legged frog are similar across Alternatives 1 (as described in the Wildlife and Plant BA), 2, 3 and 4, because the differences between these alternatives largely pertain to forest habitats (e.g., PACs, HRCAs, mature forest), where these species are not present. Indirect adverse effects would occur if treatment activities permanently altered habitat or site conditions in a manner that later resulted in a loss or degradation of aquatic or adjacent upland habitat suitable for California red-legged frog, foothill yellow-legged frogs, or Sierra Nevada yellow-legged frogs, or resulted in indirect water quality impacts (e.g., introduction of sediment to a perennial stream or other aquatic feature). Indirect effects resulting from project implementation could include changes in microclimate (e.g., reduced humidity, increased air temperatures) adjacent to aquatic habitats or within riparian habitats due to loss of riparian vegetation, loss of sheltering habitat due to consumption of woody debris, and increased sedimentation to the stream channel due to increased overland flows in upland habitats after removal of vegetation.

General design features (e.g., pretreatment surveys for listed amphibians; establishment of RCAs; general hydrology, soil, and aquatic resources design features;) and species-specific design features (e.g., Design Features CRLF-1 through CRLF-4, including consistency with the EPA California red-legged frog injunction; Design Feature FYLF-1; Design Feature SNYLF-1; Appendix A) would be included under all alternatives. These measures would include implementation of standards and limitations for operations within RCAs, standards for mechanical operations in wet weather conditions, and standards for water drafting that would minimize direct effects on aquatic and riparian habitat, in turn preventing erosion, sedimentation, and degradation of water quality and reducing the likelihood of long-term or indirect effects on these habitats. Further, treatments would be implemented over several years, and all habitat suitable for these species would not be treated in a single year, which would allow for upland habitat in the project area to remain and habitat to reestablish over time. However, due to the scale of the project in size and duration, it is difficult to predict all foreseeable potential indirect impacts on California red-legged frogs, foothill yellow-legged frogs, and Sierra Nevada yellow-legged frogs and habitat associated with the species, and indirect impacts may occur as a result of project implementation.

Gray Wolf (No Action and Alternatives 2, 3 and 4)

Direct Impacts

No Action Alternative

Under the No Action Alternative, no fuels treatments would occur. As a result, there would be no direct impact on gray wolf due to project activity.

Alternatives 2, 3 and 4

Potential impacts on gray wolf are similar across Alternatives 1 (as described in the Wildlife and Plant BA), 2, 3, and 4, because the differences between these alternatives largely pertain to the posttreatment tree density and location of treatments in forest habitats, and gray wolves are habitat generalists. Direct impacts on gray wolf would occur if treatment activities are implemented within occupied habitat and individuals (including young) are injured or killed by heavy machinery or burning (e.g., during prescribed fire activities) during implementation. Noise and other disturbance from operation of heavy machinery, chainsaws, or other vehicles during treatment activities (including mechanical treatments and manual treatments) could cause displacement of gray wolves from dens, rendezvous sites, or foraging areas. While displacement would sometimes be temporary, gray wolves could be excluded from high quality habitats during sensitive periods (e.g., breeding season) and could abandon these sites permanently. Individual wolves moving through the Project area could encounter equipment or personnel associated with project activities; however, adult wolves would likely flee from these activities and move to nearby suitable habitat and movement corridors. However, adult wolves with young (i.e., in natal dens, at rendezvous sites) or young that have been left alone while adult wolves are hunting, may not be capable of fleeing, and would be more vulnerable to potential impacts from project activities.

A design feature pertaining to gray wolf (i.e., Design Feature WOLF-1) is presented in detail in Appendix A. Prior to commencement of timber harvest, road maintenance or other project activities that have the potential to cause direct effects to wolves, the Plumas NF shall contact California Department of Fish and Wildlife (CDFW) and the U.S. Fish and Wildlife Service (the Service) to determine the presence of wolf activity near the project area. If no wolves are GPS-collared at the time of project implementation, the Forest Service will work closely with the CDFW and the Service to ensure the best available information on wolf locations and habitat use are employed to inform management activities and monitoring on the Plumas National Forest. If an active den or rendezvous site is located within one mile of the project area, the following conservation measures would be implemented:

- A limited operating period (LOP) restricting all noise or smoke generating activities would be instated from April 1 through July 15 within one mile of the den site. Further discussions and coordination with CDFW and the Service may result in modified distances or more flexible dates for this specific conservation measure. In addition, if the den or rendezvous sites are clearly separated from project-generated disturbances by topographic features or terrain, seasonal restrictions may be adjusted or eliminated, as approved by the Service. These conservation measures would avoid or minimize disturbance at active den or rendezvous sites that could disrupt reproductive success or result in adverse effects. Dens that are known to be used in consecutive years but not used in the current year may require a LOP if CDFW or the Service determines it is necessary.

- Early rendezvous sites are typically close to dens: implementing a LOP within 1 mile of den sites will generally mitigate effects to early rendezvous sites when pups are still vulnerable. Coordination with CDFW and the Service prior to implementation would be done to ensure protection of all known and/or newly discovered den and rendezvous sites.
- If a den is discovered during implementation of the proposed project, the LOP shall be implemented and coordination with CDFW and the Service shall be pursued.

These requirements will provide protection for gray wolves as recommended by CDFW and the Service. Direct effects (i.e., injury, mortality) on gray wolves outside of the breeding season would be unlikely to occur as a result of project implementation.

Indirect Impacts

No Action Alternative

Under the No Action Alternative, new fuel treatments designed to reduce the potential for high-intensity wildfire in the Project area would not occur. Without implementation of these treatments, it is likely that periodic high-intensity wildfires would continue to occur in the Project area, which could have both adverse and beneficial effects to gray wolf prey and their habitat.

Alternatives 2, 3 and 4

As described above, potential impacts on gray wolf are similar across Alternatives 1 (as described in the Wildlife and Plant BA), 2, 3, and 4.

Indirect adverse effects would occur if treatment activities altered habitat or site conditions in a manner that later resulted in a loss or degradation of habitat suitable for gray wolves, including den, rendezvous site, foraging, or dispersal and movement habitat. Project implementation would not result in any habitat becoming unsuitable for gray wolf, other than disturbance-caused short-term avoidance of habitat otherwise suitable for the species. Disturbance-related avoidance would be minimized through implementation of no-disturbance buffers limiting activities near den and rendezvous sites.

Potential indirect effects would include effects on gray wolf prey species (e.g., mule deer [*Odocoileus hemionus*]) through habitat modification, which has the potential to affect the prey base density for this species. Mule deer exhibit a preference for habitats with a mosaic of vegetation, including herbaceous openings, dense brush or tree thickets, riparian areas, and an abundance of edge habitats. Project treatments objectives under all alternatives include increasing stand structural heterogeneity, and the VDT approach that would be implemented is designed to produce a mosaic of individual trees, clumps of trees, and small openings to enhance stand resilience to severe disturbances. As a result, these treatments would likely enhance habitat in the project area for mule deer. Thus, indirect negative impacts associated with gray wolf prey (i.e., mule deer) would also be minimal.

Forest Service Sensitive Wildlife Species (Alternatives 1, 2, 3, and 4)

Thirteen Forest Service sensitive wildlife species are known or have potential to occur in the Project area, based on habitat requirements and species distribution. These species could be affected by the proposed action. The potential direct, indirect, and cumulative impacts on all of these species that could result from Alternatives 1, 2, 3, and 4 are discussed in the following sections.

Northern Goshawk and California Spotted Owl

California Spotted Owl Population Status

The California spotted owl (*Strix occidentalis occidentalis*) is currently managed as a USDA Forest Service Sensitive species (Forest Service 2013a). Sensitive species are species identified by the Regional (R5) Forester where population viability is a concern because of (1) downward population trends and/or (2) diminished habitat capacity that may reduce species distribution. The current R5 guidance based on best available science for the California spotted owl (CSO) may be found in the California Spotted Owl Conservation Strategy (Forest Service 2019).

On February 23, 2023, the U.S. Fish and Wildlife Service proposed to list two distinct population segments (DPS) of the California spotted owl under the Endangered Species Act of 1973, as amended. The 12-month finding on a petition to list the California spotted owl found that listing the Sierra Nevada DPS, which overlaps with the project area, as threatened was warranted.

Northern Goshawk Population Status

The latest published information regarding the goshawk, in terms of Sierra Nevada distribution, population and habitat trends, and species requirements can be found within SNFPA FEIS (Chapter 3, Part 4.4.2.2), and in Chapter 3.2.2.4 of the SNFPA FSEIS 2004. A total of 588 northern goshawk-breeding territories have been reported from Sierra Nevada National Forests. In 2000, there were approximately 75 northern goshawk nesting territories or PACs within PNF (Forest Service 2001), but by August 2022 this number had grown to 184 goshawk PACs. Not included in this number are 25 PACs that were retired due to wildfire.

Population trends for northern goshawks in the Sierra Nevada are unknown, but data from several studies has raised concern that goshawk populations and reproduction may be declining in California and throughout North America due to changes in the amount and distribution of habitat or reductions in habitat quality (Reynolds et al. 1994; Kennedy 1997; Squires and Reynolds 1997; Smallwood 1998; DeStefano 1998). A recent study on the PNF found that goshawks avoid recently burned forest habitat (Blakey et al. 2020). Due to the extensive fires that have burned in the past few years (North Complex, Dixie, Walker) there may be extensive declines in populations within burned areas.

Direct Impacts

No Action Alternative

Under the No Action Alternative, no fuels treatments would occur. As a result, there would be no direct impact on California spotted owl or northern goshawk due to project activity.

Alternative 1: Vegetation Treatments to Protect Communities and Achieve Landscape Resilience

Direct impacts of Alternative 1 on northern goshawk and California spotted owl would occur if active nests, eggs, or individuals, including nestlings, are lost through nest failure or abandonment during implementation of treatment activities. Logging, temporary road construction, prescribed fire, or other associated activities within or adjacent to occupied habitat could result in disturbance to individuals. Under Alternative 1, mechanical treatments would only be permitted within low-productivity PACs (i.e., PACs presently unoccupied and historically occupied by territorial singles or not used for reproduction since prior to 2000) and moderate-productivity PACs (i.e., PACs presently unoccupied

but historically occupied by pairs and used for reproduction since 2000). Only manual treatments and prescribed fire would be permitted within high-productivity PACs (i.e., PACs presently or recently occupied by pairs and currently or historically used for reproduction). A total of 169 existing PACs are in the Project area, including 98 spotted owl PACs and 71 northern goshawk PACs. Of these, a total of up to 110 low- and moderate-productivity PACs could be subject to mechanical treatments under this alternative. Manual treatments and prescribed fire would be permitted within all PACs. See Table 3.2-5 for mechanical treatment and number of PACs affected for Alternatives 1, 2, 3, and 4.

Table 3.2-5 Mechanical Treatment and Number of PACs for Alternative 1, 2, 3, and 4

	Total PACs in Project area	Total # of PACs – Mechanical Treatment (MT)	Total # of High-Productivity PACs with MT	Percent (%) of High-Productivity PACs in Project area treated with MT	Total # of PACs with no MT
Alternative 1	169	110	0	0%	59
Alternative 2	169	154	52	88%	15
Alternative 3	169	0	0	0%	169
Alternative 4	169	110	0	0%	59

All of the treatment activities would typically include the presence of personnel (e.g., hand crews, prescribed fire crews) and noise generating activities such as use of chainsaws, heavy equipment, water trucks, and chippers. All treatment activities could be used within treatment units outside of PACs where northern goshawk and California spotted owl could occur (e.g., mature forest, general forest). Treatment activities including mechanical thinning, grapple piling, mastication, and road maintenance would involve varying degrees of heavy machinery use.

Treatment activities that result in removal of large trees or snags (i.e., mechanical thinning, hazard tree removal, site preparation for reforestation) could result in inadvertent loss of nest trees, roost trees, foraging habitat, or disturbance to or removal of nests within or near these trees if nests are not identified prior to implementation. Use of heavy machinery or chainsaws during implementation of treatment activities (i.e., mechanical thinning, manual treatments, grapple piling, mastication, prescribed fire, pile burning, hazard tree removal, reforestation, road maintenance) could result in increased visual stimuli (e.g., presence of personnel, vehicles, equipment) or increased noise within the vicinity of an active nest, if these nests are not identified prior to implementation. Increased disturbance in the vicinity of active nests could result in direct impacts including abandonment of the active nest and subsequent loss of eggs or young.

Design features included as part of the Project would be implemented to avoid inadvertent loss of active nests, eggs, or individuals. Pretreatment surveys would be conducted prior to implementation of treatment activities in forest habitats suitable for northern goshawk or California spotted owl. If active northern goshawk or California spotted owl nests are detected, a limited operating period (LOP) would be implemented within 0.25 mile of the nest during the active breeding season for these species (February 15–September 15 [northern goshawk], March 1–August 31 [California spotted owl]). If an active northern goshawk or California spotted owl nest is documented outside of an established PAC, the existing PAC would be revised to include the nest site or a new PAC would be designated following PNF standards, within which all PAC requirements described under the Project alternatives would apply. Regardless of the time of year, under Alternatives 1 and 4, mechanical treatments would not be conducted within approximately 372 feet of California spotted owl and northern goshawk activity centers (maximum 6 locations per PAC. See Appendix A p. A-7 CSO-3 and NOGO-3).

Design features are described in more detail in Appendix A. Because pre-implementation surveys would be conducted in suitable habitat and LOPs would be established to protect nest sites, direct effects on northern goshawk and California spotted owl would be minimized.

Alternative 2: Vegetation Treatments to Protect Communities Consistent with the Existing Forest Plan

Under Alternative 2, mechanical treatments would be permitted within PACs that are located within the WUI Defense Zone subject to limitations in the Forest Plan. Some PACs within the WUI Threat Zone would be prioritized for mechanical treatments based on location and site condition relative to strategic fire control goals. While the actual number of PACs subject to mechanical treatments would likely be less, this could allow mechanical treatments in up to 89 PACs for spotted owl and 65 PACs for northern goshawk, a total of up to 154 PACs (Table 3.2-5). Of these, 102 are considered low/medium productivity and 52 are considered high productivity, which is up to approximately 93 percent of the low/medium productivity PACs and 88 percent of the high productivity PACs in the Project area (Table 3.2-5). As with Alternative 1, manual treatments and prescribed fire would be permitted within all PACs. The same design features as Alternative 1 would apply for Alternative 2, except mechanical treatments would not be allowed within 500 feet of a California spotted owl or northern goshawk nest (as opposed to 372 feet for activity centers under Alternatives 1 and 4). The same direct impacts on California spotted owl and northern goshawk as described above for Alternative 1 involving disturbance and mortality could occur under Alternative 2 and the same design features would be implemented, including requirements to conduct surveys and establish LOPs to avoid inadvertent loss of active nests, eggs, or individuals. While Alternative 2 would result in direct impacts from mechanical treatments in more PACs because a greater number of PACs would be mechanically treated compared to Alternative 1 (Table 3.2-5), the sum of PACs treated with manual and mechanical treatments is the same for Alternatives 1 and 2. Manual and mechanical treatments could both result in disturbance, abandonment, or removal of California spotted owl and northern goshawk nests. Thus, this alternative would have a similar potential for direct impacts as Alternative 1. As with Alternative 1, pre-implementation surveys and establishment of LOPs would minimize direct effects on the species.

Alternative 3: Vegetation Treatments to Protect Communities with Reduced Intensity Treatments

Alternative 3 would include the same suite of treatments as Alternative 2, but with more manual treatments and less mechanical treatments. Under Alternative 3, no mechanical treatments would be permitted within PACs. As with Alternative 1, manual treatments and prescribed fire would be permitted within PACs. Alternative 3 would also not include mechanical treatments in mature forest and HRCAs outside of the WUI Defense Zone, resulting in less direct disturbance from mechanical treatments than Alternatives 1 or 2. The same design features as described for Alternative 2 would apply to Alternative 3. Alternative 3 would result in the same types of direct impacts on California spotted owl and northern goshawk as described above for Alternative 1 and 2. Although Alternative 3 would include mechanical treatment in some treatment units, there would be no mechanical treatment implemented in PACs (Table 3.2-5). Mechanical and manual treatments could both result in disturbance, abandonment, or removal of California spotted owl and northern goshawk nests. However, mechanical treatments result in a greater potential for direct disturbance due to the presence of more mechanical equipment and the removal of more and larger trees. For these reasons, the direct effects of Alternative 3 would be similar to, but less than, Alternatives 1 and 2.

Alternative 4: Vegetation Treatments to Protect Communities and CSO Territories

Direct effects under Alternative 4 would be similar to Alternative 1, there is no difference in the number or productivity level of PACs that would be mechanically treated. Only manual treatments and prescribed fire would be permitted within high-productivity PACs (i.e., PACs presently or recently occupied by pairs and currently or historically used for reproduction). The same design features as described for Alternative 1 would apply to Alternative 4, with the exception of design features specific to HRCAs for Alternative 1 and design features specific to Territories and Wildlife Corridors for Alternative 4.

Indirect Impacts

No Action Alternative

Because the No Action Alternative would not implement fuel treatments, habitat in the Project area would become increasingly susceptible to stand replacing wildfire (See Section 3.1, “Fuels, Fire, and Forest Health”). California spotted owl and northern goshawk populations have been declining in portions of their range and emerging threats (e.g., mega fires, climate change, barred owl range expansion, toxicant exposure) are a concern for the longevity of these species (Forest Service 2019). These species evolved within landscapes that were within the natural range of variation (i.e., ecosystems that were present 300–400 years prior to European-American Settlement) and managing the landscape to move towards natural range of variation is necessary for California spotted owl conservation (Safford and Stevens 2017). Forests consistent with the natural range and of variation are complex with dense patches of forest that include large live and dead trees as well as a complex understory with large down logs, shrubs, and herbaceous vegetation. However, habitat in the Project area has been affected by fire exclusion; the resulting high concentration of fuels and increasing conifer densities threaten the persistence of this habitat on the landscape. Risks to the persistence of California spotted owl and northern goshawk habitat are also likely being exacerbated by increased temperature, drought, and extreme weather conditions caused by climate change. With the No Action Alternative, no management action in existing habitat suitable for these species would occur and resiliency to high-severity fire and other severe disturbances (e.g., insects, disease, drought, climate change) would continue to decrease over time. As a result, habitat suitable for these species in the Project area would be at risk of loss from a catastrophic wildfire.

Between 2017 and 2022, 43 percent of habitat within PNF suitable for California spotted owl (and in turn, northern goshawk, Pacific marten, and fisher) (CWHR Size Class 4 or 5, and Density Class M or D) was lost directly due to high severity fires or fragmented into smaller patches of suitable habitat due to high severity fire (data from Forest Service 2022a). This analysis included the North Complex Fire from 2020. During this time, following Forest Service land management direction (Forest Service 2004 p.37), 51 spotted owl PACs were retired and another 100 were revised to exclude areas of high severity fire that rendered habitat unsuitable, largely as the result of the North Complex Fire in 2020 and the Dixie Fire in 2021. The North Complex fire affected 77 spotted owl PACs and 32 were retired, the Dixie Fire affected 66 spotted owl PACs and 18 were retired. Since 2000, the Plumas NF has had 177 of the 319 designated PACs (55 percent) affected by wildfires and 75 of those have been retired. The 102 PACs impacted by fire that were not retired were instead revised to exclude high severity patches and many now consist of lower quality habitat in a less compact configuration. Large wildfires in the last several years have reduced habitat for California spotted owl, northern goshawk, and other species associated with mature forest habitat in PNF. Some California spotted owl PACs that were rendered unsuitable post-fire were likely redrawn within the Project area, and the Project area provides some of

the only

remaining habitat suitable for mature forest-associated wildlife species in PNF. Future high severity wildfire would likely reduce the remaining habitat suitable for California spotted owl and northern goshawk in the project area if treatments under the Project were not implemented. Under the No Action Alternative, impacts on suitable California spotted owl and northern goshawk habitat would likely be similar to other fires in the last several years in that this habitat would be burned at a range of severities and only a percentage of this habitat would be subject to high-severity fires and be rendered unsuitable for California spotted owl and northern goshawk. The effects of future wildfires are difficult to predict and would be dependent on various factors, including ignition timing and location, characteristics of the fire, weather (e.g., wind, temperature, relative humidity), topography, and existing forest conditions. However, it is reasonable to expect that the future loss of habitat for California spotted owl and northern goshawk could be similar to the magnitude of loss after recent wildfires (e.g., loss of 43 percent of suitable habitat between 2017 and 2022).

By taking no action, fire behavior is expected to continue to result in large, high-mortality fires such as the Dixie Fire of 2021. Over the long term, mortality occurring in high-density stands would continue to increase surface fuel load through deadfall of standing dead trees. This increase in mortality and related deadfall has been witnessed in the Project area and other parts of the Sierra Nevada range as a result of region-wide drought in the late 1980s (Guarin and Taylor 2005). These increased surface fuels, combined with continuous ladder and canopy fuels, would likely maintain stands susceptible to high-mortality fires such as the Dixie Fire. According to fire modeling incorporating 98th percentile weather conditions, 42 percent of PACs and 37 percent of the HRCAs designated in the Project area would experience crown fire under the No Action Alternative. Additionally, fire modeling showed that 25-foot flame lengths would occur in 72 percent of PACs and 64 percent of HRCAs at these weather conditions. These flame lengths could lead to high mortality in forested areas, including within untreated streamside areas, PACs, and HRCAs in the Project Area.

Alternative 1: Vegetation Treatments to Protect Communities and Achieve Landscape Resilience

Indirect adverse effects would occur if treatment activities under Alternative 1 altered habitat or site conditions in a manner that later resulted in a lack of suitable habitat for northern goshawk or California spotted owl. Habitat alteration that could adversely affect northern goshawk or California spotted owl may include loss of large, mature trees and snags, reduction in canopy cover, temporary reduction in structural complexity, loss of prey species and prey habitat.

The desired habitat conditions for northern goshawk and California spotted owl PACs are described in more detail in Section 3.2.2, “Affected Environment,” and descriptions of posttreatment conditions within PACs and HRCAs for each Project alternative are described in Chapter 2, “Proposed Action and Alternatives.” All treatments would implement variable-density thinning (VDT), which is intended to improve forest health by enhancing species composition, increase stand structural heterogeneity, and accelerate growth of mid-seral forests toward mature and late seral forest conditions. Mature forest (i.e., 4M, 4D, 5M, 5D) of the following forest types within in the Project area is considered to be suitable habitat for California spotted owl and northern goshawk: sierran mixed conifer, white fir, montane hardwood conifer, montane hardwood, Douglas fir, eastside pine, Jeffrey pine, ponderosa pine, red fir, blue oak-foothill pine, and subalpine conifer habitat types.

Under Alternative 1, posttreatment conditions would vary between low- and moderate-productivity PACs and high-productivity PACs. The goal for this is to protect and maintain current habitat conditions where PACs are highly productive and increase treatment opportunities in PACs with low or moderate productivity, in other words, PACs that have not been used by owls consistently in recent years. Treatments within PACs will maintain suitable habitat and be designed to maintain or promote suitable habitat by retaining the largest, tallest trees, retaining canopy cover clumps among the large trees, increasing the quadratic mean diameter of the PAC as a whole, and maintaining the quality of habitat in the highest quality nesting and roosting habitat. A total of up to 21,429 acres of low and moderate productivity PACs could be subject to mechanical treatments under this alternative (Table 3.2-6). Within low- and moderate-productivity PACs subject to mechanical treatment, up to six 10-acre nest and roost sites would be subject to lower-intensity treatments wherein only manual thinning could occur, trees greater than 8 inches dbh would be retained, and 70 percent canopy cover would be maintained. Outside of these 10-acre nest and roost sites within low- and moderate-productivity PACs, mechanical treatments could be implemented, trees equal to or greater than 24 inches dbh would be retained, and canopy cover would be maintained at 50 percent (or 60 percent for CWHR class 5D stands). Four to six snags would be retained per acre under Alternative 1. Within California spotted owl HRCAs canopy cover would be maintained at 40–50 percent. In some areas California spotted owl HRCA overlaps with norther goshawk PAC; in these areas, treatments will default to treatment prescriptions for PACs.

Table 3.2-6 Acreage of Mechanical Treatment in PACs for Alternative 1, 2, 3, and 4

	Total PAC acres in Project area¹	Total Acres of Mechanical Treatment in PACs	Total Acres of Mechanical Treatment in High Productivity PACs	Total Acres of no Mechanical Treatment in PACs
Alternative 1	38,532	21,429	0	17,103
Alternative 2	38,532	11,906	4,377	7,529
Alternative 3	38,532	0	0	38,532
Alternative 4	38,532	21,429	0	17,103

¹ Acreage estimates show the total amount of project area within a PAC for California spotted owl or northern goshawk. Where PACs overlap, the overlap area is only counted once.

Posttreatment conditions would prevent habitat modification within PACs and HRCAs that would lead to the PAC or HRCA being considered unsuitable for the species (e.g., canopy coverless than 50 percent for PACs and 40 to 60 percent for territories [Forest Service 2019]). While PACs within the Project area were designed to incorporate high-quality suitable habitat, additional suitable habitat is present within other treatment units (e.g., mature forest, general forest). Of the 136,807 total acres being treated outside of PACs and HRCAs approximately 68,599 acres are classified as suitable habitat (Table 3.2-7a). Suitable habitat acreages in Table 3.2-7a and 3.2-8 were calculated by removing any suitable habitat that had been burned at high severity (Class 4) in the last five years in the Post-Wildfire Area planning unit because it no longer contributes components that meet the requirements of suitable habitat for nesting, roosting and foraging. While high severity burn areas, especially in large patches may contain large/tall snags, they lack other important characteristics of mature forest that species depend upon for nesting, roosting, cover, and microclimate control over the long term, especially over time as the tree mortality continues to degrade the stand. These characteristics important for nesting and roosting include dense canopy cover, large down woody debris, horizontal and vertical complexity. Additionally, all suitable habitat in the Existing Fuel Breaks planning unit was also removed. These calculations were done for planning purposes only. Due to the scale of the project area and inherent limitations in remote sensing data, the exact area of mature forest habitat in the project area may be slightly different than presented herein. Treatments within suitable habitat outside of PACs and HRCAs, such as mature forest or general forest units, would not be subject to the same limitations as those within PACs and HRCAs (i.e., the canopy cover retention limits in PACs and

HRCAs would not apply). Within mature forest and general forest units, as well as the other units outside of PACs and HRCAs, approximately 20 to 30 percent canopy cover would be maintained (i.e., retention of rSDI from 23 to 28 percent), and zero (in the WUI Defense Zone) to four snags (outside of the WUI Defense Zone) would be retained per acre. The retention of zero snags per acre in WUI Defense would decrease habitat quality for California spotted owl and northern goshawk in the WUI Defense Zone.

Table 3.2-7a Pre- and Posttreatment Suitable Habitat (Nesting/Roosting and Foraging) in the Project area for Alternatives 1, 2, and 3

Planning Unit	Existing Suitable Habitat	Alternative 1 – Posttreatment Suitable Habitat Acres	Alternative 2 – Posttreatment Suitable Habitat Acres	Alternative 3 – Posttreatment Suitable Habitat Acres
PAC ¹	32,830	32,830	32,830	32,830
HRCA ²	33,115	33,115	20,553	33,115
Outside of PACs and HRCAs	68,599	9,240	30,171	57,054
Total	134,544	75,186	83,554	122,999

¹ Acreage estimates show the total amount of project area within a PAC for California spotted owl or northern goshawk. Where PACs for different species overlap, the overlap area is only counted once.

² Where a northern goshawk PAC overlaps with a California spotted owl HRCA, acres are counted as PAC.

Table 3.2-7b Pre- and Posttreatment Suitable Habitat in the Project area for Alternative 4.

Planning Unit	Existing Suitable Habitat	Alternative 4 – Posttreatment Suitable Habitat Acres
PACs ¹	32,830	32,830
Territories ¹	23,159	16,345
Wildlife Corridors	22,668	22,668
Outside of PACs/Territories/Wildlife Corridors	55,888	11,420
Total	134,544	83,263

¹ Acreage estimates do not include PACs and Territories in the Bucks Lake Wilderness and Feather River Wild Planning Units, which are included in the Outside of PACs/Territories/Wildlife Corridors Planning Units.

The treatment targets would prevent complete habitat type conversion (i.e., forest to shrub). However, treatment activities within approximately 59,359 acres of suitable habitat outside of PACs and HRCAs would thin suitable habitat to an rSDI of 23 to 28 percent resulting in 20 to 30-percent canopy cover. These areas would no longer be suitable for California spotted owl or northern goshawk. Currently, a total of approximately 134,544 acres of suitable habitat is present within the Project area. Approximately 68,599 acres of suitable habitat are present outside of PACs and HRCAs, which comprises approximately 51 percent of the suitable habitat in the Project area pre-implementation (Table 3.2-2; Table 3.2-7a). For Alternative 1 approximately 9,240 acres of suitable habitat outside of PACs and HRCAs and a total of approximately 75,186 acres of suitable habitat would remain in the Project area posttreatment (Table 3.2-7a). This would constitute an approximately 44 percent reduction of suitable habitat in the Project area for Alternative 1. This would contribute to the decreased connectivity of suitable habitat in the Project area, especially in the eastern portion of the Project area. Alternatives 1 and 4 would retain the most important habitat for California spotted owl and northern goshawk in the existing PACs and HRCAs, but the reduction of suitable habitat occurring outside of PACs and HRCAs would decrease the availability of suitable habitat to set aside new PACs and HRCAs in the future. Proposed treatments could degrade or remove spotted owl nesting, roosting, foraging or dispersal habitat by affecting a variety of components of each habitat type. Treatments could reduce key nesting

and roosting components such as canopy cover, multiple canopy layers, amount of large and very large trees and snags, and coarse woody debris. Proposed treatments could degrade or remove foraging habitat by creating larger areas of open canopy, temporarily affect prey species via ground disturbance with heavy machinery or remove large trees and snags such as in general forest where no PACs and HRCA or Territories are present but that contain suitable habitat, and in high severity burn areas proposed for reforestation.

Nesting/Roosting and Foraging Habitat

The Highest Quality Nesting and Roosting habitat (HQNR) available in the Project area is present in the mature forest CWHR 5D and 5M habitat types (i.e., 5D = trees greater than 24 inches dbh, greater than 24 feet crown diameter, with 60- to 100-percent canopy cover; 5M = trees greater than 24 inches dbh, greater than 24 feet crown diameter, with 40- to 59-percent canopy cover). Habitat suitable for northern goshawk or California spotted owl nesting in the Project area would be reduced by approximately 35 percent (Table 3.2-8). The Best Available Nesting, Roosting and Foraging habitat (BANRF) in the Project area is present in the CWHR 4D and 4M habitat types. Under Alternative 1, California spotted owl and northern goshawk foraging habitat would be reduced by approximately 51 percent (Table 3.2-8). Although there would be a reduction in nesting and foraging habitat, this change would occur outside of PACs and HRCAs (Table 3.2-7a and Table 3.2-8). Under Alternative 1, suitable nesting and foraging habitat in PACs and HRCAs would remain suitable for northern goshawk and California spotted owl.

Table 3.2-8 Pre- and Posttreatment Nesting (i.e., CWHR 5D and 5M) and Foraging (i.e., CWHR 4D and 4M) Habitat Acres (% remaining) in the Project area for Alternatives 1, 2, 3 and 4

	Pretreatment	Alt 1 Posttreatment	Alt 2 Posttreatment	Alt 3 Posttreatment	Alt 4 Posttreatment
5D	43,947	14,951 (34.0%)	2,410 (5.5%)	24,615 (56.0%)	18,268 (41.6%)
5M	16,054	23,875 (148.7%)	37,566 (234.0%)	31,725 (197.6%)	27,003 (168.2%)
Total Nesting	60,001	38,825 (64.7%)	39,975 (66.6%)	56,340 (93.9%)	45,271 (75.5%)
4D	39,777	4,923 (12.4%)	2,075 (5.2%)	19,967 (50.2%)	4,922 (12.4%)
4M	34,766	31,438 (90.4%)	41,504 (119.4%)	46,691 (134.3%)	33,069 (95.1%)
Total Foraging	74,543	36,360 (48.8%)	43,579 (58.5%)	66,659 (89.4%)	37,992 (51.0%)
Grand Total	134,544	75,186 (55.9%)	83,554 (62.1%)	122,999 (91.4%)	83,263 (61.9%)

PACs are designed to incorporate habitat suitable for northern goshawks and California spotted owls within approximately 200 and 300 acres, respectively, of a documented nest or roost area, and California spotted owl HRCAs are designed to incorporate an average of 700 acres of habitat used for nesting, roosting, foraging, dispersal, and territorial activities (Forest Service 2004). As a result, PACs and HRCAs in the Project area incorporate much of the highest-quality habitat for these species in the Project area. Approximately 33,115 acres of suitable habitat is present in HRCA planning areas in the project area and approximately 32,830 acres of suitable habitat is present in PACs (Table 3.2-2 and 3.2-7a). PACs would retain all 5D habitat, and 5M habitat in HRCAs would increase as a result of thinning some 4D habitat thereby converting it to 5M habitat. As stated above, suitable habitat would be reduced by approximately 44 percent (Table 3.2-7a), including a 35 percent reduction in suitable nesting habitat in the Project area (Table 3.2-8), and some of the suitable habitat, particularly in the eastern portion of the Project area, would become patchy and disconnected. As described above under Direct Impacts and in the Project design features (Appendix A), surveys for northern goshawk and California spotted owl would be conducted prior to treatment activities within habitat suitable for the species. If northern goshawk

or California spotted owl nests, roosts, or territories are detected, a PAC would be established within the occupied habitat, and these areas would be managed, and applicable treatment limitations would apply to preserve habitat suitability for the species. Thus, the actual amount of suitable habitat that would be converted to non-suitable habitat would likely be less than shown in tables 3.2-7a and 3.2-8, and occupied habitat would be retained.

Conclusion

Under the existing conditions, 43 percent of suitable habitat in PNF was lost in the past five years directly due to high severity fires or fragmented into smaller patches (Forest Service 2022a). This trend is expected to continue or worsen under the No Action Alternative (see Section 3.1, “Fire, Fuels, and Forest Health”). With Alternative 1, decreased occupancy and available suitable habitat will be offset by the long-term benefits of reducing habitat loss in the most important areas (i.e., PACs and HRCAs) due to high severity fire in the Project area. Within recent wildfires, high severity fire burned in relatively large contiguous patches, reducing connectivity of remaining mature forest habitat. While Alternative 1 could remove a similar amount of habitat as has been lost within recent wildfires to high severity fire (i.e. the No Action Alternative), it is expected to retain greater habitat connectivity and focuses on retaining the habitat currently being utilized by the species. Additionally, to prevent some adverse effects on these species in the Project area the following measures would apply to treatment activities under Alternative 1: 1) treatment activities within PACs and HRCAs would be designed to maintain habitat suitability for these species (i.e., retain at least 40 percent cover) and all treatments would implement VDT, which is intended to promote mature and late seral forest characteristics, 2) surveys for northern goshawk and California spotted owl would be conducted to determine occupancy within habitat suitable for the species outside of established PACs, and if active nests are detected, an LOP would be implemented within 0.25 mile of the nest during the active breeding season for these species, and 3) new PACs would be established for any northern goshawk or California spotted owl nests or areas of concentrated use detected during pretreatment surveys and would be subject to protections and treatment restrictions for PACs. Tables of suitable habitat in California spotted owl PACs, HRCAs, PACs + HRCAs and northern goshawk PACs pre- and post-implementation is presented in Appendix E8. Summary tables of this data are presented below in Tables 3.2-9 and 3.2-10.

Table 3.2-9a Summary of Percentage of Suitable Habitat Remaining Posttreatment in California Spotted Owl PACs and HRCAs for Alternative 1

	PACs	HRCAs	PACs + HRCAs
% 5D Posttreatment	100%	16.7%	50.5%
% 5M Posttreatment	100%	376%	272%
% 4D Posttreatment	37.1%	10.2%	18.9%

	PACs	HRCAs	PACs + HRCAs
% 4M Posttreatment	225%	258%	247%
% Suitable Habitat Posttreatment	100%	98.3%	98.9%

Note: Suitable Habitat = CWHR 4M, 4D, 5M, 5D.

Table 3.2-9b Summary of Percentage of Suitable Habitat Remaining Posttreatment in California Spotted Owl PACs and HRCAs for Alternative 2

	PACs	HRCAs	PACs + HRCAs
% 5D Posttreatment	14.9%	3.6%	7.7%
% 5M Posttreatment	428%	290%	345%
% 4D Posttreatment	14.9%	4.3%	7.5%
% 4M Posttreatment	269%	180%	207%
% Suitable Habitat Posttreatment	100%	67.8%	79.5%

Note: Suitable Habitat = CWHR 4M, 4D, 5M, 5D.

Table 3.2-9c Summary of Percentage of Suitable Habitat Remaining Posttreatment in California Spotted Owl PACs and HRCAs for Alternative 3

	PACs	HRCAs	PACs + HRCAs
% 5D Posttreatment	68.6%	62.4%	64.5%
% 5M Posttreatment	221%	225%	225%
% 4D Posttreatment	52.6%	57.4%	55.7%
% 4M Posttreatment	194%	175%	180%
% Suitable Habitat Posttreatment	100%	99.2%	99.5%

Note: Suitable Habitat = CWHR 4M, 4D, 5M, 5D.

Table 3.2-9d Summary of Percentage of Suitable Habitat Remaining Posttreatment in California Spotted Owl PACs and Territories for Alternative 4

	PACs	Territories
% 5D Posttreatment	100%	58.3%
% 5M Posttreatment	100%	219%
% 4D Posttreatment	37.1%	18.2%
% 4M Posttreatment	225%	194%
% Suitable Habitat Posttreatment	100%	86.3%

Note: Suitable Habitat = CWHR 4M, 4D, 5M, 5D. Territories include the PAC.

Table 3.2-10 Summary of Percentage of Suitable Habitat Remaining Posttreatment in Northern Goshawk PACs for Alternatives 1, 2, 3, and 4

	% 5D Posttreatment	% 5M Posttreatment	% 4D Posttreatment	% 4M Posttreatment	% Suitable Habitat Posttreatment
Alternative 1	100%	100%	53.6%	200.7%	100%
Alternative 2	15.4%	448.4%	9.0%	297.5%	100%
Alternative 3	67.4%	234.4%	57.4%	192.4%	100%
Alternative 4	100%	100%	53.6%	200.7%	100%

Note: Suitable Habitat = CWHR 4M, 4D, 5M, 5D; Northern goshawk does not have designated HRCAs.

Alternative 2: Vegetation Treatments to Protect Communities Consistent with the Existing Forest Plan

Under Alternative 2, posttreatment conditions within PACs would be dependent upon whether the PAC is located within the WUI Defense Zone, WUI Threat Zone, or outside the WUI. Within the WUI Defense Zone, mechanical treatments could be implemented in PACs and would maintain canopy cover at 50 percent. If 50-percent canopy cover cannot be maintained, then the PAC would be redrawn to replace the affected acreage (i.e., the PAC would be redrawn to incorporate adjacent suitable habitat). Specific PACs within the WUI Threat Zone could be mechanically treated if necessary to achieve the overall effectiveness of the fire and fuels strategy across the landscape. PACs within the WUI Threat Zone would be prioritized for mechanical treatments based on location and site condition relative to strategic fire control goals and will be identified during the implementation layout phase of the project. Therefore, mechanical treatments could occur in up to 31,168 acres of PACs in WUI Defense and Threat Zones for Alternative 2 (Table 3.2-6). However, mechanical treatments would only be utilized in WUI Threat Zone where necessary to achieve the overall effectiveness of the landscape fire and fuels strategy and therefore Alternative 2 would

likely result in fewer than 31,168 acres of mechanical treatments in PACs. In PACs outside of the WUI, most trees greater than 6 inches would be retained with trees up to 10 inches dbh removed where necessary to reduce ladder fuels, and the approximate existing canopy cover would be maintained.

Within California spotted owl HRCAs canopy cover would be maintained at 30 percent in the WUI Defense Zone, and 40–50 percent outside of the WUI Defense Zone. Up to six snags would be retained per acre in HRCAs outside of the WUI Defense Zone. Reduction of canopy cover in HRCAs in the WUI Defense Zone to 30 percent would result in this habitat not meeting the standards of a HRCA and overall loss of approximately 12,562 acres of HRCA suitable habitat in the Project area (Table 3.2-7a). This would be an approximate 38 percent reduction of suitable habitat in HRCAs in the Project area. Under Alternative 2, PAC habitat in the Project area would remain suitable (Table 3.2-7a).

Posttreatment conditions would generally maintain the suitability of all PACs and California spotted owl HRCAs outside the WUI Defense Zone. However, in some cases, habitat suitability in PACs and HRCAs may be degraded due to reduction in canopy cover or modification of understory features (e.g., forest understory vegetation, downed woody debris).

Alternative 2 would reduce canopy cover to approximately 30 percent in mature forest and general forest units in the WUI Defense Zone. The Alternative would retain approximately 40 percent canopy cover in mature forest outside of the WUI Defense Zone, and would retain zero (in the WUI Defense Zones) to four snags (outside of the WUI Defense Zone). In general forest-eastside units that provide suitable habitat (i.e., CWHR 4M, 4D, 5M, 5D) outside of the WUI Defense Zone, 30 percent of the existing basal area consisting of the largest-diameter trees would be retained.

Suitable habitats within the mature forest units outside of the WUI Defense Zone would generally retain mature forest characteristics (e.g., large trees, high canopy percent cover, presence of snags). However, approximately 38,428 acres of suitable habitat in mature forest units (CWHR class 4M, 4D or 5M, 5D) in the WUI Defense Zone would be thinned to 30 percent canopy cover, which would result in an area no longer providing suitable nesting habitat for northern goshawk or California spotted owl (Table 3.2-7a). Therefore, there would be a 56 percent reduction in suitable habitat outside of PACs and HRCAs.

Suitable nesting habitat in the Project area would be reduced by 33 percent with 5D habitat being reduced by 94 percent overall (Table 3.2-8). Suitable foraging habitat in the Project area would be reduced by 41 percent with 4D habitat being reduced by 95 percent (Table 3.2-8). In total, there would be a 38 percent reduction in suitable habitat in the Project area for Alternative 2 (Table 3.2-7a). This reduction in canopy cover would contribute to the decreased connectivity of suitable habitat in the Project area, particularly from the removal of suitable habitat in California spotted owl HRCAs in the WUI Defense Zone. Retention of existing suitable habitat in the other treatment units (i.e., not PACs or HRCAs) would be greater than Alternative 1, which would increase the retention of connectivity in these areas compared to Alternative 1.

Similar to Alternative 1, surveys for northern goshawk and California spotted owl would be conducted prior to treatment activities within habitat suitable for the species. If northern goshawk or California spotted owl nests, roosts, or territories are found outside established PACs, a new PAC would be established within the occupied habitat, and these areas would be managed, and applicable treatment limitations would apply to preserve habitat suitability for the species.

Direct and indirect effects of Alternative 2 from Project-related disturbances or loss of suitable forest habitat could cause reduced occupancy by northern goshawk or California spotted owl in the Project area over the long term. PACs would retain all nesting habitat (5D, 5M) as suitable with at least 40-50 percent canopy cover. Although suitable habitat would overall be reduced by 38 percent (Table 3.2-7a) including a 33 percent reduction in suitable nesting habitat in the Project area (Table 3.2-8) and some of the suitable habitat would become patchy and disconnected, this reduction would be similar to or less than the habitat reduction expected under the No Action Alternative for the same reasons described above for Alternative 1. Mechanical treatments under Alternative 2 would be more substantial in PACs (Table 3.2-6) compared to Alternative 1. As such, these PAC habitats would take a longer time to recover from treatment than PACs with no mechanical treatment. However, Alternative 2 would result in less overall loss of suitable habitat than Alternative 1 and loss of habitat would occur primarily within WUI Defense. Because Alternative 2 would have greater effects on the highest quality habitat in PACs, including PACs currently occupied by northern goshawks and California spotted owls, indirect adverse effects from mechanical treatments would be similar to but potentially greater than Alternative 1. For the same reasons described above for Alternative 1, the No Action Alternative would have a potential for adverse long-term impacts on suitable habitat in the PNF similar to or greater than that of Alternative 2. However, project implementation would not result in the loss of viability or extirpation of the local and regional northern goshawk population or jeopardize the continued existence of the California spotted owl population because habitat would remain suitable in PACs, HRCAs outside of WUI Defense, and in other treatment units such as mature forest outside of WUI Defense.

Alternative 3: Vegetation Treatments to Protect Communities with Reduced Intensity Treatments

While Alternative 3 would include up to 99,754 acres of mechanical treatment, this would be 76,226 fewer acres of mechanical treatment than Alternative 1 and 66,702 fewer acres of mechanical treatment than Alternative 2.

Under Alternative 3, no mechanical treatments would occur in PACs. Manual treatments in PACs would thin trees up to 10 inches dbh in the WUI Defense Zone and up to 6 inches dbh outside the WUI Defense Zone. Mechanical treatments in HRCAs and mature forest units would be limited to areas within the WUI Defense Zone. In the WUI Defense Zone general forest and burned areas canopy cover would be reduced to 30 percent. Within HRCAs and mature forest in the WUI Defense Zone, posttreatment conditions would retain 40 to 50 percent canopy cover. Overall, suitable habitat would be reduced by approximately 9 percent (Table 3.2-7a). Suitable habitat would only be reduced in general forest and burned area units in the WUI Defense. Outside of the WUI Defense Zone, HRCAs and mature forest units could be manually treated by removing trees up to 10 inches dbh and maintaining the approximate existing canopy cover. Four to six snags per acre would be retained throughout all PACs, HRCAs, and mature forest units. Under Alternative 3, treatments in the WUI Defense Zone for general forest and burned areas would be the same as under Alternative 2, and outside of the WUI Defense Zone, canopy cover would be maintained at 40 percent in general forest areas.

Suitable nesting habitat would be reduced by only 6 percent with 5D habitat being reduced by 44 percent (Table 3.2-8). Suitable foraging habitat would be reduced by only 11 percent with 4D habitat being reduced by 50 percent (Table 3.2-8). In total, approximately 83 percent of suitable habitat outside of PACs and HRCAs would be retained under Alternative 3 (Table 3.2-7a). Only

suitable habitat in the WUI Defense Zone outside of PACs would be reduced to unsuitable. Suitable habitat outside of the WUI Defense Zone would generally retain mature forest characteristics (e.g., large trees, high canopy percent cover, presence of snags). Design features requiring pretreatment surveys and implementation of LOPs and buffers, as described in Appendix A, would apply (i.e., Design Features CSO-1 through CSO-3 and NOGO-1 through NOGO-3).

Due to the limited amount of suitable habitat that would be lost and the implementation of protective design features, described above, the direct and indirect effects of Alternative 3 are not expected to cause reduced occupancy by northern goshawk or California spotted owl in the Project area, at least in the short-term. Nor would it result in the loss of viability or extirpation of the local and regional northern goshawk population or jeopardize the continued existence of the California spotted owl population. As described in Section 3.1, “Fire, Fuels, and Forest Health,” Alternative 3 would moderately reduce the potential for high severity wildfire compared to the No Action Alternative. For instance, with the No Action Alternative, a wildfire under the 98th percentile weather conditions would be expected to result in the most severe fire types (crown fire or torching) in 67 percent of the Project area, which would be reduced to 44 percent of the project area under Alternative 3. However, with Alternatives 1 and 2, the most severe fire types are projected to occur in only 8 percent of the project area under the same conditions. Alternative 3 would result in a modest amount of direct disturbance and habitat loss due to treatment activities, while modestly reducing the potential for habitat loss due to severe wildfire. When compared to the No Action Alternative, Alternative 3 would be similar in that it would have less direct disturbance and habitat loss from treatment activities than Alternatives 1 or 2 but would result in a greater risk of habitat loss due to severe wildfire.

Alternative 4: Vegetation Treatments to Protect Communities and CSO Territories

Alternative 4 would include the same suite of treatments as Alternative 1, but additionally prioritizes retaining mature forest habitat within CSO Territories. Under Alternative 4, at least 40-60% of the Territory (which includes the PAC) would be maintained as suitable habitat. Where moist vegetation types and site conditions exist, at least 60% of the Territory will be maintained as suitable habitat; where dry vegetation types and site conditions exist at least 50% of the Territory will be maintained as suitable habitat. Territories in WUI defense have a lower threshold, maintaining at least 40% of the Territory as suitable habitat regardless of site conditions. Habitat is retained in priority of nesting, roosting, then foraging habitat (in descending order: CWHR 6, 5D, 5M, 4D, 4M); if insufficient habitat exists pre-treatment to meet habitat retention levels within the Territory, all suitable habitat will be maintained. The remainder of the Territory is managed to promote heterogeneous forest conditions with many different structure and canopy classes at the stand level and territory level. Treatments in these areas could thin suitable habitat to an rSDI of 23 to 28 percent resulting in 20 to 30-percent canopy cover. These areas would no longer be suitable for California spotted owl or northern goshawk but would contribute to landscape resilience and heterogeneity. In addition to PACs and the areas designated within CSO Territories to be retained as suitable habitat (Suitable Habitat Retention Areas), suitable habitat would be maintained within Wildlife Corridors and the Wild and Scenic River corridors.

As with Alternative 1, posttreatment conditions under Alternative 4 would vary between low- and moderate-productivity PACs and high-productivity PACs, and a total of up to 21,429 acres of low and moderate productivity PACs could be subject to mechanical treatments under this alternative (Table 3.2-6). Alternative 4 proposes the same treatments and design features for PACs as are described for Alternative 1, including up to six 10-acre nest and roost sites that would receive to lower-intensity treatments. In Wildlife Corridors and areas designated within the CSO Territories for habitat retention

(Suitable Habitat Retention Areas), canopy cover would be maintained at 40–50 percent. The Wildlife Corridors and Suitable Habitat Retention Areas together largely coincide with areas designated as HRCA under Alternative 1; however, some areas of suitable habitat planned for more intensive treatments under Alternative 1 would receive less intensive treatments that retain suitable habitat. Overall, the amount of suitable habitat retained under Alternative 4 is greater than Alternative 1, with an additional 8,077 acres (6 percent) retained, including an increase of 6,446 acres (11 percent) of nesting habitat retained and 1,632 acres (2 percent) of foraging habitat retained. See Table 3.2-8.

Treatment activities within approximately 55,888 acres of suitable habitat outside of PACs, Territories, and Wildlife Corridors would thin suitable habitat to an rSDI of 23 to 28 percent resulting in 20 to 30-percent canopy cover (Table 3.2-7b). For Alternative 4, a total of approximately 83,263 acres of suitable habitat would remain in the Project area posttreatment (Table 3.2-7b). This would constitute an approximately 38 percent reduction of suitable habitat in the Project area. Under Alternative 4, suitable nesting habitat would be reduced by approximately 24 percent, with 5D habitat reduced by approximately 58 percent, and foraging habitat would be reduced by approximately 51 percent (Table 3.2-8). There would be a decrease in overall connectivity of suitable habitat in the Project area, mostly in the eastern portion of the Project area as with Alternative 1; however, Alternative 4 would have greater habitat connectivity than Alternative 1 through areas of increased habitat retention within CSO Territories. Alternative 4 is expected to be similar to or less than the amount of habitat loss that would occur as a result of high severity fire under the No Action Alternative, and is expected to be offset by the long-term benefits of retaining suitable habitat in the most important areas and with greater connectivity compared to what has occurred as a result of recent wildfires (i.e., the expected outcome of the No Action Alternative). Direct and indirect effects of Project-related disturbances or loss of suitable forest habitat could cause reduced occupancy by northern goshawk or California spotted owl in portions of the Project area over the long term. However, project implementation would not result in the loss of viability or extirpation of the local and regional northern goshawk population and may affect but is not likely to jeopardize the continued existence of the California spotted owl population because habitat would remain suitable in PACs, Wildlife Corridors, and CSO Territory Suitable Habitat areas, including in any new PACs and CSO Territory Suitable Habitat areas that are delineated based on the results of pre-implementation surveys. Over 75 percent of the available suitable nesting habitat will be retained post-implementation.

Bald Eagle

Direct Impacts

No Action Alternative

Under the No Action Alternative, no fuels treatments would occur. As a result, there would be no direct impacts on bald eagle due to project activity.

Alternative 1: Vegetation Treatments to Protect Communities and Achieve Landscape Resilience

Direct impacts on bald eagle would occur if active nests, eggs, or individuals, including nestlings, are lost through nest failure or abandonment during implementation of treatment activities.

Bald eagle habitat exists within two land allocations in the Project area: bald eagle primary use areas (i.e., current nesting roosting, and foraging habitat) and secondary use areas (i.e., managed

for future nesting, foraging and roosting habitat and population expansion). For bald eagle, nesting habitat in the Project area is particularly associated with large tree mature forest habitats (i.e., 5M, 5D) within approximately 1 mile of a permanent water source (e.g., river, lake, reservoir). Bald eagle primary and secondary use areas overlap with several different planning units in the project area, including general forest, mature forest, HRCAs, Other Areas, PACs, shrub and early seral, Bucks Lake Wilderness, burned areas, existing fire control lines, and Feather River recreational treatment units. The Forest Plan has identified standards and guidelines for activities within primary and secondary use areas. These standards and guidelines focus on maintenance of generally continuous forest cover and heterogeneous forest age structure in primary use areas and maintenance of large (i.e., greater than 28 inches dbh) pines and snags.

Treatment activities that result in removal of large trees or snags (i.e., mechanical thinning, hazard tree removal) could result in inadvertent loss of bald eagle nest trees or disturbance to or removal of nests within or near these trees if these nests are not identified prior to treatment implementation. Use of heavy machinery or chainsaws during implementation of treatment activities (i.e., mechanical thinning, manual treatments, grapple piling, mastication, prescribed fire, pile burning, hazard tree removal, reforestation, road maintenance) could result in increased visual stimuli (e.g., presence of personnel, vehicles, equipment) or increased noise within the vicinity of an active nest, if these nests are not identified prior to treatment implementation. Increased disturbance in the vicinity of active nests could result in direct impacts including loss of eggs and young due to abandonment of the active nest, disruption of foraging and breeding activity, or premature fledging of young.

Design features included as part of the proposed action would be implemented to avoid inadvertent loss of active bald eagle nests, eggs, or individuals. Pretreatment surveys for bald eagles would be conducted prior to implementation of treatment activities in known bald eagle nest sites or use areas. If active bald eagle nests are detected, a no-disturbance buffer of 0.25 mile would be implemented from January 1–August 31 or until young are no longer dependent on adults. This design feature is described in more detail in Appendix A.

Alternative 2: Vegetation Treatments to Protect Communities Consistent with the Existing Forest Plan

The same direct impacts on bald eagle as described above for Alternative 1 could occur under Alternative 2. While Alternative 2 would result in slightly more direct impacts from mechanical treatments due to slightly more bald eagle primary and secondary use areas being planned for mechanical treatment compared to Alternative 1, the same amount will be treated overall. Both of these treatment types could result in disturbance, abandonment, or removal of bald eagle nests. The same design features, including limited operating periods, would apply. Thus, this alternative would have the same potential for direct impacts as Alternative 1.

Alternative 3: Vegetation Treatments to Protect Communities with Reduced Intensity Treatments

Alternative 3 would result in the same direct impacts on bald eagle as described above for Alternative 1. Under Alternative 3, the overall amount of primary and secondary use area that would be subject to treatment is the same as in Alternatives 1 and 2, but there would be less mechanical treatment and more acres treated manually compared to either Alternative 1 or 2. Since both mechanical and manual treatments types could result in disturbance, abandonment, or

removal of bald eagle nests this alternative would have similar potential for direct impacts as Alternative 1 or 2. The same design features, including limited operating periods, would apply.

Alternative 4: Vegetation Treatments to Protect Communities and CSO Territories

The same direct impacts on bald eagle as described above for Alternative 1 could occur under Alternative 4, which proposes the same amount of mechanical versus manual treatments in bald eagle primary and secondary use areas. Both of these treatment types could result in disturbance, abandonment, or removal of bald eagle nests. Thus, this alternative would have the same potential for direct impacts as Alternative 1. The same design features, including limited operating periods, would apply.

Indirect Impacts

No Action Alternative

Under the No Action Alternative, new fuel treatments designed to reduce the potential for high-intensity wildfire in the Project area would not occur. Without implementation of these treatments, it is likely that periodic high-intensity wildfires would continue to occur in the Project area, potentially resulting in direct loss of forest habitat for bald eagle through stand replacement. High-intensity wildfire exhibiting moderate to high soil burn severities would also likely generate substantially increased runoff and erosion that would measurably affect water quality in streams within and near burned areas, which could result in adverse effects on prey species important to bald eagles.

Alternative 1: Vegetation Treatments to Protect Communities and Achieve Landscape Resilience

Indirect adverse effects would occur if treatment activities altered habitat or site conditions in a manner that later resulted in a lack of suitable habitat for bald eagle. Approximately 3,484 acres of bald eagle primary use areas and 2,181 acres of secondary use areas are present in the Project area. Habitat alteration that could adversely affect bald eagle may include loss of large, mature trees, and reduction in canopy cover.

Habitat conditions suitable for bald eagle include dense canopy, and presence of large trees and snags. Nesting habitat suitable for bald eagle within the Project area is particularly associated with mature forest habitats within approximately 1 mile of a permanent water source (e.g., river, lake, reservoir). Bald eagles prefer to roost in dense stands of old-growth trees that offer protection from the weather, roost sites may be farther from water than nest sites.

As described above, the Forest Plan has identified standards and guidelines for activities within primary and secondary use areas. These standards and guidelines focus on maintenance of generally continuous forest cover and heterogeneous forest age structure in primary use areas and maintenance of large (i.e., greater than 28 inches dbh) pines and snags. Additionally, some planning units where bald eagle primary and secondary use areas overlap would not be treated or would be treated only with prescribed fire (i.e., Other Areas and Bucks Lake Wilderness) thus, preserving nesting habitat for bald eagle. Treatments within Wild and Scenic River corridors (designated and eligible) would retain mature forest habitat characteristics, providing bald eagles nesting habitat in these areas. However, under Alternative 1 (in and outside of the WUI Defense Zone), some mature forest habitats in the general forest, mature forest, and HRCA land allocations, including where bald eagle secondary use areas overlap could be modified to such a degree that

these habitats would no longer exhibit mature forest characteristics (i.e., high canopy cover percentage). While bald eagles don't necessarily require dense canopy cover habitat for nesting, roosting is associated with dense forest cover and these habitats may not continue to provide habitat suitable for bald eagle roosting post treatment.

Direct and indirect effects of Project-related disturbances or loss of mature forest habitat are not expected to cause reduced occupancy by bald eagle in the Project area over the long term, or loss of viability or extirpation of the local and regional bald eagle or great gray owl population, for the following reasons: 1) standards and guidelines for activities within bald eagle primary and secondary use areas as described in the Forest Plan would be implemented, 2) treatment activities would implement VDT with an upper diameter limit of less than 30-inches dbh, which is intended to preserve and promote mature and late seral forest characteristics, and 3) surveys to monitor known bald eagle nests and use areas would be conducted, and if active nests are detected, then a no-disturbance buffer of at least 0.25 mile would be implemented from January 1–August 31, or until young are no longer dependent on adults.

Alternative 2: Vegetation Treatments to Protect Communities Consistent with the Existing Forest Plan

Differences between Alternative 1 and Alternative 2 within bald eagle primary and secondary use areas would include additional retention of mature forest habitat in HRCAs, and mature forests, which may overlap bald eagle use areas. Treatments under Alternative 2 would be similar to those described under Alternative 1 and would also aim to preserve and promote mature and late seral forest habitat through implementation of VDT. However, under Alternative 2 in the WUI Defense Zone some mature forest habitats could be modified to such a degree that these habitats would no longer exhibit mature forest characteristics (i.e., high canopy cover percentage). As a result, mature forest habitats may not continue to provide habitat suitable for bald eagle roosting post treatment. The main difference between Alternative 1 and Alternative 2 is the location of more intensive mechanical thinning treatments. Under Alternative 2, more intensive thinning treatments would occur within the WUI Defense Zone, while under Alternative 1 the more intensive thinning treatments would be dispersed throughout the project area.

Direct and indirect effects of Alternative 2 are not expected to cause reduced occupancy by bald eagle in the Project area over the long term. Nor would it result in the loss of viability or extirpation of the local and regional bald eagle population, for the same reasons described above for Alternative 1.

Alternative 3: Vegetation Treatments to Protect Communities with Reduced Intensity Treatments

Differences between Alternative 1 and Alternative 3 within bald eagle primary and secondary use areas would include substantial retention of mature forest habitats. While Alternative 3 would include up to 99,754 acres of mechanical treatment, this would be 76,226 fewer acres of mechanical treatment than Alternative 1 and 66,702 fewer acres of mechanical treatment than Alternative 2. Under Alternative 3, no mechanical treatments would occur in PACs and would occur only within the WUI Defense Zone in HRCAs and mature forest planning units. Mature forest habitats within and outside of the WUI Defense Zone would generally retain mature forest characteristics (e.g., large trees, high canopy percent cover, presence of snags).

Surveys to monitor known bald eagle nests and use areas would be conducted and if active bald eagle nests are detected, a no-disturbance buffer of at least 0.25 mile would be implemented from January 1–August 31 or until young are no longer dependent on adults. This design feature is described in more detail in Appendix A.

Direct and indirect effects of Alternative 3 are not expected to cause reduced occupancy by bald eagle in the Project area over the long term for the reasons described above. Nor would it result in the loss of viability or extirpation of the local and regional bald eagle population.

Alternative 4: Vegetation Treatments to Protect Communities and CSO Territories

Indirect impacts on bald eagle under Alternative 4 would be similar to Alternative 1, which proposes the same amount of mechanical versus manual treatments in bald eagle primary and secondary use areas. Additional dense canopy cover habitat would be retained throughout the project area which could provide additional roosting habitat.

Willow Flycatcher

Direct Impacts

No Action Alternative

Under the No Action Alternative, no fuels treatments would occur. As a result, there would be no direct impacts on willow flycatcher due to project activity.

Alternatives 1, 2, 3, and 4

Potential impacts on willow flycatcher are similar across Alternatives 1, 2, 3, and 4, because the differences between these alternatives largely pertain to forest habitats (e.g., PACs, HRCAs, mature forest planning units), where willow flycatcher is not present. Direct impacts on willow flycatcher would occur if active nests, eggs, or individuals, including nestlings, are lost through nest failure or abandonment during implementation of treatment activities. Willow flycatchers are associated with wet meadow and montane riparian habitats, most often in broad, open river valleys or large mountain meadows with lush growth of shrubby willows. These habitats in the Project area would be largely incorporated into RCAs, adjacent to perennial stream, meadows, and other SAFs. Treatments in meadows would not be implemented under this Project. Generally, manual treatments would be used as a lower impact treatment method within riparian habitats and removal of native riparian vegetation is not a key objective of the Project.

While treatments would largely be avoided in habitat suitable for willow flycatcher, some treatment activities could occur within riparian habitat if these habitats are located adjacent forest habitats. Treatment activities (i.e., mechanical treatments, manual treatments) could result in inadvertent loss or disturbance of willow flycatcher nests if these nests are not identified prior to treatment implementation. Use of heavy machinery or chainsaws during implementation of treatment activities (i.e., mechanical thinning, manual treatments, grapple piling, mastication, prescribed fire, pile burning, hazard tree removal, reforestation, road maintenance) could result in increased visual stimuli (e.g., presence of personnel, vehicles, equipment) or increased noise within the vicinity of an active nest, if these nests are not identified prior to treatment implementation. Increased disturbance in the vicinity of active nests could result in direct impacts including abandonment of the active nest and subsequent loss of eggs or young.

Design features included as part of the proposed action would be implemented to avoid inadvertent loss of active willow flycatcher nests, eggs, or individuals. RCAs would be implemented surrounding streams (i.e., perennial, intermittent) and SAFs (e.g., reservoirs, meadows, wetlands) within which mechanical treatments, prescribed fire, and pile burning would be excluded within 25–82 feet of these features. While 25–82 feet may not include all the riparian habitat surrounding a stream or SAF that may provide nesting habitat suitable for willow flycatcher, most riparian habitat would likely be incorporated within these buffers. If habitat is occupied by willow flycatcher, an LOP of May 1–July 31 would be implemented to prevent disturbance or abandonment of the nest. These design features are described in more detail in Appendix A.

Indirect Impacts

No Action Alternative

Under the No Action Alternative, new fuel treatments designed to reduce the potential for high-intensity wildfire in the Project area would not occur. Without implementation of these treatments, it is likely that periodic high-intensity wildfires would continue to occur in the Project area. High-intensity wildfire exhibiting moderate to high soil burn severities would also likely generate substantially increased runoff and erosion that would measurably affect water quality in streams within and near burned areas, which could result in adverse effects on riparian and wetland habitats suitable for willow flycatcher. Although willows resprout readily after fire, there could be short-term loss of riparian habitat before willows recover in burned area. Potential long-term beneficial effects of wildfire would include killing encroaching conifers currently degrading riparian habitat.

Alternatives 1, 2, 3, and 4

Potential indirect impacts on willow flycatcher are similar across Alternatives 1, 2, 3, and 4, because the differences between these alternatives largely pertain to forest habitats (e.g., PACs, HRCAs, mature forest planning units), where willow flycatcher is not present. Indirect adverse effects to willow flycatcher habitat could occur if riparian vegetation is removed or disturbed. Hazard tree removal may occur in riparian areas and some manual treatments may be used in riparian areas. Although it is not desired because of resource considerations, if needed to meet Project objectives mechanical treatment could occur in riparian habitat (Design Feature HYD-1, Appendix A). Approximately 1,120 acres of willow flycatcher habitat has been identified in the project area, and this habitat overlaps several treatment units in the Project area, including Feather River recreational areas, general forest, shrub and early seral, mature forest, Other Areas, HRCAs, Bucks Lake Wilderness, PACs, and existing fire control lines land allocations. The Other Areas planning unit (i.e., approximately 9 percent of the willow flycatcher habitat in the project area) consists of portions of the Project area where no treatment is proposed, including waterbodies, wet meadows, and other land cover types that do not require fuel reduction or forest resilience treatments.

As described above, manual treatments would be used as a lower impact treatment method within riparian habitats and removal of native riparian vegetation is not a key objective of the Project. Further, habitats including wet meadows and other waterbodies are considered part of the Other Areas planning unit, which includes land cover types that do not require fuel reduction or forest resilience treatments, and treatments in meadows would not be implemented under this Project. While some treatments may occur within riparian habitat (e.g., if these habitats are located adjacent forest habitats), treatment activities would not result in removal of a substantial amount of riparian vegetation such that riparian areas would continue to function as habitat suitable for willow flycatcher.

Direct and indirect effects of Project-related disturbances or treatments within riparian habitat are not expected to cause reduced occupancy by willow flycatcher in the Project area over the long term, or loss of viability or extirpation of the local and regional willow flycatcher population, for the following reasons: 1) treatment activities within riparian habitat would generally be limited to manual treatments and would be subject to RCA requirements and 2) if habitat is occupied by willow flycatcher, then an LOP from May 1–July 31 would be implemented.

Greater Sandhill Crane

Direct Impacts

No Action Alternative

Under the No Action Alternative, no fuels treatments would occur. As a result, there would be no direct impacts on greater sandhill crane due to project activity.

Alternatives 1, 2, 3, and 4

Potential impacts on greater sandhill crane are similar across Alternatives 1, 2, 3, and 4, because the differences between these alternatives largely pertain to forest habitats (e.g., PACs, HRCAs, mature forest units), where greater sandhill cranes would not be present. Direct impacts on greater sandhill crane would occur if active nests, eggs, or individuals, including nestlings, are lost through nest failure or abandonment during implementation of treatment activities. Greater sandhill crane habitat is only present in the Other Areas planning unit described above under Section 2.1.2, “Planning Units.” The Other Areas unit consists of portions of the Project area where no treatment is proposed, including waterbodies, wet meadows, and other land cover types that do not require fuel reduction or forest resilience treatments. Greater sandhill cranes are associated with wet meadows, shallow lakes, and fresh emergent wetland habitats in the Project area. These habitats in the Project area would be incorporated into RCAs and treatments in meadows would not be implemented under this project.

While treatment activities would not occur within breeding habitat suitable for greater sandhill crane, use of heavy machinery or chainsaws during implementation of treatment activities (i.e., mechanical treatments, manual treatments, grapple piling, mastication, prescribed fire, pile burning, hazard tree removal, road maintenance) in adjacent forested areas could result in increased visual stimuli (e.g., presence of personnel, vehicles, equipment) or increased noise within the vicinity of an active greater sandhill crane nest. Increased disturbance in the vicinity of active nests could result in direct impacts including abandonment of the active nest and subsequent loss of eggs or young, although there are not currently any documented greater sandhill crane nest sites in the Project area.

Design features included as part of the proposed action would be implemented to avoid inadvertent loss of active greater sandhill crane nests, eggs, or individuals. EEZs would be implemented surrounding SAFs (e.g., reservoirs, meadows, wetlands) within which mechanical treatments, prescribed fire, and pile burning would be excluded within 25–82 feet of these features except for ephemeral streams where these activities would be excluded within 15 feet (Table 3.2-4). The EEZ buffer would fully encompass habitat suitable for greater sandhill cranes, which would largely be present within the interior of SAFs.

Indirect Impacts

No Action Alternative

Under the No Action Alternative, new fuel treatments designed to reduce the potential for high-intensity wildfire in the Project area would not occur. Without implementation of these treatments, it is likely that periodic high-intensity wildfires would continue to occur in the Project area. High-intensity wildfire exhibiting moderate to high soil burn severities would also likely generate substantially increased runoff and erosion that would measurably affect water quality in streams within and near burned areas, which could result in adverse effects on meadow and wetland habitats suitable for greater sandhill crane. Potential long-term beneficial effects on wildfire would include killing encroaching conifers currently degrading meadow habitat.

Alternatives 1, 2, and 3

Potential impacts on greater sandhill crane are similar across Alternatives 1, 2, 3, and 4, because the differences between these alternatives largely pertain to forest habitats (e.g., PACs, HRCAs, mature forest planning units), where greater sandhill cranes would not be present. Indirect adverse effects to habitat for greater sandhill crane could occur if treatment activities altered habitat such that it was no longer suitable to support the species.

Habitat suitable for greater sandhill cranes, including wet meadows and other waterbodies, are considered part of the Other Areas planning unit, which includes land cover types that do not require fuel reduction or forest resilience treatments. Treatments are not expected to occur within any habitats that would be used by breeding greater sandhill cranes. Because treatment activities would not be implemented within habitats suitable for greater sandhill cranes, indirect adverse effects, as described above, would not occur.

Direct and indirect effects of Project-related disturbances are not expected to cause reduced occupancy by greater sandhill crane in the Project area over the long term, or loss of viability or extirpation of the local and regional greater sandhill crane population, for the following reasons: 1) treatment activities would not occur within breeding habitat suitable for greater sandhill cranes and 2) areas adjacent to breeding habitat suitable for greater sandhill cranes would be subject to RCA and EEZ requirements.

Western Pond Turtle

Direct Impacts

No Action Alternative

Under the No Action Alternative, no fuels treatments would occur. As a result, there would be no direct impacts on western pond turtle due to project activity.

Alternatives 1, 2, 3, and 4

Potential impacts on western pond turtle are similar across Alternatives 1, 2, 3, and 4, because the differences between these alternatives largely pertain to forest habitats (e.g., PACs, HRCAs, mature forest planning units), where western pond turtles generally are not present. Direct impacts on western pond turtle would occur if individuals, young, or eggs are injured or killed through direct crushing (e.g., by heavy machinery or personnel), burial (e.g., by heavy machinery), or burning (e.g., during prescribed fire activities) during implementation of treatment activities. All treatment activities would involve varying degrees of heavy machinery use and presence of personnel. Noise and other disturbance from operation of heavy machinery, chainsaws, or other

vehicles during treatment activities could cause displacement of western pond turtle. Displacement would be temporary and could cause an increase in predation risk if individuals are unable to locate proper cover.

Design features included as part of the proposed action would be implemented to avoid inadvertent loss of western pond turtle individuals and to avoid impacts on aquatic and riparian habitats where western pond turtle could occur. Road maintenance activities, including culvert installation for temporary roads or existing roads, could modify the bed, bank, or channel, or alter the flow of waterways, including aquatic habitats suitable for western pond turtles. Design Feature AQWLD-1 prohibits mechanical equipment within 82 feet of intermittent or perennial streams or special aquatic features and no new stream crossings will be constructed within 0.25 mile of occupied sites unless a biological review determines construction and use would result in no effect to listed aquatic species (Appendix A). Additionally, EEZs would be implemented surrounding streams (i.e., perennial, intermittent) and SAFs (e.g., reservoirs, meadows, wetlands) within which mechanical treatments, prescribed fire, and pile burning would be excluded within 25 feet of these features except for ephemeral streams where these activities would be excluded within 15 feet. These requirements would provide some protection for western pond turtle but may not fully protect the species, which is known to move through and nest in upland habitat farther than 15 feet of ephemeral streams and 82 feet from all other aquatic habitat. Therefore, it is possible that individual western pond turtles or turtle nests outside of EEZs could be injured, killed, or crushed. General hydrology, soil, and aquatic resources design features would also be implemented, which include standards and limitations for operations within RCAs, standards for mechanical operations in wet weather conditions, and standards for water drafting. These design features are described in more detail in Appendix A.

The Wildlife and Plant BA includes design features and conservation measures designed to reduce impacts on Sierra Nevada yellow-legged frog, foothill yellow-legged frog, and California red-legged frog. These design features and conservation measures would also reduce impacts on western pond turtle that may occur in some of the same aquatic and upland habitats.

Indirect Impacts

No Action Alternative

Under the No Action Alternative, new fuel treatments designed to reduce the potential for high-intensity wildfire in the Project area would not occur. Without implementation of these treatments, it is likely that periodic high-intensity wildfires would continue to occur in the Project area. High-intensity wildfire exhibiting moderate to high soil burn severities would also likely generate substantially increased runoff and erosion that would measurably affect water quality in streams within and near burned areas, which could result in adverse effects on aquatic habitat suitable for western pond turtle. Potential long-term beneficial effects of wildfire could include an increase in basking site habitat and upland nesting habitat.

Alternatives 1, 2, 3, and 4

Potential impacts on western pond turtle are similar across Alternatives 1, 2, and 3, because the differences between these alternatives largely pertain to forest habitats (e.g., PACs, HRCAs, mature forest planning units), where western pond turtles generally are not present. Indirect adverse effects would occur if treatment activities altered habitat or site conditions in a manner

that later resulted in a lack of habitat suitable for western pond turtle or resulted in an indirect water quality impact (e.g., introduction of sediment to a perennial stream or other aquatic feature).

Design features included as part of the proposed action (e.g., establishment of RCAs; general hydrology, soil, and aquatic resources design features) and design features and conservation measures for federally listed amphibians (described above under Direct Impacts) would be implemented to avoid indirect impacts on aquatic and riparian habitat where western pond turtle could occur. These design features and conservation measures would reduce potential indirect impacts on western pond turtle by preventing water quality impacts, erosion, and other degradation of aquatic and riparian habitat. Thus, the proposed action is not expected to result in adverse indirect effects on western pond turtle or habitat.

Direct and indirect effects of Project-related disturbances are not expected to cause reduced occupancy by western pond turtle in the Project area over the long term, or loss of viability or extirpation of the local and regional western pond turtle population, for the following reasons: 1) areas adjacent to aquatic habitat suitable for western pond turtle would be subject to RCA and EEZ requirements, 2) general hydrology, soil, and aquatic resources design features would be implemented, and 3) design features and conservation measures designed to reduce impacts on Sierra Nevada yellow-legged frog and California reg-legged frog would be implemented which would also reduce impacts on western pond turtle.

Pallid Bat, Fringed Myotis, and Townsend's Big-Eared Bat

Direct Impacts

No Action Alternative

Under the No Action Alternative, no fuels treatments would occur. As a result, there would be no direct impacts on pallid bat, fringed myotis, and Townsend's big-eared bat due to project activity.

Alternative 1: Vegetation Treatments to Protect Communities and Achieve Landscape Resilience

Forest Service sensitive bat species that could occur within the Project area include pallid bat, fringed myotis, and Townsend's big-eared bat. These bat species use a variety of habitat types for roosting, including rock crevices, tree hollows, mines, caves, and a variety of human-made structures. These habitats are used with varying degrees of specificity depending on the species; for example, Townsend's big-eared bats have an affinity for mineshafts, caves, and other large, cavernous habitats. All three bat species are clutter-adapted foragers (i.e., species adapted for flight and foraging in cluttered habitats due to wing morphology and echolocation strategy). Direct impacts on sensitive bats would occur if bat roosts are removed or disturbed during implementation of treatment activities, potentially resulting in injury or death of individuals, including young. Bat roosts under bridges could also be disturbed during proposed road maintenance activities, potentially leading to roost abandonment. All treatment activities would involve varying degrees of heavy machinery use and presence of fire and other personnel. Noise and other disturbance from operation of heavy machinery, chainsaws, or other vehicles during treatment activities could cause displacement of bats, and temporary or permanent abandonment of roost sites located near this activity. Displacement could cause an increase in predation risk if individuals are unable to locate proper cover or loss of young, which may be incapable of flying.

Treatment activities that result in removal of large trees or snags (i.e., mechanical thinning, hazard tree removal) could result in inadvertent loss of pallid bat, fringed myotis, or Townsend's big-eared bat roost trees or disturbance to roosts within or near these trees. Use of heavy machinery or chainsaws during implementation of treatment activities (i.e., mechanical thinning, manual treatments, grapple piling, mastication, prescribed fire, pile burning, hazard tree removal, road maintenance) could result in increased visual stimuli (e.g., presence of personnel, vehicles, equipment) or increased noise within the vicinity of an active roost. Increased disturbance in the vicinity of active roosts could result in direct impacts including abandonment of the active roost and subsequent loss of young.

Design features included as part of the proposed action would be implemented to avoid inadvertent loss of known pallid bat, fringed myotis, or Townsend's big-eared bat roosts. A no-disturbance buffer of 1/8 mile would be implemented to prevent disturbance or abandonment of the roost during the bat maternity season (April 1–August 31). This design feature is described in more detail in Appendix A.

Alternative 2: Vegetation Treatments to Protect Communities Consistent with the Existing Forest Plan

The same direct impacts on pallid bat, fringed myotis, and Townsend's big-eared bat as described above for Alternative 1 could occur under Alternative 2. While Alternative 2 would result in slightly more direct impacts from mechanical treatments because more of the Project area that include suitable mature forest habitat for these species would be mechanically treated compared to Alternative 1, the same amount of habitat could be mechanically and manually treated in Alternative 1. Since both mechanical and manual treatments could result in disturbance, abandonment, or removal of bat roosts, this alternative would have the same potential for direct impacts as Alternative 1.

Alternative 3: Vegetation Treatments to Protect Communities with Reduced Intensity Treatments

Alternative 3 would result in the same direct impacts on pallid bat, fringed myotis, and Townsend's big-eared bat as described above for Alternative 1. Although Alternative 3 would include mechanical treatment, fewer acres that contain suitable habitat for these three bat species would be subject to mechanical treatment than under Alternative 1 or 2. Alternative 3 would have the same amount of the Project area being treated as Alternatives 1 and 2. Since mechanical and manual treatments both have the potential to result in disturbance, abandonment, or removal of bat roosts this alternative would have similar potential for direct impacts as Alternative 1 or 2.

Alternative 4: Vegetation Treatments to Protect Communities and CSO Territories

Alternative 4 would result in the same direct impacts on pallid bat, fringed myotis, and Townsend's big-eared bat as described above for Alternative 1. Alternative 4 proposes the same number of acres of mechanical treatment as Alternative 1. Additionally, since mechanical and manual treatments both have the potential to result in disturbance, abandonment, or removal of bat roosts this alternative would have similar potential for direct impacts as all action Alternatives.

Indirect Impacts

No Action Alternative

Under the No Action Alternative, new fuel treatments designed to reduce the potential for high-intensity wildfire in the Project area would not occur. Without implementation of these treatments, it is likely that periodic high-intensity wildfires would continue to occur in the Project area, potentially resulting in direct loss of forest habitat, including roost trees for pallid bat, fringed myotis, and Townsend's big-eared bat through stand replacement, or significant modification of microhabitat features (e.g., temperature, sunlight) such that these habitats would no longer be suitable for these species. Additionally, wildfires can alter forest structure, which reduces "clutter" (i.e., structurally complex vegetation) in these burned habitats (Beaty and Taylor 2008). Since all three bat species are clutter-adapted foragers, high-intensity wildfires may result in increased predation in recently burned habitats due to clutter-adapted bats being more susceptible to predation in open habitats (Lima and O'Keefe 2013).

Alternative 1: Vegetation Treatments to Protect Communities and Achieve Landscape Resilience

Indirect adverse effects would occur if treatment activities altered habitat or site conditions in a manner that later resulted in a lack of suitable habitat for pallid bat, fringed myotis, or Townsend's big-eared bat. Pallid bat, fringed myotis, and Townsend's big-eared bat habitat exists within several treatment units in the Project area, including general forest, mature forest, California spotted owl PACs and HRCAs, and northern goshawk PACs. The desired conditions and standards in the mature forest and general forest units would aim to prevent complete stand type conversion, and some mature forest habitats would generally retain mature forest characteristics (e.g., large trees). While Alternative 1 could result in up to an estimated 40 percent reduction in mature forest habitat across the Project area, it is unlikely that these modifications would result in forest habitats becoming unsuitable for pallid bat, fringed myotis, or Townsend's big-eared bat posttreatment, because suitable roost trees (i.e., mature trees greater than 30 inches dbh) in the Project area and snags outside of the WUI Defense Zone would still remain. As such, 5M habitat in the Project area would increase by approximately 73 percent (Table 3.2-8). However, since Alternative 1 would reduce canopy cover to 20–30 percent in general forest and mature forest units, there could be an increased risk of predation to these clutter-adapted bat species after treatments create open habitats. Additionally, with only 20–30 percent canopy cover retained in these habitats, understory "clutter" would be reduced, which may result in a decrease in foraging habitat for these three bat species.

Direct and indirect effects of Project-related disturbances or loss of suitable forest habitat could result in reduced occupancy by pallid bat, fringed myotis, or Townsend's big-eared bat in the Project area over the long term. However, project implementation will not result in the loss of viability or extirpation of the local and regional bat population because large roosting trees would be retained throughout the Project area. Additionally, although there would be an increased risk of predation and decreased availability of foraging habitat from Alternative 1 these impacts would be comparable or less than the adverse impacts of the No Action Alternative where high severity fire has the potential to increase predation and decrease foraging habitat available. All treatments would implement VDT, which is intended to promote mature and late seral forest characteristics and would prevent some adverse effects on these species within mature forest habitats in the project area.

Alternative 2: Vegetation Treatments to Protect Communities Consistent with the Existing Forest Plan

Treatments under Alternative 2 would be similar to those described under Alternative 1 and would also aim to promote mature and late seral forest habitat through implementation of VDT. However, under Alternative 2 up to 38 percent of mature forest habitats in the Project area would be modified to such a degree that these habitats would no longer exhibit mature forest characteristics (i.e., high canopy cover percentage). This is slightly less than the reduction of suitable habitat in Alternative 1 (Table 3.2-7a). Tree retention standards are generally comparable for Alternative 1 and 2 except in PACs. For Alternative 2, PACs have a live DBH limit of less than 30 inches in the WUI Defense, 10 inches in WUI Threat, and less than 6 inches outside of the WUI. This is compared to Alternative 1 where low- and moderate-productivity PACs have a limit of 24 inches and high-productivity PACs have a limit of only 10 inches. This will result in slightly more roosting and foraging habitat and slightly less risk of predation from the reduction in clutter compared to Alternative 1.

Direct and indirect effects of Alternative 2 could cause reduced occupancy by pallid bat, fringed myotis, or Townsend's big-eared bat in the Project area over the long term. However, it would not result in the loss of viability or extirpation of the local and regional pallid bat, fringed myotis, or Townsend's big-eared bat population, for the same reasons described above for Alternative 1. Additionally, Alternative 2 would be less impactful than Alternative 1 when considering increased risk of predation from habitat modification and loss of foraging habitat due to the retention of more understory trees in Alternative 2.

Alternative 3: Vegetation Treatments to Protect Communities with Reduced Intensity Treatments

While Alternative 3 would include up to 99,754 acres of mechanical treatment, this would be 76,226 fewer acres of mechanical treatment than Alternative 1 and 66,702 fewer acres of mechanical treatment than Alternative 2. Manual treatments in PACs would thin trees up to 10 inches dbh in the WUI Defense Zone and up to 6 inches dbh outside the WUI Defense Zone. Posttreatment conditions would prevent habitat modification within PACs, HRCAs, and mature forest units that would lead to it being considered unsuitable for pallid bat, fringed myotis, or Townsend's big-eared bat. Mature forest habitats would generally retain mature forest characteristics (e.g., large trees, presence of snags). Under Alternative 3, treatments in the WUI Defense Zone for general forest areas would be the same as under Alternative 2, and outside of the WUI Defense Zone, canopy cover would be maintained at 40 percent in general forest areas.

Direct and indirect effects of Alternative 3 are not expected to cause reduced occupancy by pallid bat, fringed myotis, or Townsend's big-eared bat in the Project area over the long term. Nor would it result in the loss of viability or extirpation of the local and regional pallid bat, fringed myotis, or Townsend's big-eared bat population because most mature forest habitat in the Project area would retain mature forest characteristics suitable for these species.

Alternative 4: Vegetation Treatments to Protect Communities and CSO Territories

Treatments under Alternative 4 would be similar to those described under Alternative 1 and would also aim to promote mature and late seral forest habitat through implementation of VDT. However, Alternative 4 would retain additional mature forest habitat with moderate to dense canopy cover which will result in slightly more roosting and foraging habitat and slightly less risk of predation from the reduction in clutter compared to Alternative 1.

Direct and indirect effects of Alternative 4 could cause reduced occupancy by pallid bat, fringed myotis, or Townsend's big-eared bat in the Project area over the long term. However, it would not result in the loss of viability or extirpation of the local and regional pallid bat, fringed myotis, or Townsend's big-eared bat population, for the same reasons described above for Alternative 1.

Pacific Marten and Fisher

Direct Impacts

No Action Alternative

Under the No Action Alternative, no fuels treatments would occur. As a result, there would be no direct impact on Pacific marten and fisher due to project activity.

Alternative 1: Vegetation Treatments to Protect Communities and Achieve Landscape Resilience

Direct impacts on Pacific marten and fisher would occur if active dens are abandoned or individuals, including young, are injured or killed during implementation of treatment activities. Pacific marten and fisher habitat exists within several treatment units in the Project area, including general forest, mature forest, California spotted owl PACs and HRCAs, and northern goshawk PACs.

Treatment activities that result in removal of large trees or snags (i.e., mechanical treatments, hazard tree removal) could result in inadvertent loss of trees containing Pacific marten or fisher dens or disturbance to dens in the project area. Use of heavy machinery or chainsaws during implementation of treatment activities (i.e., mechanical thinning, manual treatments, grapple piling, mastication, prescribed fire, pile burning, hazard tree removal, reforestation, road maintenance) could result in increased visual stimuli (e.g., presence of personnel, vehicles, equipment) or increased noise within the vicinity of an active den, if these dens are not identified prior to treatment implementation. Increased disturbance in the vicinity of active dens could result in direct impacts including abandonment of the active den and subsequent loss of young.

Design Features included as part of the proposed action would be implemented to avoid inadvertent loss of Pacific marten and fisher. Further, an LOP would be implemented within a 100-acre buffer around all known marten den sites and within a 700-acre buffer for all known fisher dens to prevent disturbance or abandonment of the den during the maternity season (March 1–June 30). While marten have been detected within and adjacent to the project area, there are no known den sites. There are currently two identified fisher den sites in the Project area (Bauer pers. comm., 2023). These dens are located in the western portion of the Project area. One of the identified fisher den sites is in the Dixie Fire burn perimeter in the Feather River Canyon. This den site has most likely been destroyed by fire so a den site buffer would not be implemented at this location. The second den site is located north of Concow and west of the fisher den site located in the Dixie Fire burn perimeter. Site-specific treatment of the fisher den site buffer would be determined in coordination with the district biologist to retain important habitat features this den site. These design features are described in more detail in Appendix A.

Alternative 2: Vegetation Treatments to Protect Communities Consistent with the Existing Forest Plan

The same direct impacts on Pacific marten and fisher as described above for Alternative 1 could occur under Alternative 2. The same amount of habitat could be mechanically and manually treated

in Alternatives 1 and 2. Since mechanical and manual treatment both could result in disturbance, abandonment, or removal of marten and fisher dens, this alternative would have the same potential for direct impacts as Alternative 1.

Alternative 3: Vegetation Treatments to Protect Communities with Reduced Intensity Treatments

Alternative 3 would result in the same direct impacts on Pacific marten and fisher as described above for Alternative 1. Although Alternative 3 would include mechanical treatment, fewer areas that contain suitable habitat for Pacific marten and fisher would be subject to mechanical treatment than under Alternative 1 or 2. Since mechanical and manual treatments both have the potential to result in disturbance, abandonment, or removal of marten and fisher dens, this alternative would have the same potential for direct impacts than Alternative 1 or 2.

Alternative 4: Vegetation Treatments to Protect Communities and CSO Territories

Alternative 4 would result in the same direct impacts on Pacific marten and fisher as described above for Alternative 1. Alternative 4 proposes the same number of acres for each treatment type, and the same design features would apply.

Indirect Impacts

No Action Alternative

Under the No Action Alternative, new fuel treatments designed to reduce the potential for high-intensity wildfire in the Project area would not occur. Without implementation of these treatments, it is likely that periodic high-intensity wildfires would continue to occur in the Project area, potentially resulting in direct loss of forest habitat, including den habitat (e.g., large trees, snags, downed logs) for Pacific marten and fisher through stand replacement, or modification of late seral forests such that these habitats would no longer be suitable for these species.

Alternative 1: Vegetation Treatments to Protect Communities and Achieve Landscape Resilience

Indirect adverse effects would occur if treatment activities altered habitat or site conditions in a manner that later resulted in a lack of suitable habitat for Pacific marten and fisher. Habitat alteration that could adversely affect Pacific marten and fisher may include loss of large, mature trees and reduction in canopy cover. Overall, all treatments under all Project alternatives would implement VDT, which is intended to improve forest health by enhancing species composition, increase stand structural heterogeneity, and accelerate growth of mid-seral forests toward mature and late seral conditions.

Habitat conditions suitable for Pacific marten and fisher are similar to those of California spotted owl and northern goshawk (e.g., dense canopy, large trees and snags) and den habitat suitable for these species within the Project area likely includes areas included in California spotted owl PACs and HRCAs and northern goshawk PACs. As described above, desired conditions for treatments within PACs and HRCAs would prevent habitat modification in these land allocations such that PACs and HRCAs would continue to provide habitat suitable for northern goshawks and California spotted owls, which would also benefit Pacific marten and fisher.

Under Alternative 1, approximately 44 percent of the mature forest habitats in the project area could be modified to such a degree that these habitats would no longer exhibit mature forest

characteristics (i.e., high canopy cover percentage) (Table 3.2-7a). As a result, these areas would not continue to provide habitat suitable for Pacific marten and fisher post treatment. Dense canopy mature forest 5D and 4D habitat that provides suitable denning habitat would be reduced by approximately 76 percent; some suitable denning habitat would be thinned to 40% canopy cover and therefore be converted to foraging habitat (5M or 4M) resulting in an increase of approximately 9%. (Table 3.2-8). This reduction in canopy cover would contribute to decreased connectivity of suitable habitat in the Project area, mostly in the eastern portion of the Project area. One active fisher den has been documented in the western portion of the Project area which will have a 700-acre buffer where habitat modification would not occur.

Direct and indirect effects of Project-related disturbances or loss of late seral forest could cause reduced occupancy by Pacific marten and fisher in the Project area over the long term. Additionally, focused surveys for Pacific marten and fisher would not be conducted prior to implementation of project activities in the majority of the project area. Therefore, Pacific marten and fisher den sites in the project area may not be detected. Adverse effects on Pacific martens and fishers that have not been detected within the project area may occur as a result of project-related habitat modification. However, Project implementation will not result in the loss of viability or extirpation of the regional Pacific marten or fisher population because these species do not appear to occupy the majority of the project area, based on past survey efforts. The area with the highest concentration of known Pacific marten observations is in Lakes Basin area and will not be affected by project activities; there is a smaller concentration of historic observations of near Little Grass Valley Reservoir where there is a high degree of habitat retention due to overlap with PACs and HRCAs. The area with the highest concentration of fisher observations is associated with an introduced population near Stirling City and the Camp Fire area. Additional local populations may exist in small numbers and could experience loss of viability. Loss of suitable habitat in the project area could lead to loss of connectivity between populations to the north and south of the project area. Although overall suitable habitat would be reduced by approximately 44 percent (Table 3.2-7a), This reduction would either be less or comparable to the No Action Alternative. Under existing conditions in the past five years 43 percent of suitable habitat in the PNF was lost directly due to high severity fires or fragmented into smaller patches (Forest Service 2022a). This trend is expected to continue or increase under the No Action Alternative (See Section 3.1, “Fire, Fuels, and Forest Health”). Decreased occupancy and suitable habitat will be offset by the long-term benefit of reduced high severity fire potential in the Project area. Additionally, the following measures would apply to treatment activities under Alternative 1, which would prevent some adverse effects on these species within late seral habitats in the project area: 1) treatment activities within PACs and HRCAs would be designed to maintain late seral characteristics (thus, habitat suitability for Pacific marten and fisher), 2) all treatments would implement VDT, which is intended to preserve and promote mature and late seral forest characteristics and, 3) an LOP will be implemented within a 100-acre buffer of all known marten den sites and within of a 700-acre buffer of all known fisher dens during the maternity season (March 1–June 30) to prevent disturbance or abandonment of the den.

Alternative 2: Vegetation Treatments to Protect Communities Consistent with the Existing Forest Plan

Treatments under Alternative 2 would be similar to those described under Alternative 1, and approximately 38 percent of the total mature forest habitat in the Project area may not continue to provide habitat suitable for Pacific marten and fisher post treatment (Table 3.2-7a). Denning habitat (CWHR 5D and 4D) would be reduced by approximately 94 percent (Table 3.2-8). Some habitat

suitable for denning (5D, 4D) would be converted to foraging habitat, leading to an overall increase in foraging habitat of approximately 56 percent. The reduction in overall amount of mature forest habitat would contribute to the decreased connectivity of suitable habitat in the Project area, particularly from the removal of suitable habitat in the WUI Defense Zone. Retention of suitable habitat present in the other land allocations outside WUI Defense Zone would be greater than Alternative 1, which would increase the retention of connectivity in these areas compared to Alternative 1. Under Alternative 2, more intensive thinning treatments which remove suitable habitat would occur within the WUI Defense Zone, while under Alternative 1 the more intensive thinning treatments would be dispersed throughout the project area. One active fisher den has been documented in the Project area, which would have a 700-acre buffer where habitat modification would not occur.

Direct and indirect effects of Alternative 2 could cause reduced occupancy by Pacific marten and fisher in the Project area over the long term. However, this would not result in the loss of viability or extirpation of the local and regional Pacific marten and fisher population, for the same reasons described above for Alternative 1. Although there would be an approximately 38 percent reduction in suitable mature forest habitat, adverse effects from the No Action Alternative would be comparable or more severe for overall habitat loss.

Alternative 3: Vegetation Treatments to Protect Communities with Reduced Intensity Treatments

Alternative 3 would include up to 99,754 acres of mechanical treatment, this would be 76,226 fewer acres of mechanical treatment than Alternative 1 and 66,702 fewer acres of mechanical treatment than Alternative 2. Under Alternative 3, no mechanical treatments would occur in PACs. Mechanical treatments in mature forest habitat types outside of PACs would be limited to areas within the WUI Defense Zone. Posttreatment conditions would retain suitable habitat for Pacific marten and fisher (e.g., large trees, high canopy percent cover, presence of snags) within PACs, HRCAs, and mature forest units. Mature forest habitats within the WUI Defense Zone would mostly be unsuitable for mature forest species posttreatment, except for in the PACs where at least 50 percent canopy cover and four snags per acre would be retained. Denning habitat (5D and 4D) would be reduced by approximately 47 percent (Table 3.2-8), much of which would be converted to foraging habitat leading to an increase to foraging habitat of approximately 54 percent. Overall suitable habitat for Pacific Marten and fisher would only be reduced by approximately 9 percent under Alternative 3.

Direct and indirect effects of Alternative 3 could cause reduced occupancy by Pacific marten and fisher in portions of the Project area over the long term, namely within the WUI Defense Zone. However, Project implementation would not result in the loss of viability or extirpation of the local and regional Pacific marten and fisher population because most mature forest habitat in the Project area would retain mature forest characteristics suitable for these species. Alternative 3 would have less potential for habitat loss due to high-severity wildfire than the No Action Alternative, but more potential for fire-related habitat loss than Alternatives 1 and 2 (See Section 3.1, “Fire, Fuels, and Forest Health”).

Alternative 4: Vegetation Treatments to Protect Communities and CSO Territories

Alternative 4 would implement the same suite of treatments as Alternative 1 but retains additional mature forest habitat within CSO Territories (see description of treatments summarized above under

the discussion of indirect effects on California spotted owl and northern goshawk). Alternative 4 would retain slightly more denning habitat than Alternative 1, with a reduction of approximately 72 percent, and a larger portion would be converted to foraging habitat instead of being converted to unsuitable compared to Alternative 1. Foraging habitat would increase by approximately 18 percent. Overall, approximately 38 percent of the suitable habitat in the project area could be modified to such a degree that these habitats would no longer exhibit mature forest characteristics (i.e., high canopy cover percentage) (Table 3.2-7b). As a result, these areas would not continue to provide habitat suitable for Pacific marten and fisher post treatment. Alternative 4 would retain additional connectivity of habitat compared to Alternative 1 by retaining additional suitable habitat within CSO Territories.

Direct and indirect effects of Alternative 4 could cause reduced occupancy by Pacific marten and fisher in the Project area over the long term. However, this would not result in the loss of viability or extirpation of the local and regional Pacific marten and fisher population, for the same reasons described above for Alternative 1. Although there would be an approximately 38 percent reduction in suitable mature forest habitat, adverse effects from the No Action Alternative would be comparable or more severe for overall habitat loss.

Western Bumble Bee and Monarch

Direct Impacts

No Action Alternative

Under the No Action Alternative, no fuels treatments would occur. As a result, there would be no direct impact on western bumble bee and monarch.

Alternatives 1, 2, 3, and 4

Potential direct impacts on western bumble bee and monarch are similar across Alternatives 1, 2, 3, and 4 because the differences between these alternatives largely pertain to forest habitats (e.g., PACs, HRCAs, mature forest planning units), and these species primarily occur outside of these habitats. Direct impacts on western bumblebee or monarch would occur if bees or butterflies are directly injured or killed while in flight (e.g., by heavy machinery or personnel, prescribed fire); if underground bumble bee nests or overwintering queens are crushed or burned (e.g., by heavy machinery or personnel, prescribed fire, pile burning); if monarch butterfly eggs or larvae on milkweed host plants are destroyed through removal, crushing, or burning; or if western bumble bees or monarchs are inadvertently exposed to herbicides during or after (i.e., while foraging) herbicide application. Design features will be implemented to reduce impacts of herbicide use on western bumblebee and monarch butterfly (Appendix A).

Western bumble bees are aboveground from approximately May 15–August 31 (i.e., the flight season), during which bees foraging on floral resources in the Project area would be vulnerable to disturbance or mortality resulting from heavy equipment use, vehicles, and prescribed fire. Outside of and overlapping part of the flight season, western bumble bees would be underground either nesting (i.e., during the late spring and summer) or overwintering (i.e., in the late fall and winter). Western bumble bee nesting and overwintering habitat is poorly understood but may include rodent burrows, downed logs, tree and snag bases, leaf litter and duff, refuse piles, and bunch grasses in meadows, grasslands, forest edges, and forests. Because western bumble bees could be present in the Project area year-round and in many different habitat types, treatment activities could

result in incidental mortality of western bumble bees in flight or inadvertent destruction of underground nests of overwintering sites. Monarchs are present in the Sierra Nevada region in the late spring and summer to forage and to lay eggs on milkweed plants. Monarch butterflies in flight (i.e., during migration, while foraging) would be vulnerable to disturbance or mortality resulting from heavy equipment use, vehicles, and prescribed fire. Monarch butterfly eggs on milkweed plants could be destroyed if milkweed plants were removed during treatment activities or burned by prescribed fire.

Treatment activities across the nearly 218,000-acre Project area would not be conducted all at once; thus, all habitat suitable for western bumble bee and monarch would not be treated in a given year. Treatments would be implemented in such a way that during treatment and post treatment, foraging and breeding habitat for western bumble bee and monarch would be available across the landscape (i.e., untreated areas), and treated areas would relatively quickly provide foraging and breeding opportunities for both species (i.e., during the year following treatment). Some individual western bumble bees and monarchs could be inadvertently killed during treatment activities, some underground western bumble bee nests or overwintering sites could be destroyed, and some milkweed plants containing monarch eggs could be removed or burned during treatment activities. However, treatment activities are not expected to cause reduced occupancy by western bumble bee or monarch in the Project area over the long term, or loss of viability or extirpation of the local and regional western bumble bee or monarch populations, because all habitat suitable for these species would not be treated at once and habitats posttreatment would continue to provide habitat suitable for these species.

Indirect Impacts

No Action Alternative

Under the No Action Alternative, new fuel treatments designed to reduce the potential for high-intensity wildfire in the Project area would not occur. Without implementation of these treatments, it is likely that periodic high-intensity wildfires would continue to occur in the Project area, potentially resulting in direct loss of bumble bees and butterflies or loss of habitat for these species. High-intensity wildfire exhibiting moderate to high soil burn severities would also likely generate substantially increased runoff and erosion that would measurably affect water quality in streams within and near burned areas, which could result in adverse effects on riparian or meadow habitats which are both important for foraging western bumble bees and monarchs. Potential beneficial effects of wildfire would include killing encroaching conifers currently degrading meadow habitat and encouraging growth of some plant species potentially resulting in an increase in floral resources for western bumble bee and monarch.

Alternatives 1, 2, 3, and 4

Potential indirect impacts on western bumble bee and monarch are similar across Alternatives 1, 2, 3, and 4 because the differences between these alternatives largely pertain to forest habitats (e.g., PACs, HRCAs, mature forest planning units), and these species primarily occur outside of these habitats. Indirect adverse effects would occur if treatment activities altered habitat or site conditions in a manner that later resulted in a lack of habitat suitable for western bumble bee or monarch, including foraging habitat (i.e., floral resources), breeding habitat (i.e., underground nesting habitat for bumble bees, milkweed plants for monarchs), and overwintering habitat (i.e., underground overwintering habitat for bumble bee queens). Treatment activities, including

mechanical treatments, manual treatments, prescribed fire, and herbicide application could result in temporary removal of floral resources, removal of milkweed plants (i.e., monarch breeding habitat), and temporary disturbance to western bumble bee nesting and overwintering habitat (e.g., crushing rodent burrows, removal of downed logs, removal of duff and litter in forest habitats).

Treatment activities, which are designed to thin dense forest habitats may benefit floral resources within these habitats by reducing heavy litter and duff buildup and reducing shading, which could enhance foraging habitat for western bumble bees. However, western bumble bee queens likely overwinter under litter and duff in forest habitats and forest edges, and treatment activities may result in temporary loss of some overwintering habitat for this species (i.e., until duff and leaf litter reaccumulates). Adverse effects on western bumble bee foraging habitat, nesting habitat, and overwintering habitat would be temporary.

Implementation of treatments would not result in removal of overwintering habitat for monarch, because the Project is outside of the overwintering range of the species. Treatment activities would occur in habitat that may provide foraging or breeding habitat (i.e., milkweed) for monarchs. During the foraging and breeding season, monarchs are typically found in prairies, meadows, grasslands, and along roadsides (NPS 2017). In the Project area, the most suitable foraging and breeding habitat for monarchs would be grasslands, which comprise approximately 1.4 percent of the total Project area (annual grassland, perennial grassland; Table 3.2-1). Common California milkweed species are not limited to grasslands, and can also occur in riparian areas, wetlands, open woodlands, and openings in forests. RCAs would be implemented surrounding streams (i.e., perennial, intermittent) and SAFs (e.g., reservoirs, meadows, wetlands) within which mechanical treatments, prescribed fire, and pile burning would be excluded within 25–82 feet of these features. These requirements would provide some protection for milkweed plants in riparian areas and wetlands. Much of the woodland and forest habitat in the Project area does not contain openings or significant light infiltration due to the dense, overstocked nature of these habitats; thus, high quality habitat for milkweed is not likely present in woodlands or forests in the Project area. Treatment activities, which are designed to thin dense forest habitats may benefit milkweed species within these habitats by reducing heavy litter and duff buildup and reducing shading. Impacts on monarch foraging and breeding habitat in the Project area would be potentially beneficial in the long-term with negative impacts limited to the short-term.

Indirect effects of Project-related disturbances are not expected to cause reduced occupancy by western bumble bee or monarch in the Project area over the long term, or loss of viability or extirpation of the local and regional western bumble bee or monarch populations, for the following reasons: 1) all habitat suitable for these species would not be treated at once and habitats posttreatment would recover quickly and continue to provide habitat suitable for these species, 2) adverse effects on western bumble bee and monarch habitat would be temporary.

Hardhead

Direct Impacts

No Action Alternative

Under the No Action Alternative, no fuels treatments would occur. As a result, there would be no direct impact on hardhead.

Alternatives 1, 2, 3, and 4

Potential impacts on hardhead are similar across Alternatives 1, 2, and 3, because the differences between these alternatives largely pertain to forest habitats (e.g., PACs, HRCAs, mature forest planning units), where hardhead are not present. Direct impacts on hardhead would occur if adult fish, juvenile fish, or eggs are injured or killed during instream work such as road maintenance or construction. Road maintenance activities, including culvert installation for temporary roads or existing roads, could modify the bed, bank, or channel, or alter the flow of waterways, including aquatic habitats suitable for hardhead. Design Features included as part of the proposed action would be implemented to avoid inadvertent loss of hardhead individuals and to avoid impacts on aquatic habitats where hardhead could occur. This includes Design Feature AQWLD-1 which prohibits mechanical equipment within suitable habitat, including within 82 feet of intermittent or perennial streams or special aquatic features (Appendix A). Additionally, EEZs would be implemented surrounding streams (i.e., perennial, intermittent) and SAFs (e.g., reservoirs, meadows, wetlands) within which mechanical treatments, prescribed fire, and pile burning would be excluded within 25–82 feet of these features except for ephemeral streams where these activities would be excluded within 15 feet of these features. These requirements would provide protection for hardhead within these aquatic features. General hydrology, soil, and aquatic resources design features would also be implemented, which include standards and limitations for operations within RCAs, standards for mechanical operations in wet weather conditions, and standards for water drafting. These design features are described in more detail in Appendix A.

Indirect Impacts

No Action Alternative

Under the No Action Alternative, new fuel treatments designed to reduce the potential for high-intensity wildfire in the Project area would not occur. Without implementation of these treatments, it is likely that periodic high-intensity wildfires would continue to occur in the Project area. High-intensity wildfire exhibiting moderate to high soil burn severities would also likely generate substantially increased runoff and erosion that would measurably affect water quality in streams within and near burned areas, which could result in adverse effects on aquatic habitats suitable for hardhead.

Alternatives 1, 2, 3, and 4

Potential indirect impacts on hardhead are similar across Alternatives 1, 2, 3, and 4, because the differences between these alternatives largely pertain to forest habitats (e.g., PACs, HRCAs, mature forest planning units), where hardhead are not present. Indirect adverse effects would occur if treatment activities altered habitat or site conditions in a manner that resulted in negative impacts on water quality (e.g., introduction of sediment to a perennial stream or other aquatic feature) or changes in microclimate.

Design features included as part of the proposed action (e.g., establishment of RCAs; general hydrology, soil, and aquatic resources design features; described above under Direct Impacts) would be implemented to avoid indirect impacts on aquatic habitat where hardhead could occur. These design features would reduce potential indirect impacts on hardhead by preventing water quality impacts, erosion, and other degradation of aquatic habitat. Thus, the proposed action is not expected to result in adverse indirect effects on hardhead or habitat.

Cumulative Impacts for Forest Service Sensitive Wildlife Species

The geographic scope of cumulative impacts for Forest Service Sensitive wildlife species in this analysis is PNF. A cumulative effect can result from the incremental effect of the current action when added to the effects of past, present, and reasonably foreseeable future actions. These effects are considered regardless of what agency or person undertakes the other actions and regardless of ownership of the land on which the other actions occur. An individual action when considered alone may not have a significant effect, but when its effects are considered in sum with the effects of other past, present, and reasonably foreseeable future actions, the effects may be significant (40 Code of Federal Regulations [CFR] 1508.7 and 1508.8 and Forest Service Handbook [FSH] 1909.15 Section 15.1). 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 for wildlife is based on current environmental conditions.

Land uses or environmental stressors have resulted in loss, degradation, and fragmentation of sensitive wildlife habitat, including fire suppression, fuels management activities, large-scale tree mortality from drought and disease, urban development, logging, montane meadow degradation (e.g., due to cattle grazing activities), altered hydrology of aquatic habitats, water pollution, introduced aquatic species, fishing and other recreational uses, and climate change. Additionally, the 2021 Dixie Fire as well as other fires in and around the PNF has resulted in substantial habitat loss or modification for wildlife throughout the PNF. Prior to 2018 suitable mature forest habitat in the PNF totaled approximately 431,557 acres (Forest Service 2022a). High severity fire and fragmentation due to high severity fire has led to the 43 percent (i.e., approximately 241,776 acres) loss of suitable mature forest habitat (e.g., suitable for California spotted owl, northern goshawk, Pacific marten, fisher) in the PNF, a loss that occurred over just a five-year period (Forest Service 2022a). These large, high severity wildfires threaten mature forest species (California spotted owl, northern goshawk, Pacific marten, fisher) persistence across the landscape over the long term. Project implementation under all Alternatives would result in additional loss of mature forest habitat that would be additive to the loss from recent wildfires, albeit at differing levels between Alternatives (Table 3.2-7a and Table 3.2-7b). Additionally, there are fuel treatment projects planned or in progress in the area including the Claremont Project which is located south of Quincy and adjacent to the Project. The Claremont Project comprises vegetation treatments, fuels reduction, prescribed burning, habitat enhancement, and road management treatments on approximately 30,180 acres. Another project located adjacent to the south of the Project is the North Yuba Landscape Resilience Project which is located near New Bullards Bar Reservoir up to the Sierra Crest along Highway 49 and encompasses approximately 275,000 acres. Although analysis of this project states that high quality habitat for California spotted owl, northern goshawk, Pacific marten, and fisher would be improved posttreatment for all three alternatives (Forest Service 2022b). Furthermore, the expansion of barred owl (*Strix varia*) and exposure to contaminants, such as anticoagulant rodenticides, are also stressors on California spotted owl. Other stressors on Pacific marten include removal of downed woody material from the forest floor, which may lead to increased predation. Additional stressors on western bumble bee and monarch include the use of pesticides and disease.

Other planned or ongoing projects in the vicinity of the project area include vegetation management activities (e.g., Community Protection-Eastside Project, North Yuba Landscape Resilience, Claremont Forest Resiliency Project, North Quincy Forest Resilience Project), restoration activities

(e.g., PSW Post-Fire Meadow Restoration, Feather Falls Post-Fire Project), and hazard tree removal (Region 5 Post-Disturbance Hazardous Tree Management Project, Dixie Fire Residential Hazard Tree Removal). Refer to Appendix B for a full list and descriptions of these cumulative projects. These planned or ongoing vegetation management, restoration, and hazard tree removal projects may degrade, fragment, or temporarily disturb habitat for Forest Service sensitive wildlife species and potentially disturb, injure, or kill individuals if they are not identified prior to project activities. However, restoration projects may also improve habitat for these species. If disturbances from treatment activities under these previously approved projects overlap with disturbances from other fuels management projects, recreational activities, or other activities that affect these wildlife species, impacts could be cumulatively substantial.

Contributions to cumulative adverse direct impacts under the proposed Project would be minimal because implementation of Design Features would result in avoidance or reduction of direct and indirect impacts on Forest Service sensitive wildlife species to a negligible level. Contributions to cumulative adverse indirect impacts under the proposed Project would be substantial. Alternative 1, Alternative 2, and Alternative 4 would reduce suitable mature forest habitat in the Project area by 44 to 38 percent (Table 3.2-7a and Table 3.2-7b). Mature forest 5D and 5M habitat would be reduced by 35 to 24 percent (Table 3.2-8). These reductions may be similar to or less severe than the No Action Alternative, especially if the trend of suitable habitat being reduced by 43 percent in five years continues due directly and indirectly to high severity wildfire, however, they would be additive to the habitat loss that has already occurred across Plumas National Forest due to wildfires in recent years.

Migratory Birds

Under the National Forest Management Act, Forest Service is directed to “provide for a diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives” (Public Law 94-588, Section 6(g)(3)(B)). The January 2000 Forest Service Landbird Conservation Strategic Plan (Forest Service 2000), followed by Executive Order 13186 in 2001, in addition to the Partners in Flight (PIF) specific habitat Conservation Plans for birds and the January 2004 PIF North American Landbird Conservation Plan all reference goals and objectives for integrating bird conservation into forest management and planning.

In late 2008, a Memorandum of Understanding (MOU) between the Forest Service and USFWS to Promote the Conservation of Migratory Birds was signed. In 2016, the Forest Service and USFWS agreed to an extension of the Migratory Bird Treaty Act MOU and currently they are working on an additional extension. The intent of the MOU is to strengthen migratory bird conservation through enhanced collaboration and cooperation between the Forest Service and USFWS as well as other federal, state, tribal and local governments. Within the National Forests, conservation of migratory birds focuses on providing a diversity of habitat conditions at multiple spatial scales and ensuring that bird conservation is addressed when planning for land management activities.

PNF uses the USFWS 2008 Birds of Conservation Concern (BCC) for the Sierra Nevada as its framework for analyzing effects on migratory birds (USFWS 2008). Eleven USFWS BCC species are included on the Sierra Nevada list:

- American peregrine falcon (*Falco peregrinus anatum*),
- bald eagle,
- black swift (*Cypseloides niger*),
- California spotted owl,
- calliope hummingbird (*Stellula calliope*),

- Cassin’s finch (*Carpodacus cassinii*),
- flammulated owl (*Otis flammeolus*),
- Lewis’s woodpecker (*Melanerpes lewis*),
- olive-sided flycatcher (*Contopus cooperi*),
- Williamson’s sapsucker (*Sphyrapicus thyroideus*), and
- willow flycatcher.

Of this list of 11 birds, nine bird species are either analyzed in detail in the “Forest Service Sensitive Species” section, above (i.e., California spotted owl, bald eagle, willow flycatcher), or indirectly in the “Management Indicator Species” section below. Project implementation would not result in direct or indirect effects on nesting habitat (i.e., large, sheltered rock cliffs) for American peregrine falcon or black swift; however, direct effects on these species due to disturbance could occur. As described above, all treatments would implement VDT, which is intended to preserve and promote mature and late seral forest characteristics, which would benefit bird species associated with these habitats. The desired conditions in the mature forest and general forest land allocations would prevent complete stand type conversion. Design features would be implemented as part of the Project for American peregrine falcon, bald eagle, California spotted owl, and willow flycatcher, which would minimize or avoid short-term disturbances to these bird species and their habitats, and habitat quality for some migratory bird species may improve overall as a result of treatments relative to existing conditions, especially over the long-term. As a result, Project implementation would not substantially adversely affect migratory birds and a separate detailed specialist report for this analysis was not prepared.

Table 3.2-11 Migratory Bird Species for Project Analysis

Birds of Conservation Concern (Sierra Nevada – BCR 15) Species	Species Status¹	Forest Service Sensitive Species (S) or Management Indicator Species (MIS)	Critical Habitat Component or Threat as Defined by Sierra Nevada Bird Conservation Plan (PIF)
American peregrine falcon	USFWS: BCC		Bodies of water in open areas with protected cliffs, canyons, and ledges for cover and nesting
Bald eagle	USFS: S, SE USFWS: BCC	Bald eagle (S)	Designated as a non-land bird in Sierra Nevada Bird Conservation Plan
Black swift	USFWS: BCC		Wet cliffs, waterfalls
California spotted owl	USFS: S USFS: MIS CDFW: SSC USFWS: BCC	California spotted owl (S)	Old growth
Calliope hummingbird	USFWS: BCC	Sooty (blue) grouse (<i>Dendragapus obscurus</i>) (MIS) Yellow warbler (<i>Setophaga petechia</i>) (MIS) Willow flycatcher (S)	Open Forested habitats, and moist habitats on the East Slope

Birds of Conservation Concern (Sierra Nevada – BCR 15) Species	Species Status ¹	Forest Service Sensitive Species (S) or Management Indicator Species (MIS)	Critical Habitat Component or Threat as Defined by Sierra Nevada Bird Conservation Plan (PIF)
Cassin’s finch	USFWS: BCC	California spotted owl (S)	Old growth
Flammulated owl	USFWS: BCC	Mule deer (MIS) Hairy woodpecker (MIS)	Oaks or oak woodlands, loss of snags
Lewis’ woodpecker	USFWS: BCC	Hairy woodpecker (<i>Picoides villosus</i>) (MIS)	Loss of snags
Olive-sided flycatcher	CDFW: SSC, USFWS: BCC	California spotted owl (S) Hairy woodpecker (MIS)	Late successional/old growth forest (but does not depend on it critically), loss of snags
Williamson’s sapsucker	USFWS: BCC	Hairy woodpecker (MIS)	Loss of snags
Willow flycatcher	USFS: S, SE USFWS: BCC	Willow flycatcher (S)	Montane meadow habitat

BCR = Bird Conservation Region; S = Sensitive; MIS = Management Indicator Species; PIF = California Partners in Flight

Species Status

SE	Listed as Endangered under the California Endangered Species Act
USFWS: BCC	US Fish and Wildlife Service Birds of Conservation Concern
USFS: S	US Forest Service Sensitive
USFS: MIS	US Forest Service Management Indicator Species
CDFW: SSC	California Department of Fish and Wildlife Species of Special Concern

Management Indicator Species

The Sierra Nevada Forests MIS Amendment (Forest Service 2007) identifies bioregional scale habitat and/or population monitoring for MIS for 10 National Forests including the PNF. The habitat and/or population monitoring requirements for PNF MIS are described in the 2010 Sierra Nevada Forests Bioregional Management Indicator Species Report (Forest Service 2010) and are summarized below for the MIS being analyzed for the Project. The applicable habitat and/or population monitoring results are described in the Forest Service 2010 report and are summarized below for the MIS being analyzed for the Project.

Ten MIS and one group of species (i.e., aquatic macroinvertebrates) have been identified in the Forest Plan. These MIS and their habitat potentially affected by the proposed action were reviewed and placed into three categories based on proximity of MIS habitats to the Project area and likelihood of effects related to implementation of treatments on the habitats (Table 3.2-12). One MIS – California spotted owl – is analyzed in detail in the “Forest Service Sensitive Species” section, above.

Road maintenance activities, including culvert installation for temporary roads or existing roads, could modify the bed, bank, or channel, or alter the flow of waterways, including aquatic habitats suitable for aquatic macroinvertebrates. However, Design features included as part of the proposed action (e.g., establishment of RCAs; general hydrology, soil, and aquatic resources design features; Appendix A) would be implemented to avoid indirect impacts on aquatic habitat by preventing water quality impacts, erosion, and other degradation of aquatic habitat. This includes Design Feature AQWLD-1, which prohibits mechanical equipment within suitable habitat, including within 82 feet of intermittent or perennial streams or special aquatic features and no new stream

crossings will be constructed within 0.25 mile of occupied sites unless a biological review determines construction and use would result in no effect to listed aquatic species (Appendix A). Additionally, RCAs would be implemented surrounding streams (i.e., perennial, intermittent) and SAFs (e.g., reservoirs, meadows, wetlands) within which treatments would be limited to maintain habitat function of riparian habitat, wet meadows, and other SAFs. As a result, riverine, lacustrine, riparian, and wet meadow habitat, which are associated with aquatic macroinvertebrates, yellow warbler, and Pacific tree (chorus) frog, respectively, would not be substantially affected directly or indirectly by Project implementation.

Potential impacts on California spotted owl are analyzed in detail in the “Forest Service Sensitive Species” section, above and are not included here. All treatments would implement VDT, which is intended to preserve and promote mature and late seral forest characteristics. The desired conditions in the mature forest and general forest land allocations would prevent complete stand type conversion. Design features for California spotted owl and American peregrine falcon would be implemented as part of the Project, which would minimize or avoid short-term disturbances to these bird species. For Alternatives 1 and 2 there would be substantial reduction in mature forest habitat in the Project area (Table 3.2-7a; Table 3.2-8). Please see ‘Indirect Impacts’ section for northern goshawk and California spotted owl above for discussion on habitat modification. Habitat quality for some migratory bird species may improve overall as a result of treatments relative to existing conditions, especially over the long-term. As a result, oak associated hardwoods and hardwood/conifers and mid seral coniferous, which are associated with mule deer and mountain quail, respectively, would not be substantially affected by Project implementation. Suitable habitat (i.e., mature and late seral closed canopy coniferous forest habitats) associated with California spotted owl and northern flying squirrel would be substantially affected by Project implementation in Alternative 2, because there would be a 94 percent reduction in 5D mature forest habitat and a 95 percent reduction in 4D habitat (Table 3.2-8). Alternatives 1 and 4 are less impactful with a reduction in 5D habitat of 66 percent and 58 percent, respectively, as well as a reduction in 4D habitat of 88 percent for both Alternatives. Alternative 3 is the least impactful with a reduction in 5D and 4D habitats of 44 percent and 50 percent, respectively. Suitable habitat for open canopy coniferous forests associated with sooty grouse would be increase with an increase of approximately 49 percent (Alternative 1), 134 percent (Alternative 2), 98 percent (Alternative 3), and 68 percent (Alternative 4) in 5M habitat. Alternatives 1 and 4 would decrease the amount of 4 M habitat: 10 percent (Alternative 1) and 5 percent (Alternative 4), while Alternative 2 and 3 would increase the percent of 4M habitat: 19 percent (Alternative 2) and 34 percent (Alternative 3) in the Project area (Table 3.2-8). A portion of the 4M habitat posttreatment would exist as a result of the conversion of 4D habitat.

Table 3.2-12 Management Indicator Species for Project Analysis

Species	Indicators of Management	No Habitat in or Adjacent to the Project Area, Thus Not Affected Directly or Indirectly by the Project	Habitat in or Adjacent to the Project Area, but Not Affected Directly or Indirectly by the Project	Habitat Would Be Affected Directly or Indirectly by the Project
Aquatic macroinvertebrates	Riverine and lacustrine	—	—	X

Species	Indicators of Management	No Habitat in or Adjacent to the Project Area, Thus Not Affected Directly or Indirectly by the Project	Habitat in or Adjacent to the Project Area, but Not Affected Directly or Indirectly by the Project	Habitat Would Be Affected Directly or Indirectly by the Project
Fox sparrow (<i>Passerella iliaca</i>)	Shrubland (west-slope chaparral types)	—	—	X
Mule deer	Oak-associated hardwoods and hardwood/conifers	—	—	X
Yellow warbler	Riparian	—	—	X
Pacific tree (chorus) frog (<i>Pseudacris regilla</i>)	Wet Meadow	—	—	X
Mountain quail (<i>Oreortyx pictus</i>)	Early seral coniferous	—	—	X
Mountain quail	Mid seral coniferous	—	—	X
Sooty (blue) grouse	Late seral open canopy coniferous	—	—	X
California spotted owl	Late seral closed canopy coniferous	—	—	X
Northern flying squirrel (<i>Glaucomys sabrinus</i>)	Late seral closed canopy coniferous	—	—	X
Hairy woodpecker	Snags in green forest	—	—	X
Black-backed woodpecker (<i>Picoides arcticus</i>)	Snags in burned forest	—	—	X

Source: Compiled by Ascent Environmental in 2022.

The primary goal for treatments within shrub and early seral areas would be to reduce fire hazard and increase suppression efficiency while retaining trees at densities to allow for greater drought resilience and reduced tree to tree fire spread. These desired conditions would prevent complete stand type conversion. Shrubland and early seral coniferous habitats, which are associated with fox sparrow and mountain quail, respectively would not be substantially affected by Project implementation.

Snags in green forest, which are associated with hairy woodpecker and black-backed woodpecker, respectively, would not be substantially affected by Project implementation at the bio-regional scale. All treatments would implement VDT, which is intended to preserve and promote mature and late seral forest characteristics, including retention of snags. Within green forest habitats, outside of the WUI Defense Zone, three to six snags would be retained per acre. In the WUI Defense Zone zero snags may be retained within green forest which would limit the availability of

snag habitat in green forest in these localized areas but would not affect the availability at the bio-regional scale. Treatments within burned areas would include hazard tree removal and reforestation activities. Outside of the WUI Defense Zone, up to four snags would be retained per acre. Snags in burned forest, which are also associated with hairy woodpecker and black-backed woodpecker, may be substantially affected by Project implementation. In the eastern part of the Project area (see Appendix B), there would be no snag retention guidelines, which may lead to a substantial reduction in this type of habitat in burned areas. In the western and central part of the Project area snags and dead trees would be retained at 3 to 6 snags per acre, averaged across the treatment unit in clumped arrangement, utilizing trees greater than or equal to 15 inches DBH and greater than or equal to 20 feet in height (see Appendix B). This would result in a substantial reduction of habitat for these species in post-wildfire areas and in the WUI Defense Zone. Habitat suitable for hairy woodpecker and black-backed woodpecker would remain in the Project area posttreatment outside of burned areas and WUI Defense.

3.2.6. Determination for Wildlife

Listed Wildlife Species

California Red-Legged Frog, Foothill Yellow-Legged Frog, Sierra Nevada Yellow-Legged Frog, and Gray Wolf

The Wildlife and Plant BA analyzed the proposed action under Alternative 1: Vegetation Treatments to Protect Communities and Achieve Resilient Stand Density, which is assumed to be the Project alternative with the greatest intensity of treatments; effects of Alternative 1 to these species would be less than or similar to Alternatives 2 and 3 and the same as Alternative 4. As discussed in the Wildlife and Plant BA, implementation of the Project could result in direct effects (i.e., injury, mortality) on California red-legged frogs, foothill yellow-legged frogs, and Sierra Nevada yellow-legged frogs even after implementing Project design features (Appendix A), because there is potential for these species to be present in some areas outside of the 82-foot exclusion buffer that would be implemented under RCA requirements, because all frogs may not be detected during the pretreatment survey required under Design Feature AMPHIB-1, and because hand treatments may result in frogs being crushed if they are present within the treatment area. As a result, PNF has determined that under all Alternatives the Project **may affect and is likely to adversely affect** California red-legged frog, foothill yellow-legged frog, and Sierra Nevada yellow-legged frog.

Implementation of design features pertaining to gray wolf (i.e., Design Feature WOLF-1; Appendix A) would prevent direct effects on gray wolf by protecting natal dens and rendezvous sites. As a result, PNF has determined that under all Alternatives the Project **may affect but is not likely to adversely affect gray wolf**.

Additionally, impacts on aquatic critical habitat for California red-legged frog and Sierra Nevada yellow-legged frog would be minimal because aquatic habitat would not be targeted for treatments and implementation of design features would include implementation of standards and limitations for operations within RCAs, standards for mechanical operations in wet weather conditions, and standards for water drafting that would prevent erosion, sedimentation, and degradation of water quality. While some vegetation would be removed within some upland and dispersal critical habitats for California red-legged frog and Sierra Nevada yellow-legged frog, Project Design Features (Appendix A) that would be implemented in these habitats would prevent adverse habitat modification such that habitat function for California red-legged frog and Sierra Nevada yellow-

legged frog would be maintained. As a result, PNF has determined that under all Alternatives the Project **may affect but is not likely to adversely affect** critical habitat for California red-legged frog and Sierra Nevada yellow-legged frog. The Project would have **no effect** on critical habitat for foothill yellow-legged frog or gray wolf, because critical habitat either has not been established by USFWS or does not exist in the project area for these species.

Proposed and Candidate Wildlife Species

It is PNF's determination that Alternatives 2, 3, and 4 of the Project **may affect individuals but is not likely to jeopardize the continued existence** of the following species:

- California spotted owl.

It is PNF's determination that Alternatives 1, 2, 3, and 4 of the Project **may affect individuals but is not likely to contribute to the need for federal listing or loss of viability** of the following species:

- monarch butterfly.

Monarch is a candidate for listing under the ESA; thus, the species is currently already trending toward federal listing and proposed project activities are not expected to have long-term impacts that would measurably contribute to the decline of the species or result in a loss of viability within the project area.

Forest Service Sensitive Wildlife Species

It is PNF's determination that Alternatives 1, 2, 3, and 4 of the Project **may affect individuals but is not likely to result in a trend toward federal listing or loss of viability** of the following species:

- northern goshawk (except Alternative 1),
- bald eagle,
- willow flycatcher,
- greater sandhill crane,
- western pond turtle,
- pallid bat,
- fringed myotis,
- Townsend's big-eared bat,
- Pacific marten (except Alternative 1),
- fisher (except Alternative 1),
- western bumble bee,
- hardhead.

There is a high degree of uncertainty of the impact of Alternative 1 on mature forest associated species such as California spotted owl, northern goshawk, Pacific marten, and fisher. Alternative 1 could result in greater overall habitat loss than occurred due to recent wildfires. While focusing on retaining habitat currently utilized by California spotted owl and northern goshawk, and likely with greater connectivity than under a wildfire scenario, is thought to be less impactful than the expected result of the No Action Alternative, with the large amount of overall habitat loss it is uncertain if these populations would experience a loss of viability within the project area. Given the large spatial extent of the project, the impacts could be substantial.

These determinations are based on the following rationale:

- Prior to implementation of treatment activities, focused surveys for California spotted owl and northern goshawk would be conducted within habitat suitable for the species, and if active California spotted owl or northern goshawk nests are detected, species-specific design features would be applied (e.g., LOPs, new PACs).
- Regardless of the time of year, mechanical treatments would not be conducted within 500 feet of documented northern goshawk and spotted owl nests, or within approximately 372 feet of a California spotted owl nest under Alternative 1 and Alternative 4, specifically.
- Treatment activities within PACs and HRCAs/Territories would follow desired conditions and standards which are designed to maintain habitat suitability for California spotted owls and northern goshawks, which would in turn maintain habitat suitability for other Forest Service sensitive wildlife species that use these habitats (e.g., Pacific marten, fisher). This is with the exception of HRCAs in Alternative 2 where there would be a 32 percent reduction in suitable habitat in HRCAs located in the WUI Defense.
- Although Alternatives 1 2 and 4 would reduce mature forest habitat in the Project area by 44 to 38 percent, the No Action Alternative has the potential for comparable or more severe impacts. In the past five years 43 percent of suitable habitat for California spotted owl and northern goshawk in the PNF was lost directly due to high severity fires or fragmented into smaller patches (Forest Service 2022a). These effects would likely continue and become more severe under the No Action Alternative. This impact also relates to other mature forest species of Pacific marten and fisher.
- All treatments would implement VDT, which is intended to better mimic pre-settlement conditions created under a frequent fire regime to which native species are adapted.
- Pretreatment surveys for bald eagles would be conducted prior to implementation of treatment activities in known bald eagle nest sites or use areas. If active bald eagle nests are detected, a no-disturbance buffer of 0.25 mile would be implemented from January 1–August 31 or until young are no longer dependent on adults.
- EEZs would be established around meadow habitat, streams, and other SAFs to prevent degradation of these habitats, which would help maintain habitat function for aquatic and meadow and riparian dependent species.
- Road maintenance activities, including culvert installation for temporary roads or existing roads, could modify the bed, bank, or channel, or alter the flow of waterways, including aquatic habitats suitable for aquatic species. No new stream crossings will be constructed within 0.25 mile of occupied sites unless a biological review determines construction and use would result in no effect to listed aquatic species (Appendix A). While in-stream work for road maintenance could result in short-term release of sediment into aquatic habitats, BMPs and design features would be implemented to protect aquatic habitats and are not expected to result in long-term impacts to aquatic habitats.
- General hydrology, soil, and aquatic resources design features would be implemented, which include standards and limitations for operations within RCAs, standards for mechanical treatment operations in wet weather conditions, and standards for water drafting.
- For known pallid bat, fringed myotis, and Townsend's big-eared bat roosts, a 1/8-mile no-disturbance buffer would be implemented to prevent disturbance or abandonment of the roost during the bat maternity season (April 1–August 31). Snag retention levels outside of WUI

defense areas and retention of all trees 30-inches dbh and larger would provide continued availability of roost habitat, while and improving overall health of the habitat and enhancing growth of the trees into the larger size classes is expected to provide for future bat roost habitat.

- Although there would be substantial reductions in mature forest habitat in the Project area under all Alternatives as well as a reduction in clutter habitat and therefore an increase in possible predation and decrease in foraging habitat, these effects would be comparable or less than the No Action Alternative. Impacts from high severity fire are likely to continue and become more severe under the No Action Alternative, which would also increase possible predation and decrease foraging habitat.
- An LOP would be implemented within a 100-acre buffer of all known Pacific marten den sites and within a 700-acre buffer for all known fisher dens during the maternity season (March 1–June 30) to prevent disturbance or abandonment of the den. While denning habitat will be substantially reduced or converted to foraging habitat in the project area, design features for California spotted owl PACs (all Alternatives) as well as HRCAs (Alternatives 1, 2, and 3) or Territories and Wildlife Corridors (Alternative 4) would retain suitable habitat and greater habitat connectivity than would like occur under the No Action Alternative.
- The Project area would not be treated all at once; therefore, all foraging, breeding, and overwintering (western bumble bee only) habitat suitable for western bumble bee and monarch would not be treated in a given year. Foraging, breeding, and overwintering habitat (western bumble bee only) for these species would be available within the Project area posttreatment, and treated areas would provide habitat for both species relatively quickly after treatment (i.e., the following year).

3.2.7. Analytical Approach for Plants

PNF Life history and occurrence information for species listed as endangered or threatened under the ESA, species that are proposed or candidate species for listing under the ESA, or Forest Service sensitive plant species (Appendix E7) was assembled from the following sources:

- CNDDDB (CNDDDB 2022);
- USFWS IPaC Tool (USFWS 2023)
- NRIS Species Occurrence Data Provided by PNF (PNF 2022);
- Forest Service Region 5 Regional Forester's Sensitive Plant List (Forest Service 2013b); and
- other pertinent literature regarding these species.

Reconnaissance level surveys were completed to better understand species habitats and potential effects from Project activities within the Project area. Surveys will need to be conducted prior to each year of treatment within the remaining Project area. Surveys will be conducted according to procedures outlined in the Forest Service Handbook: Threatened and Endangered Plants Program (FSH 2609.25.11).

Geographic Area Evaluated

To analyze potential impacts of Project implementation on plant species listed as endangered or threatened under the ESA, species that are proposed or candidate species for listing under the ESA, or Forest Service sensitive plant species, the Project area and a 3-mile buffer surrounding the Project area was considered; hereinafter referred to as the botanical analysis area (Appendix E4; Figure 7). The botanical analysis area captures all special-status plants that occur within the Project area or for which habitat is present in the Project area, as well as source populations (i.e., potential for seed

dispersal) near the Project area. Portions of the project area and botanical analysis area have burned in recent fires (Appendix E4, Figure 8).

Plant Species Evaluated

A total of 56 plant species listed as threatened or endangered under the ESA and Forest Service Sensitive plant species were evaluated as potentially occurring within the Project area (Table 3.2-6). The four threatened or endangered plant species, Layne's butterweed, Webber's ivesia, whitebark pine, and slender Orcutt grass, were evaluated separately in Project BA. Distribution and documented CNDDDB and NRIS occurrences, habitat, and current threats to these species are summarized in species accounts included in Appendix E7.

Forest Service Watch List plant species are presented in Appendix E9. While Forest Service Watch List plant species are not included in this analysis, Design Feature BOTANY-11 requires inclusion of these species in pretreatment surveys (required under Design Feature BOTANY-1) and development of protection measures for these species in consultation with the PNF botanist and in compliance with the Interim Management Prescriptions.

Table 3.2-13 Special-Status Plants with Potential to Occur in the Project Area

Common Name	Scientific Name	Status ^{1,2}	Global Rank ⁴	Occurrences in Botanical Analysis Area (3-Mile Project Buffer)	Occurrences Known in Project Area	Potential Habitat Y/N	Species Analyzed Y/N	Rationale
Jepson's onion	<i>Allium jepsonii</i>	FSS	G2	X	X	Y	Y	–
Lemmon's milkvetch	<i>Astragalus lemmonii</i>	FSS	G2	–	–	Y	Y	–
Lens-pod milkvetch	<i>Astragalus lentiformis</i>	FSS	G2	X	X	Y	Y	–
Modoc Plateau milkvetch	<i>Astragalus pulsiferae</i> var. <i>coronensis</i>	FSS	G3	–	–	Y	Y	–
Pulsifer's milkvetch	<i>Astragalus pulsiferae</i> var. <i>pulsiferae</i>	FSS	G4	X	–	Y	Y	–
Webber's milkvetch	<i>Astragalus webberi</i>	FSS	G1	X	–	Y	Y	–
Big-scale balsamroot	<i>Balsamorhiza macrolepis</i> var. <i>macrolepis</i>	FSS	G2	–	–	Y	Y	–
Constance's rock cress	<i>Boechera constancei</i> Synonym: <i>Arabis constancei</i>	FSS	G2	X	X	Y	Y	–
Upswept moonwort ³	<i>Botrychium ascendens</i>	FSS	G3	–	–	Y	Y	–

Common Name	Scientific Name	Status ^{1,2}	Global Rank ⁴	Occurrences in Botanical Analysis Area (3-Mile Project Buffer)	Occurrences Known in Project Area	Potential Habitat Y/N	Species Analyzed Y/N	Rationale
Scalloped moonwort ³	<i>Botrychium crenulatum</i>	FSS	G4	X	–	Y	Y	–
Common moonwort ³	<i>Botrychium lunaria</i>	FSS	G5	–	–	Y	Y	–
Mingan moonwort ³	<i>Botrychium minganense</i>	FSS	G5	X	X	Y	Y	–
Western goblin ³	<i>Botrychium montanum</i>	FSS	G3	X	X	Y	Y	–
Northern moonwort ³	<i>Botrychium pinnatum</i>	FSS	G5	X	X	Y	Y	–
Bolander's bruchia moss	<i>Bruchia bolanderi</i>	FSS	G3	X	X	Y	Y	–
Buxbaumia moss	<i>Buxbaumia viridis</i>	FSS	G3	X	X	Y	Y	–
Butte County calycadenia	<i>Calycadenia oppositifolia</i>	FSS	G3	X	X	Y	Y	–
White-stemmed clarkia	<i>Clarkia gracilis</i> ssp. <i>albicaulis</i>	FSS	G5	X	–	Y	Y	–
Mildred's clarkia	<i>Clarkia mildrediae</i> ssp. <i>mildrediae</i>	FSS	G3	X	X	Y	Y	–
Mosquin's clarkia	<i>Clarkia mosquinii</i>	FSS	G2	X	X	Y	Y	–
Clustered lady's-slipper	<i>Cypripedium fasciculatum</i>	FSS	G4	X	X	Y	Y	–
Mountain lady's-slipper	<i>Cypripedium montanum</i>	FSS	G4	X	X	Y	Y	–
Branched collybia	<i>Dendrocollybia racemosa</i>	FSS	G2	–	–	Y	Y	–
California twisted spikerush	<i>Eleocharis torticulmis</i>	FSS	G1	X	X	Y	Y	–
Clifton's eremegone	<i>Eremogone cliftonii</i>	FSS	G3	X	X	Y	Y	–

Common Name	Scientific Name	Status ^{1,2}	Global Rank ⁴	Occurrences in Botanical Analysis Area (3-Mile Project Buffer)	Occurrences Known in Project Area	Potential Habitat Y/N	Species Analyzed Y/N	Rationale
Schoolcraft's wild buckwheat	<i>Eriogonum microthecum</i> var. <i>schoolcraftii</i>	FSS	G5	–	–	Y	Y	–
Ahart's sulphur flower	<i>Eriogonum umbellatum</i> var. <i>ahartii</i>	FSS	G5	X	X	Y	Y	–
Brook pocket-moss	<i>Fissidens aphelotaxifolius</i>	FSS	G3	–	–	Y	Y	–
Fissidens moss	<i>Fissidens pauperculus</i>	FSS	G3?	X	X	Y	Y	–
Caribou coffeeberry	<i>Frangula purshiana</i> ssp. <i>ultramafica</i>	FSS	G4	X	X	Y	Y	–
Butte County fritillary	<i>Fritillaria eastwoodiae</i>	FSS	G3	X	X	Y	Y	–
Blandow's bog-moss	<i>Helodium bandowii</i>	FSS	G4	–	–	Y	Y	–
Sierra Valley ivesia	<i>Ivesia aperta</i> var. <i>aperta</i>	FSS	G2	X	X	Y	Y	–
Plumas ivesia	<i>Ivesia sericoleuca</i>	FSS	G2	X	X	Y	Y	–
Webber's ivesia	<i>Ivesia webberi</i>	FT; FSS	G3	–	–	Y	Y	–
Santa Lucia dwarf rush	<i>Juncus luciensis</i>	FSS	G3	–	–	Y	Y	–
Cantelow's lewisia	<i>Lewisia cantelovii</i>	FSS	G3	X	X	Y	Y	–
Hutchison's lewisia	<i>Lewisia kelloggii</i> ssp. <i>hutchisonii</i>	FSS	G3	X	X	Y	Y	–
Kellogg's lewisia	<i>Lewisia kelloggii</i> ssp. <i>kelloggii</i>	FSS	G3	–	–	Y	Y	–
Adobe parsley	<i>Lomatium roseanum</i>	FSS	G2	X	–	Y	Y	–
Broad-nerved hump-moss	<i>Meesia uliginosa</i>	FSS	G5	X	–	Y	Y	–

Common Name	Scientific Name	Status ^{1,2}	Global Rank ⁴	Occurrences in Botanical Analysis Area (3-Mile Project Buffer)	Occurrences Known in Project Area	Potential Habitat Y/N	Species Analyzed Y/N	Rationale
Elongate copper-moss	<i>Mielichhoferia elongata</i>	FSS	G5	X	–	Y	Y	–
Follet's monardella	<i>Monardella follettii</i>	FSS	G2	X	X	Y	Y	–
Stebbin's monardella	<i>Monardella stebbinsii</i>	FSS	G2	–	–	Y	Y	–
Slender Orcutt grass	<i>Orcuttia tenuis</i>	FT	G2	–	–	N	N	No vernal pools known on Forest
Plumas alpine-aster	<i>Oreostemma elatum</i>	FSS	G2	X	X	Y	Y	–
Cut-leaved ragwort	<i>Packera eurycephala</i> var. <i>lewisrosei</i>	FSS	G4	X	X	Y	Y	–
Layne's butterweed	<i>Packera layneae</i>	FT	G2	X	–	Y	Y	–
Veined water lichen	<i>Peltigera gowardii</i>	FSS	G4	X	X	Y	Y	–
Closed-throated beardtongue	<i>Penstemon personatus</i>	FSS	G4	X	X	Y	Y	–
Susanville beardtongue	<i>Penstemon sudans</i>	FSS	G3	–	–	Y	Y	–
Olive phacollybia	<i>Phacollybia olivacea</i>	FSS	G3	–	–	Y	Y	–
Whitebark pine	<i>Pinus albicaulis</i>	FT	G3	–	–	N	N	Project out of range
Sierra blue grass	<i>Poa sierrae</i>	FSS	G3	X	X	Y	Y	–
Sticky pyrrocoma	<i>Pyrrocoma lucida</i>	FSS	G3	X	X	Y	Y	–
Feather River stonecrop	<i>Sedum albomarginatum</i>	FSS	G2	X	X	Y	Y	–

¹ FFS= Forest Service Sensitive

² FT – Federally Threatened

³ Some occurrences of *Botrychium* spp. (i.e., identified to genus only) were noted in the Plumas National Forest special-status species database.

⁴ Globa -Rank - G1: Critically Imperiled G2: Imperiled, G3: Vulnerable, G4: Apparently Secure, G5: Secure – At very low risk of extinction due to a very extensive range, abundant populations or occurrences, and little to no concern from declines or threats. GNR: Unranked – Global rank not yet assessed. (see CNPS 2023 for definitions)

Source: Data received from PNF in 2023.

Plant Species Considered but Not Evaluated Further

Three additional species were initially evaluated but were determined unlikely to be affected by the Project. Slender Orcutt grass, and whitebark pine have not been documented within the action area. Habitat suitable for slender Orcutt grass (i.e., deep vernal pools with clay soils) is not known to occur in PNF based on previous surveys (Belsher, pers. comm., 2022) and most of the Project area is outside of the elevation range of the species. The known range of whitebark pine does not include the Project area (USFWS 2021).

3.2.8. Environmental Effects for Sensitive Plants

Analysis Assumptions

Although Alternatives 1, 2, 3 and 4 include the same desired conditions, planning units, and suite of potential treatment methods, the alternatives vary in the intensity of fuel reduction, the extent and location of each treatment method, and the degree to which the alternative meets desired conditions. All alternatives would employ the same on the ground activities, but Alternatives 1 and 4 would result in more intensive thinning activities to achieve rSDI targets in some treatment units.

Special-status plant, lichen, and fungi species would be affected by Project implementation in different ways depending on their life cycles, habitat associations, current habitat conditions, expected habitat responses in those current conditions, timing of actions, and other factors. Some assumptions that are useful as initial filters for this analysis are the following:

- Rare botanical species, associated with forest habitats that burned at moderate to high intensity, as indicated by RAVG data (Appendix E6), may no longer have habitat to support populations of these species.
- Plants that tolerate disturbance may still be affected; however, adverse effects would be expected to be less severe than effects to plants that are intolerant of disturbance.
- Adverse effects would be highest for species that are in areas with a high density of trees, are disturbance intolerant, and are associated with shaded habitats.
- Plants that occur in cliffs or steep rocky habitats are unlikely to be affected by Project activities due to lack of trees.
- Aquatic, emergent, and other obligate or facultative wetland-associated plants are less likely to be affected, largely because of DFs limiting Project activities in these Riparian Conservation Area buffers.

Special-status plant species were organized into seven groups based on habitat and the manner in which these habitats would be affected by the above assumptions and Project activities. Some special-status plant species are included in more than one group some that aren't covered adequately in one group were analyzed in a general forest group. Special-status plant groups are presented below:

- wetland and aquatic species;
- species associated with serpentine soils and rocky/bedrock outcrops;
- annual plant species;
- species associated sagebrush and chaparral habitats;

- rhizomatous species with low tolerance to disturbance that are associated with late seral habitats;
- species associated with cliffs and steep roadcuts; and
- other general forest species not completely covered by habitats above.

Federally Listed Plant Species

The Wildlife and Plant BA analyzed the proposed action under Alternative 1: Vegetation Treatments to Protect Communities and Achieve Resilient Stand Density, which is assumed to be the Project alternative with the greatest intensity of treatments. The Wildlife and Plant BA analyzed potential direct, indirect, and cumulative effects on Layne's butterweed resulting from Project implementation. The Wildlife and Plant BA is hereby incorporated by reference and is available for review on the PNF website. Determinations for federally listed plant species, as described in detail in the Wildlife and Plant BA, are provided below under Section 3.2.9, "Determination for Plants."

Layne's Butterweed and Webber's Ivesia (Alternatives 2 and 3)

Direct Impacts

No Action Alternative

Under the No Action Alternative, no fuels treatments would occur. As a result, there would be no direct impact on Layne's butterweed and Webber's ivesia due to project activity.

Alternatives 2 and 3

The same direct impacts on Layne's butterweed and Webber's ivesia as described for Alternative 1 in the Wildlife and Plant BA could occur under Alternatives 2 and 3, because the differences between these alternatives largely pertain to forest habitats (e.g., PACs, HRCAs, mature forest planning units), where these species are not present. In addition, botany design features would be included under all alternatives (i.e., Design Feature BOTANY-1, surveys for special-status plants would be conducted prior to Project implementation and pursuant to Design Feature BOTANY-2, any special-status plant population identified during these surveys would be flagged for avoidance (Appendix A). Within these flagged areas, no treatment activities would occur unless approved by a PNF botanist, as described in Design Feature BOTANY-2 (Appendix A). Treatments within and adjacent to flagged areas would be implemented pursuant to Design Features BOTANY-2, BOTANY-3, and BOTANY-5 (Appendix A). As a result, direct impacts on these species would be largely avoided, unless it is determined by the PNF botanist, that treatments are needed within special-status plant populations or that treatments would be beneficial to some special-status plant species.

Indirect Impacts

No Action Alternative

Because the No Action Alternative would not implement fuel treatments, habitat in the Project area would become increasingly susceptible to high intensity wildfire (See Section 3.1, "Fuels, Fire, and Forest Health"). This could result in adverse effects to Layne's butterweed and Webber's ivesia habitat.

Alternatives 2 and 3

The same indirect impacts on Layne's butterweed and Webber's ivesia as described for Alternative 1 in the Wildlife and Plant BA could occur under Alternatives 2 and 3, because the differences between these alternatives largely pertain to forest habitats (e.g., PACs, HRCAs, mature forest planning units), where these species are not present. In addition, botany design features would be included under all alternatives (i.e., Design Feature BOTANY-1, surveys for special-status plants would be conducted prior to Project implementation and pursuant to Design Feature BOTANY-2, any special-status plant population identified during these surveys would be flagged for avoidance (Appendix A). Within these flagged areas, no treatment activities would occur unless approved by a PNF botanist, as described in Design Feature BOTANY-2 (Appendix A). Treatments within and adjacent to flagged areas would be implemented pursuant to Design Features BOTANY-2, BOTANY-3, and BOTANY-5 (Appendix A). As a result, direct impacts on these species would be largely avoided, unless it is determined by the PNF botanist, that treatments are needed within special-status plant populations or that treatments would be beneficial to some special-status plant species.

Forest Service Sensitive Plant Species

No Action Alternative

Under the No Action Alternative, new fuel treatments designed to reduce the potential for high-intensity wildfire in the Project area would not occur. Without implementation of these treatments, it is expected that periodic high-intensity wildfires would continue to occur in the Project area, potentially resulting in direct loss of Forest Service Sensitive plant species or loss of habitat for these species through stand replacement. High-intensity wildfire exhibiting moderate to high soil burn severities would also likely generate substantially increased runoff and erosion that would measurably affect water quality in streams within and near burned areas, which could result in adverse effects on plant species associated with wetlands and aquatic habitat. Additionally, in the absence of fuel treatments, tree density within forest habitats would likely continue to increase, resulting in areas with greater canopy closure, reduced light infiltration, and increased duff and litter deposition, which may benefit some special-status plant species and exclude others.

Alternatives 1, 2, 3, and 4

Fifty-two Forest Service Sensitive plant species are known or have potential to occur in the Project area, based on habitat requirements and species distribution. These species could be affected by the proposed action. The potential direct, indirect, and cumulative impacts on all of these species that could result from the proposed action (i.e., Alternatives 1, 2, 3, and 4) are discussed in the following sections. Potential impacts on special-status plants are similar across Alternatives 1, 2, 3, and 4.

Direct and Indirect Impacts on Special-Status Plants

The following direct, indirect, and potentially beneficial impact mechanisms would apply for all special-status plant species in all groups.

Direct Impacts

Direct impacts on special-status plants may occur if plants are physically removed or damaged during Project implementation. Proposed treatment activities that have potential to directly affect special-status plants include timber felling; use of off-road vehicles or equipment; skidding, construction of new landings or use of existing landings; grapple piling; mastication; pile burning; road maintenance; prescribed fire; herbicide application; and foot trampling by Project personnel. These actions may result in death, altered growth, or reduced seed set of special-status plants due to physical breaking, crushing, burning, scorching, or uprooting of these plants.

Indirect Impacts

Indirect impacts can be beneficial or detrimental to special-status plant species including changes in vegetation composition (e.g., density, canopy cover), hydrology, successional patterns, soil qualities, fire regimes, or the distribution and abundance of invasive plants (See Appendix E5, “*Invasive Plant Risk Assessment*”). Adverse indirect effects are more likely to occur to species that are intolerant of disturbance and tend to occupy interior forest habitats with high canopy cover including clustered lady’s-slipper and mountain lady’s-slipper.

Potentially Beneficial or Detrimental Indirect Impacts

While adverse effects on special-status plant species may occur because of Project implementation, some treatment activities could have either or both a beneficial or detrimental impact on special-status plant species depending on the species’ life history and habitat preferences. These potentially beneficial impacts are described below:

- Special-status plant species associated with wetlands may benefit from mechanical, manual, and prescribed fire treatments that reduce conifer encroachment. Conversely, they could be harmed by changes to water flow.
- Special-status species may benefit from reduced competition through thinning of vegetation in riparian areas and forests. Conversely, they could be harmed by direct changes to light conditions and the resulting plant community.
- Road maintenance may restore hydraulic systems, indirectly benefiting special-status plants in wetland and aquatic habitats. Road maintenance may harm sensitive plants by redirecting water.
- Forest thinning may result in reduction in canopy cover which may indirectly benefit species that prefer more open canopy conditions by increasing light and water infiltration. Conversely, reduction in canopy cover can harm species that cannot tolerate the increased light and water.
- Herbicide application targeting invasive plant infestations may result in reduced competition for native plant species, including special-status plants.
- Project implementation may assist in seed dispersal for special-status plants, especially annual species (e.g., *Clarkia* spp.). Project implementation may prevent seed production by damaging plants before they produce seed or creating conditions of higher temperatures, excessive light, and drying that impair seed production.
- Project implementation may benefit species that are adapted to disturbed habitats (e.g., *Clarkia* spp.). Project implementation may harm sensitive plants by creating more disturbance than they can tolerate. Some species tolerate only moderate disturbance.

- While the effect of fire on special-status plant species on PNF is generally poorly understood, some species may benefit from prescribed fire. Design Feature BOTANY-12 recommends allowing for the opportunity to evaluate the effects of prescribed fire on special-status plant populations pursuant to Forest Service Management Prescriptions (Appendix E10).

General Forest Species Not Completely Covered in Groupings Below

The special-status plant species included in the general forest species group include Jepson's onion, Webber's milk vetch, big-scale balsamroot, Constance's rock cress, buxbaumii moss, white-stemmed clarkia, Mildred's clarkia, clustered lady's-slipper, mountain lady's-slipper, branched collybia, Clifton's eremegone, Caribou coffeeberry, Cantelow's lewisia, Hutchison's lewisia, Kellogg's lewisia, closed-throated beardtongue, olive phaecollybia, and Sierra blue grass. These species were difficult to easily design actions to protect them since they more generalist species that could potentially be found though much of the Project area. For all of these species, design features described in detail in Appendix A would be applied. Pursuant to Design Feature BOTANY-1, surveys for special-status plants would be conducted prior to Project implementation and pursuant to Design Feature BOTANY-2, any special-status plant population identified during these surveys would be flagged for avoidance (Appendix A). Within these flagged areas, no treatment activities would occur unless approved by a PNF botanist, as described in Design Feature BOTANY-2 (Appendix A). Treatments within and adjacent to flagged areas would be implemented pursuant to Design Features BOTANY-2, BOTANY-3, and BOTANY-5 (Appendix A). As a result, direct and indirect impacts on these species would be largely avoided, unless it is determined by the PNF botanist, that treatments are needed within special-status plant populations or that treatments would be beneficial to some special-status plant species.

Additional design features apply only to certain special-status plant species groups and these differences are discussed below. Further, some special-status plant species groups would be more or less susceptible to disturbance resulting from Project implementation dependent upon their life history, lifeform, or preferred habitat, and some groups are more likely to benefit from treatments. These differences are also described below.

Wetland and Aquatic Species

The special-status plant species included in the wetland and aquatic species group are Lemmon's milkvetch, upswept moonwort, scalloped moonwort, common moonwort, Mingan moonwort, western goblin, northern moonwort, Bolander's bruchia moss, California twisted spikerush, Blandow's bog-moss, Brook pocket moss, fissidens moss, Santa Lucia dwarf rush, broad-nerved hump-moss, Plumas alpine-aster, and veined water lichen.

In addition to the design features described above, RCAs and EEZs would be implemented surrounding streams (i.e., perennial, intermittent) and SAFs (e.g., reservoirs, meadows, wetlands) within which mechanical treatments, prescribed fire, and pile burning would be excluded within 25–82 feet of these features except for ephemeral streams where these activities would be excluded within 15 feet (Table 3.2-4). General hydrology, soil, and aquatic resources design features would also be implemented, which include standards and limitations for operations within RCAs, standards for mechanical operations in wet weather conditions, and standards for water drafting. These design features are described in more detail in Appendix A. Pursuant to RCA requirements and design features, mechanical treatment activities (e.g., felling, piling, chipping, scattering, off-road

equipment use, limbing, skidding, landings construction, grapple piling, mastication) would not occur within EEZs, where special-status plant populations associated with these habitats occur. If treatments are determined to be warranted within RCAs, only manual treatments would be implemented, pursuant to Design Feature BOTANY-2 (Appendix A). Mechanical felling adjacent to EEZs would occur directionally away from flagged special-status plant populations, pursuant to Design Feature BOTANY-8 (Appendix A). Construction of slash piles would not occur in RCAs pursuant to Design Feature HYD-6 (Appendix A). Hand felled trees would be directionally felled away from flagged special-status plant populations pursuant to Design Feature BOTANY-5. Pile burning would not occur within EEZs pursuant to Design Feature BOTANY-8 (Appendix A). If herbicides are applied within an RCA (e.g., to address Canada thistle [*Cirsium arvense*] infestations), only herbicides approved for use in wetland habitats would be utilized and applied by hand, avoiding special-status plants within flagged areas pursuant to Design Feature BOTANY-8 (Appendix A).

Species Associated with Serpentine Soils and Rocky/Bedrock Outcrops

The special-status plant species associated with serpentine soils and rocky/bedrock outcrops are Jepson's onion, big-scale balsamroot, Constance's rock cress, Butte County calycadenia, Ahart's sulphur flower, Caribou coffeeberry, white-stemmed clarkia, Butte County fritillary, Cantelow's lewisia, Hutchison's lewisia, Kellogg's lewisia, broad-nerved hump-moss, elongate copper-moss, Follet's monardella, Stebbin's Monardella, cut-leaved ragwort, and Feather River stonecrop.

In addition to the design features described above, no mechanical treatments would occur on vulnerable serpentine soils and rocky/bedrock outcrops. No landings, skid trails, piling, mastication, chip spreading, or burning would occur in these communities unless approved by the Forest Service botanist pursuant to Design Feature BOTANY-7 (Appendix A). Manually felled trees would be left in place, unless trees can be removed with full suspension, (Design Feature BOTANY-7; Appendix A). There are approximately 31 miles of roads within serpentine bedrock habitats in the Project area (Appendix E11). Road maintenance activities outside of the current road surface would be avoided across serpentine and bedrock habitat unless necessary, pursuant to Design Feature BOTANY- 7 (Appendix A). Herbicides may be used within areas with serpentine soils and bedrock outcrops; however, flagged populations of special-status plants would be protected from direct impacts and herbicide drift pursuant to Design Feature INVASIVE-1 (Appendix A).

Annual Plant Species

Special-status annual plant species include Butte County calycadenia, white-stemmed clarkia, Mildred's clarkia, Mosquin's clarkia, and Santa Lucia dwarf rush. Annual special-status plant species may be subject to potentially beneficial effects due to preferences of more open canopy habitat, if treatments are implemented during the appropriate time in the species' life history (e.g., after seed set in the fall, during the dormant season). Treatments done at other times can be detrimental to these species.

Species Associated with Sagebrush and Chaparral Habitats

Special-status plant species associated with forest openings in sagebrush and chaparral habitats, include Lemmon's milk vetch, Pulsifer's milk vetch, Modoc Plateau milk vetch, lens-pod milk vetch, Schoolcraft's wild buckwheat, Ahart's sulphur flower, Clifton's eremogone, Butte County

fritillary, Sierra Valley ivesia, Plumas ivesia, Santa Lucia dwarf rush, Cantelow's lewisia, adobe parsley, closed-throated beardtongue, Susanville beardtongue, and sticky pyrrocoma. Habitats dominated by shrubs would be less likely to be affected by Project implementation because areas with a lower density of trees would likely not be targeted for treatments as denser forests. Additionally, these species could benefit from an increase of habitat with forest openings and reduced conifer encroachment.

Rhizomatous Species with Low Tolerance to Disturbance That Are Associated with Late Seral Habitats

Special-status plant species associated with late seral habitats that are rhizomatous and that have a low tolerance to disturbance are clustered lady's-slipper and mountain lady's-slipper. Clustered lady's-slipper and mountain lady's-slipper are likely intolerant of disturbance that directly reduces the duff layer and exposes or damages rhizomes or mycorrhizal symbionts. Interim Management Prescriptions suggest evaluating the effects of fire, but also protecting plants, seeds and mycorrhizal relationships from excessive heat. These species are usually found in areas that have not been disturbed, have minimal disturbance, or have disturbance that has occurred in distant past. Lady's-slipper populations within the Project area range from a few individuals to over approximately 500 individuals (PNF 2022). Thorpe et al. (2010) determined that smaller populations (i.e., less than 10 individuals) had a higher rate of extinction compared to larger populations. Therefore, these species may be highly susceptible to disturbance resulting from Project implementation.

Species Associated with Cliffs and Steep Roadcuts

Special-status plant species associated with cliffs and steep roadcuts are Cantelow's lewisia, elongate copper-moss, and Feather River stonecrop. Mechanical treatments would not occur on slopes greater than 50 percent. Manual treatments would likely not occur within cliff habitats and steep roadcuts due to the nature of the terrain and safety concerns, and these habitats would likely not carry low intensity prescribed fire given the rocky substrates and lack of fuels; therefore, Project implementation is unlikely to affect cliff habitats and steep roadcuts occupied by Cantelow's lewisia and elongate copper-moss.

Cumulative Impacts for Forest Service Sensitive Plant Species

The geographic scope of cumulative impacts for Forest Service Sensitive plant species in this analysis is PNF. A cumulative effect can result from the incremental effect of the current action when added to the effects of past, present, and reasonably foreseeable future actions. These effects are considered regardless of what agency or person undertakes the other actions and regardless of ownership of the land on which the other actions occur. An individual action when considered alone may not have a significant effect, but when its effects are considered in sum with the effects of other past, present, and reasonably foreseeable future actions, the effects may be significant (40 CFR 1508.7 and 1508.8 and FSH 1909.15 Section 15.1). 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 for plants is based on current environmental conditions.

Cumulative effects of Project implementation coupled with the effects of past actions is particularly difficult to assess for special-status plant species due to lack of long-term and historical data. In addition, habitats within which many special-status plant species are presently found have a long history of disturbance, making undisturbed reference sites difficult to identify. The additive effects of past actions (e.g., wildfire suppression, timber harvest, recreation, grazing) have shaped the present landscape and corresponding populations of special-status plants. All of these activities have contributed to type conversion, changes in canopy cover, modification of stand dynamics, alteration in fire frequency and intensity, and change in microsite conditions. Undoubtedly, some plant species have always been rare due to particular ecological requirements or geographic isolation. It is also likely that past actions have caused some plant species to become rarer and others to become more common. Special-status plants associated with wetlands and aquatic habitats, in particular, have likely been adversely affected historically by land use activities such as water diversions, habitat type conversion (e.g., meadow to annual grassland), intense grazing by domestic livestock, and construction of roads and trails.

Other planned or ongoing projects in the vicinity of the Project area include vegetation management activities (e.g., Community Protection-Eastside Project, North Yuba Landscape Resilience, Mapes Crocker Project, Claremont Forest Resiliency Project), restoration activities (e.g., PSW Post-Fire Meadow Restoration, Feather Falls Post-Fire Project), and hazard tree removal (Region 5 Post-Disturbance Hazardous Tree Management Project, Dixie Fire Residential Hazard Tree Removal). Refer to Appendix B for a full list and descriptions of these cumulative projects. These planned or ongoing vegetation management, restoration, and hazard tree removal projects may degrade, fragment, or disturb habitat for Forest Service sensitive plant species and potentially disturb, damage, or remove individual plants or plant populations if they are not identified prior to project activities. However, restoration projects may also improve habitat for these species. If disturbances from treatment activities under these previously approved projects overlap with disturbances from other fuels management projects, recreational activities, or other activities that affect these wildlife species, impacts could be cumulatively substantial.

Contributions to cumulative adverse impacts under the proposed Project would be minimal because implementation of design features would result in avoidance or reduction of direct and indirect impacts on Forest Service sensitive plant species and habitat to a negligible level. Interim Management Prescriptions exist for each sensitive species and project implementation is required to adhere to them. The prescriptions are designed to prevent significant impacts.

3.2.9. Determination for Plants

Listed Plants

PNF has determined that **No Action Alternative** for this the Project **may affect, likely to adversely affect** Layne's butterweed and Webber's ivesia because of the risk of fuels build up and potential high severity fires directly impacting plants and altering habitat.

The Wildlife and Plant BA analyzed the proposed action under Alternative 1: Vegetation Treatments to Protect Communities and Achieve Resilient Stand Density, which is assumed to be the Project alternative with the greatest intensity of treatments. Implementation of Project design features (Appendix A) would reduce impacts on any newly identified populations by requiring pretreatment surveys, avoidance of identified occurrences, additional protection measures for identified occurrences (e.g., from herbicide drift) and minimization of the potential for indirect

impacts resulting from invasive plant infestations. In addition, fuel reduction activities in Layne's butterweed habitat may create favorable recruitment sites and facilitate the reintroduction of fire into the habitat of this early successional fire-adapted species. Additionally, fuel reduction activities in and surrounding Webber's Ivesia habitat would reduce the potential high intensity fire entering sagebrush and chaparral ecosystems.

Effects under Alternatives 2 and 3 would be similar, because differences within these alternatives largely pertain to forest habitats (e.g., PACs, HRCAs, mature forest planning units), where these species are not normally present and Design Features will all still be implemented.

PNF has determined that Alternatives 1, 2, 3 and 4 **may affect but is not likely to adversely affect** Layne's butterweed and Webber's Ivesia.

The Project, and all Alternatives, would have **no effect** on critical habitat for Layne's butterweed, because critical habitat has not been established by USFWS for this species. The Project would have no effect on critical habitat for Webber's Ivesia, because critical habitat has not been designated within the Project area for this species.

Forest Service Sensitive Plants

PNF has determined that Alternatives 1, 2, 3 and 4 of the Project **may affect individuals but is not likely to result in a trend toward federal listing or loss of viability** of the following species groups or species:

- wetland and aquatic species;
- species associated with serpentine soils and bedrock outcrops;
- annual plant species;
- species associated with sagebrush and chaparral
- rhizomatous species with low tolerance to disturbance that are associated with late seral habitats;
- species associated with cliffs and steep roadcuts; and
- other general forest species not completely covered by habitats above.

These determinations are based on the following rationale:

- Pursuant to Design Feature BOTANY-1, surveys for special-status plants would be conducted prior to Project implementation and pursuant to Design Feature BOTANY-2, any special-status plant population identified during these surveys would be flagged for avoidance (Appendix A). Within these flagged areas, no treatment activities would occur unless approved by a PNF botanist, as described in Design Feature BOTANY-2 (Appendix A) and Design Feature BOTANY-4. Treatments within and adjacent to flagged areas would be implemented pursuant to Design Features BOTANY-2, BOTANY-3, BOTANY-4, and BOTANY-5 (Appendix A).
- RCAs and EEZs would be established around meadow habitat, streams, and other SAFs to prevent degradation of these habitats, which would help maintain habitat function for special-status plant species associated with these habitats.
- General hydrology, soil, and aquatic resources design features would be implemented, which include standards and limitations for operations within RCAs, standards for mechanical treatment operations in wet weather conditions, and standards for water drafting.
- Design features intended to protect sensitive serpentine and bedrock outcrop habitats would be implemented.

- Project implementation may result in some beneficial effects on special-status plant species including: the annuals (Butte County calycadenia, white-stemmed clarkia, Mildred's clarkia, Mosquin's clarkia, and Santa Lucia dwarf rush) and species occurring in encroached sagebrush and wetland habitats respectively (Lemmon's milk vetch, Pulsifer's milk vetch, Modoc Plateau milk vetch, lens-pod milk, vetch, Schoolcraft's wild buckwheat, Ahart's sulphur flower, Clifton's eremogone, Butte County fritillary, Sierra Valley ivesia, Plumas ivesia, Santa Lucia dwarf rush, Cantelow's lewisia, adobe parsley, closed-throated beardtongue, Susanville beardtongue, and sticky Pyrrocoma and upswept moonwort, scalloped moonwort, common moonwort, Mingan moonwort, western goblin, northern moonwort, California twisted spikerush, Santa Lucia dwarf rush, and Plumas alpine-aster.

PNF has determined the No Action Alternative of the Project **may affect individuals but is not likely to result in a trend toward federal listing or loss of viability** of the following species groups or species:

- wetland and aquatic species;
- species associated with serpentine soils and bedrock outcrops;
- annual plant species;
- species associated with sagebrush and chaparral;
- rhizomatous species with low tolerance to disturbance that are associated with late seral habitats;
- species associated with cliffs and steep roadcuts; and
- general forest species not completely covered by habitats above.

These determinations are based on the following rationale:

- Under the No Action Alternative, no new fuel treatments would occur and there would be no direct effect. No new fuel treatments would occur, which may result in negative indirect effects on habitat for these species through a long-term increase in forest density and an increased risk of high-severity wildfire.

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3.3. Cultural Resources

3.3.1. Introduction

This section analyzes the potential effects of the alternatives on cultural resources. Native American tribes have lived in the Project area for thousands of years. The Native American community is active in the area and continues to practice a variety of traditional cultural activities. The area is also associated with early Euroamerican exploration of California and the Gold Rush. There is substantial evidence (e.g., known precontact and historic archaeological sites) of Native American and Euroamerican occupation and use of the Project area.

3.3.2. Current Management Direction

Section 101 of the National Environmental Policy Act (NEPA) requires the federal government to preserve important historic, cultural, and natural aspects of our national heritage. To accomplish this, federal agencies utilize the Section 106 process of the National Historic Preservation Act (NHPA). Passed by Congress three years before NEPA, the NHPA sets forth a framework for identifying and evaluating historic properties and assessing effects to these properties. This process is codified in 36 CFR 800 Subpart B.

Pursuant to 36 CFR 800, the *2021 National Programmatic Agreement among the U.S. Department of Agriculture Forest Service, the Advisory Council on Historic Preservation, and the National Conference of State Historic Preservation Officers, for phasing Section 106 of the National Historic Preservation Act for large scale multi-year undertakings* (National PA) has been developed to allow the Forest Service to carry out Section 106 of the NHPA with a phased approach. This National PA requires a Heritage Implementation Plan (HIP) to document how Section 106 responsibilities will be met post-NEPA decision but pre-Implementation.

The PNF developed the Protect and Recover Project HIP in consultation with the Greenville Indian Rancheria, Susanville Indian Rancheria, Enterprise Rancheria, Berry Creek Rancheria, Mooretown Rancheria, Washoe Tribe of California and Nevada, Mechoopda Indian Tribe of the Chico Rancheria, Maidu Summit Consortium, Konkow Valley Band of Maidu, Ya-Mani Maidu Cultural Association, Tasmam Koyom Foundation, Maidu Cultural Group and the California State Historic Preservation Officer (SHPO).

3.3.3. Affected Environment

Cultural Resources in the Project Area

A cursory records search for the Project area conducted by the Northeast Information Center of the California Historical Resources Information System identified more than 2,050 previously recorded cultural resources (e.g., precontact and historic sites) within its boundaries.

Previously recorded cultural resources indicate that precontact or Native American sites may include lithic scatters, milling features, bed rock mortars, ethnographic sites, and possible habitation sites. While historic-era sites may include logging camps, refuse scatters, cabins, homestead features, flumes, and other water conveyance systems, transportation systems/networks (roads, trails, railroads, etc.), transmission corridors, and aborglyphs. It is highly likely that there are other previously unidentified sites within the Project area.

3.3.4. Design Features

Design features would be implemented to protect and avoid disturbance of known locations of cultural and tribal resources. Applicable design features are described in Appendix A.

3.3.5. Environmental Effects

Direct, Indirect, and Cumulative Effects

Alternative 1 - Vegetation Treatments to Protect Communities and Achieve Landscape Resilience

To comply with 36 Code of Federal Regulations (CFR) 800.5(1) the PNF is following guidance at 36 CFR 800.4(2) *Phased Identification and Evaluation* and implementing a Heritage Implementation Plan (HIP). This approach would identify and determine the significance of any cultural or tribal resources in a specific area prior to project implementation. Standard Protection Measures (SPMs) from the PNF HIP would be employed as additional design features and applied to all cultural resources within the project area. Application of this strategy would result in findings of either *No Historic Properties Affected* or *No Adverse Effect* as defined at 36 CFR 800.4(d)(1) and 800.5(d)(1) for the project. In addition, the proposed project would have a beneficial effect from improved protection of cultural and tribal resources by reducing the risk of a catastrophic fire that could destroy the resources.

Alternative 2 - Vegetation Treatments to Protect Communities Consistent with the Existing Forest Plan

The potential effects and treatment options for Alternative 2 are very similar to those for Alternative 1 in the areas where project activities would occur. Implementing the HIP would result in findings of either *No Historic Properties Affected* or *No Adverse Effect* as defined at 36 CFR 800.4(d)(1) and 800.5(d)(1) for the project.

Alternative 3 - Vegetation Treatments to Protect Communities with Reduced Intensity Treatments

The potential effects and treatment options for Alternative 3 are very similar to those for Alternative 1 in the areas where project activities would occur. Under Alternative 3, there would be up to 76,226 fewer acres subject to mechanical treatment than under Alternative 1. Thus, the risk that resources would be affected by mechanical treatments would be less than Alternative 1. Implementing the HIP would result in findings of either *No Historic Properties Affected* or *No Adverse Effect* as defined at 36 CFR 800.4(d)(1) and 800.5(d)(1) for the project.

Alternative 4 - Vegetation Treatments to Protect Communities and CSO Territories

The potential effects and treatment options for Alternative 4 are very similar to those for Alternative 1 in the areas where project activities would occur. Implementing the HIP would result in findings of either *No Historic Properties Affected* or *No Adverse Effect* as defined at 36 CFR 800.4(d)(1) and 800.5(d)(1) for the project.

No Action Alternative

With no proposed activity, there would be no effect to cultural resources.

3.4. Hydrology and Soils

3.4.1. Introduction

This section evaluates the effects of the alternatives on watershed resources, including soils, hydrology, and the potential for disturbance in Riparian Conservation Areas (RCAs). For this watershed resource assessment, the spatial analysis is bounded by 7th-level Hydrologic Unit (Code [HUC]-14) drainages (listed in Appendix F) that have the potential to be affected directly, indirectly, or cumulatively by the Project. The temporal boundary is 10 years for past projects and any known, foreseeable projects that have enough detail to reasonably analyze in the cumulative watershed effects (CWE) analysis and that have the potential to combine with effects of proposed actions at the HUC-14 scale.

3.4.2. Current Management Direction

Region 5 Management Framework

The SNFPA Record of Decision requires that a site-specific project-level analysis be conducted to determine whether activities proposed within Riparian Conservation Areas (RCAs) meet the riparian conservation objectives (RCOs) identified as a part of the SNFPA Aquatic Management Strategy (AMS). The analysis must consider physical factors, such as soil characteristics, geology, slope, and stream characteristics, as well as biological factors, such as the presence of aquatic- and riparian-dependent species, their habitat needs, and the capability of the existing environment to provide needed habitat.

Aquatic Management Strategy

The SNFPA AMS is a holistic approach to managing aquatic, riparian, and meadow ecosystems that encompasses a variety of elements. These elements are a set of interrelated actions intended to work together to achieve the nine AMS goals (listed below), which act as endpoints for forest management. They include three central components: 1) desired conditions for aquatic, riparian, and meadow habitats developed from the nine AMS goals; 2) an array of land allocations that delineate aquatic, riparian, and meadow habitats and emphasize specific actions in these areas; and 3) a set of standards and guidelines that specify appropriate land uses and activities within those allocations. The standards and guidelines set out for RCAs and Critical Aquatic Refuges (CARs) are all associated with corresponding RCOs, which provide a checklist for evaluating whether an activity is consistent with achieving the AMS goals.

The nine AMS goals which guide management of aquatic habitats address 1) water quality, 2) species viability, 3) plant and animal community diversity, 4) special habitats, 5) watershed connectivity, 6) floodplains and water tables, 7) watershed condition, 8) streamflow patterns and sediment regimes, and 9) stream banks and shorelines.

Riparian Conservation Areas

RCAs “are land allocations that are managed to maintain or restore the structure and function of aquatic, riparian, and meadow ecosystems” (Forest Service 2004). The intent of the management direction for RCAs is to 1) preserve, enhance, and restore habitat for riparian- and aquatic-dependent species, 2) ensure that water quality is maintained or restored, 3) enhance habitat conservation for

species associated with the transition zone between upslope and riparian areas, and 4) provide greater connectivity within the watershed.” RCAs are delineated and managed consistent with the RCOs defined in SNFPA.

RCA widths vary depending on the type of water body (Table 3.4-1). The types of water bodies are designated as follows: 1) perennial streams; 2) seasonally flowing streams (includes ephemerals with defined stream channel or evidence of scour); 3) streams in inner gorge; 4) special aquatic features (lakes, meadows, bogs, fens, wetlands, vernal pools, and springs); and 5) other hydrologic or topographic depressions without a defined channel. The SNFPA defines RCA widths as follows:

Table 3.4-1 Sierra Nevada Forest Plan Amendment Record of Decision Land Allocations

RCA Designation Type	Width
Perennial Stream	300 feet measured from bank full edge
Seasonal Flowing Stream	150 feet measured from bank full edge
Streams in Inner Gorge (stream adjacent slopes >70% gradient)	Top of inner gorge if beyond 300 feet
Special Aquatic Features (lakes, wet meadows, bogs, fens, wetlands, vernal pools, and springs) or Perennial Streams with riparian conditions extending more than 150 feet from the edge of the streambank, or Seasonally Flowing Streams with riparian conditions extending more than 50 feet from the edge of the streambank.	300 feet from edge of feature or riparian vegetation, whichever is greater
Other hydrologic or topographic depressions without a defined channel	RCA width and protection measures determined through project-level analysis

Source: Forest Service 2004.

Central Valley Regional Water Quality Control Board

The Central Valley RWQCB adopted General Order No. R5-2017-0061 (General Order) on June 9, 2017, which serves as general waste discharge requirements (WDRs) for timberland management activities on USDA Forest Service lands within the Central Valley Region of California. The Project meets eligibility criteria for enrollment under the General Order, listed below.

1. The Forest Service has conducted a multi-disciplinary review of the timberland management activities, including review by watershed specialists, and has specified BMPs, and additional control measures as needed, to assure compliance with applicable water quality control plans (Basin Plans).
2. The Forest Service has conducted a CWE analysis and included specific measures needed to reduce the potential for adverse CWEs to assure compliance with the applicable Basin Plan.
3. The Forest Service has provided Project documents to the Central Valley RWQCB and allowed time for adequate review and comment.

The General Order requires identification of Significant Existing or Potential Erosion Sites (SEPES) and priority road improvement locations as well as proposed treatments and a schedule of completion for these sites to improve or protect water quality. NFS roads within the project area have been surveyed and SEPES have been identified. Many system road improvements to benefit

water quality have occurred within the Project area in recent years. Additional road work may occur, as needed, to address any newly discovered SEPES during project implementation.

3.4.3. Affected Environment

The project area is located on land that drains chiefly to the Middle and North Forks of the Feather River, which flow in a generally southwesterly direction. A substantial portion of the project area is also located within the Upper Yuba River watershed, which also flows generally southwesterly. Major features within these watersheds include Lake Almanor, Butt Valley Reservoir, Round Valley Reservoir, and Bucks Lake (North Fork Feather River); Lake Davis and Little Grass Valley Reservoir (Middle Fork Feather River); and New Bullards Bar Reservoir (Upper Yuba River).

Beneficial uses within these watersheds include municipal and domestic water supplies, hydroelectric power generation, contact and non-contact recreation, canoeing and rafting, cold freshwater fisheries spawning, and wildlife habitat (Central Valley RWQCB 2011). Effects to water resources from Project activities focus on water quality and impacts to downstream beneficial uses.

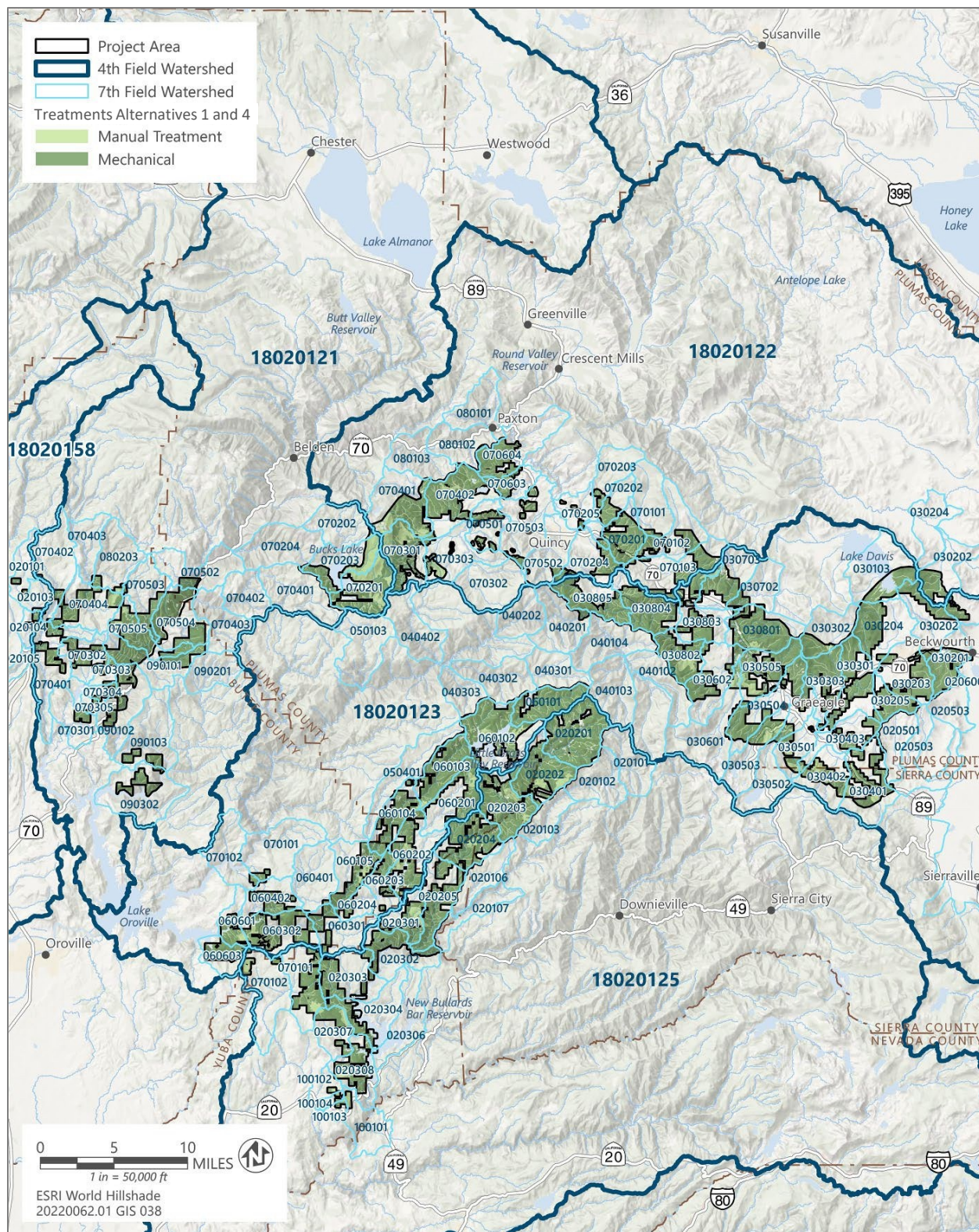
Hydrological resources within the Project area include riparian and aquatic habitats and water quality. Riparian and aquatic habitats include perennial, seasonal, and ephemeral drainages; seeps and springs; and wetlands. Perennial drainages carry water almost year-round in well-defined channels; intermittent drainages typically only flow during the wet season; and ephemeral drainages flow only periodically, during and following rain and snowmelt.

Watersheds

The Project spans 130, 7th-level HUC-14 watersheds. Project treatment activities would occur on from less than one percent to up to 100 percent of each watershed area. The intensity of treatment and therefore the intensity of effects would vary among action alternatives. Figures 3.4-1, 3.4-2, and 3.4-3 illustrate where mechanical and manual treatment activities would occur within each affected HUC-14 catchment for Alternatives 1 and 4, 2, and 3, respectively. Generally, Alternative 2 would have less intensive treatment activity overall than Alternatives 1 and 4 because mechanical treatments would be less intensive to achieve the canopy cover targets in Alternative 2 than necessary to achieve the relative Stand Density Index (rSDI) targets in Alternatives 1 and 4. Alternative 3 would have the least impact to watersheds overall because the intensity of treatments proposed is less than under Alternatives 1, 2, and 4 due to further limits on mechanical thinning and higher canopy cover targets than what is proposed for Alternative 2. These effects are evaluated in detail in the effects analysis below.

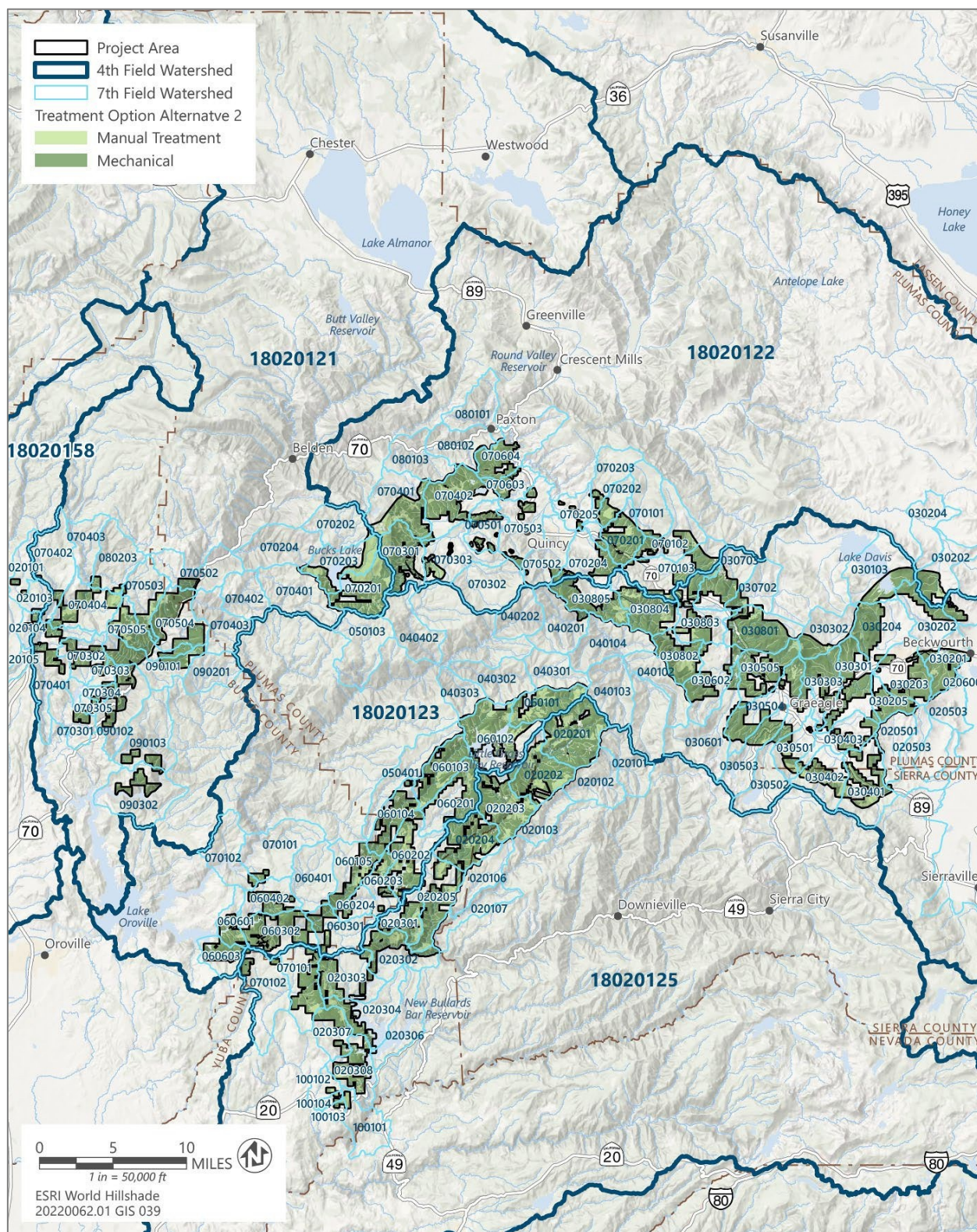
Riparian Conservation Areas

The analysis area, which covers 130 HUC-14 watersheds, contains a total of 259,937 acres of RCAs. The majority of RCA acres are related to streams; however, in certain catchments containing large waterbodies, lake and wetland RCAs dominate. Generally, catchments with a larger proportion of area designated as RCA are more sensitive to disturbance, and those with a lower proportion of RCA area (and thus, more upland area) are less sensitive to disturbance.



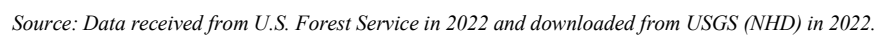
Source: Data received from U.S. Forest Service in 2022 and downloaded from USGS (NHD) in 2022.

Figure 3.4-1 Watershed Boundary HUC-14 and Treatment Options Alternative 1 and Alternative 4 Map



Source: Data received from U.S. Forest Service in 2022 and downloaded from USGS (NHD) in 2022.

Figure 3.4-2 Watershed Boundary HUC-14 and Treatment Option Alternative 2 Map



3.4-6

Soils

Soil quality measurement indicators analyzed are soil productivity and soil hydrologic function. The Forest Service Pacific Southwest Region (Region 5) Forest Service Manual (FSM) Supplement (Forest Service 2017) describes several soil quality measures that have been developed to support analysis of these indicators, which are analyzed below. These measures are to be used for lands dedicated to growing vegetation. However, appropriate erosion control and soil stabilization measures are to be followed for areas dedicated to other specific uses such as roads, trails, and recreation and administrative sites.

Hydrology

Riparian-adjacent hillslopes in the project area range from gradual on the ridges to steep where they approach main drainages. The uplands are dominated by conifer and mixed conifer/hardwood vegetation with a mixed understory that provides ground cover to aid in erosion control. Hillslopes are mostly stable with no evidence of significant surface erosion.

Stream Channels

Stream channels in the project area range from gentle to steep. The characteristics of these varied channel types are defined by their position in the watershed, their underlying geology, the climate, and riparian and upland vegetation. This also drives the way they process water flow and sediment in the watershed. Therefore, different stream types will tend to respond differently to temporal changes in sediment input or streamflow due to natural or human caused events.

The ephemeral streams are primarily steep headwater colluvial channels (i.e., small headwater streams that flow over a colluvial valley fill and exhibit weak or ephemeral fluvial transport) (Montgomery and Buffington 1997). These channels are narrow and shallow and are sometimes hard to define on the ground due to their headwater location. Highly sporadic fluctuations in runoff are common in these channels and they accumulate sediment from the hillslope over long time periods (decades to centuries). They then flush stored sediment downstream during infrequent high runoff events or debris flows (Montgomery and Buffington 1997). Such channels are described as transport-limited and respond to changes in sediment supply by fluctuating the amount of sediment in storage and changes in runoff by changing the frequency of sediment flushing events.

Downstream of colluvial headwaters are steep bedrock, cascade, and step-pool channels (Montgomery and Buffington 1997). They are high gradient, high-energy, supply-limited systems; in the sense that they exhibit a high capacity to transport sediment relative to sediment supply. Therefore, these channels can withstand temporal increases in sediment supply and efficiently transport such supply increases through the system (Montgomery and Buffington 1997). Also, these channels are often stable enough to withstand large flood events or periods of low sediment input.

The perennial streams alternate between low gradient pool-riffle and steeper bedrock or step-pool segments. The steep sections follow the descriptions above for the tributaries. The low gradient segments are lower energy than steep segments and therefore have a lower sediment transport capacity relative to supply. This results in these low gradient segments being more sensitive to changes in sediment supply or streamflow. Increased supply or decreased runoff can result in detrimental sediment deposition while decreased supply or increased runoff can cause erosion of the streambed and banks (Montgomery and Buffington 1997).

Overall, channel segments in the project area appear stable with only localized evidence of excessive erosion or deposition of sediment. Some stream reaches are downcut and incised, which

reflects impacts of historic land-use within project area watersheds including mining, logging, wildfire, post-fire reforestation efforts, and roads or ongoing impacts from roads.

Fuel loading in riparian areas is higher than desired in most of the project area, due in part to fire suppression. In addition, active treatment of vegetation within riparian zones has been limited or excluded to protect these areas from disturbance affecting their habitat qualities. Consequently, these areas are now more susceptible to unnaturally severe burning, which means when these areas do experience fire in the future, impacts to the riparian zone, stream channels, and water quality conditions will be much greater than they would be under more natural conditions. This situation is common throughout the Sierra Nevada (Van de Water and North 2010; 2011). Therefore, active treatment of fuels within riparian zones is necessary within the Project area to protect these areas from impacts of future high severity fire.

3.4.4. Best Management Practices and Design Features

Design features are included in all alternatives to reduce the risk of accelerated erosion and sedimentation associated with Project activities that could adversely impact aquatic and riparian habitats. Some design features incorporate implementation of Forest Service best management practices (BMPs), or other measures prescribed by law, regulation, or guidance. These design features have been implemented for other projects by the Plumas National Forest and other Region 5 forests and have a long and well-studied history of successful and effective implementation. Research and field observations of other, similar projects have shown that these design features and BMPs reduce or eliminate detrimental soil and water-related effects from mechanical thinning, mastication, prescribed fire, and other fuel reduction activities. A complete list of design features for the Project is included in Appendix A.

3.4.5. Environmental Consequences

Direct and Indirect Effects

The SNFPA defines the standards and guidelines that address the types of management activities that are allowed in RCAs. RCOs provide a checklist for evaluating whether a proposed activity is consistent with the desired conditions described in the AMS. For projects that include activities within RCAs all applicable RCOs and their associated standards and guidelines must be analyzed. Applicable objectives and their corresponding standards and guidelines are listed in Appendix F, together with a discussion of how the project alternatives meet them.

Three of the standards and guidelines identified in the SNFPA are applicable to the Project and integral to conducting an analysis of activities proposed within an RCA. They are chiefly intended to articulate the methodology that should be employed when conducting an RCO review:

- 91. Designate riparian conservation area (RCA) widths as described in [Table 3.4-1]. The RCA widths displayed in [Table 3.4-1] may be adjusted at the project level if a landscape analysis has been completed and a site-specific RCO analysis demonstrates a need for different widths.
- 92. Evaluate new proposed management activities within CARs and RCAs during environmental analysis to determine consistency with the riparian conservation objectives at the project level and the AMS goals for the landscape. Ensure that appropriate mitigation measures are enacted to (1) minimize the risk of activity-related sediment entering aquatic systems and (2) minimize impacts to habitat for aquatic- or riparian-dependent plant and animal species.

- 94. As part of project-level analysis, conduct peer reviews for projects that propose ground-disturbing activities in more than 25 percent of the RCA or more than 15 percent of a CAR.

Implementing the Project would result in “ground disturbing activities,” which are defined in the ROD as “activities that result in detrimental soil compaction or loss of organic matter beyond the thresholds identified in the soil quality standards.” There are no CARs in the project area, but necessary improvements to existing roads for Project implementation may involve vegetation clearing and grading, which may be located within RCAs on a limited basis. Additionally, the use of mechanical, track-based or wheeled equipment would be used to treat vegetation in forested upland and riparian areas, in aspen stands, and meadows, all of which would overlap with RCAs where treatment conditions necessitate. Prescribed fire is also proposed under the Project and would be used to reduce surface accumulation of vegetation as a follow up or standalone fuel treatment. To facilitate prescribed burning, fire lines may need to be established around the perimeter of planned burn areas where existing roads and natural barriers are not available.

Appendix F summarizes and compares the acreage of potential ground disturbance within RCAs for the activity types for each action alternative. The values shown in Appendix F mainly support a comparison of alternatives and provide an impact ceiling where it can be confidently determined that actual effects would be less. Ground disturbance within RCAs would be minimized through design features, including adherence to an equipment exclusion zone in riparian areas, but would nevertheless exceed the 25 percent threshold for proposed ground-disturbing activities in RCAs. Therefore, peer review is required. Consultation with U.S. Fish and Wildlife pursuant to Section 7 of the Endangered Species Act and consultation with the California State Water Quality Control Board (Central Valley Region) for enrollment under the General Order constitute peer review per RCA Standard and Guideline 94.

Forest fuels treatment activities have the potential to negatively impact hydrologic, soil, and aquatic resources by causing soil disturbance, altering vegetative cover, and changing local drainage patterns. The type and magnitude of adverse effects from Project activities on individual soil qualities and hydrologic function depend on the fuel treatment techniques used and correct application of design features of the Project to reduce effects.

No Action Alternative

Under the No Action alternative, effective soil cover in the form of fine organic matter and large woody debris would be expected to increase as organic materials accumulate on the forest floor. Because of the existing layer of duff and downed woody debris, erosion potential is very low and would continue to be so in the absence of a high severity fire. The extent and degree of soil compaction is expected to decline slowly over time. This process may take several decades in forested environments (Grigal 2000). Root penetration, extension, and decay, along with the burrowing action of soil dwelling animals would contribute to an increase in soil porosity and decrease compaction.

Under the No Action alternative, erosion, as expressed as Equivalent Roaded Area (ERA) values, would slowly decline to a steady-state level over time if a wildfire does not occur. Surface, ladder, and crown fuels would not be treated in upland areas or in RCAs. Because fuel treatment activities would not occur, sub-watersheds would be at a substantially greater risk of high-severity wildfire (see Section 3.1, “Fire, Fuels, and Forest Health”). A future severe wildfire could greatly increase ERA values within and across catchments.

Mechanical thinning treatments, mechanical fuels treatments and prescribed fire treatments are designed to reduce the likelihood of high intensity wildfire in the treated forest stands. In the event of a severe wildfire in these stands, moderate and high soil burn severities would not only impact soil cover but would also likely generate substantially increased runoff and erosion that would measurably impact water quality in streams within and near the burned area (Forest Service 2005). Other impacts include loss of riparian and wetland habitat, destabilization of stream channels, increased runoff and sedimentation, warmer stream temperatures, degraded water quality, and impairment of fish habitat (Bladon et al. 2014).

High-severity fires can also generate conditions that increase the risk of associated natural disasters like landslides and flooding. Debris flows—a type of landslide made up of a rapidly moving mixture of dirt, rocks, trees, and water—are common following high-severity burns due to the lack of ground-stabilizing vegetation following fire. Debris flows are very dangerous and can destroy homes and other structures in a matter of moments and, in some cases, result in the loss of life (Forest Service 2023). Debris flows are triggered by storms and can occur days to years after a fire (USGS 2022).

Road drainage improvements would not occur under the No Action Alternative. Deferred maintenance issues of the road system, and the absence of treatment for eroding road sites would continue to pose risks to water quality.

Alternative 1: Vegetation Treatments to Protect Communities and Achieve Landscape Resilience

To support landscape resilience, the risk of direct effects to forest soils, water quality, and aquatic species would be minimized through vegetation management actions among Project design features (see Appendix A). BMPs have been selected using information regarding soil, slope, geology, and climate conditions and anticipated project activities. Many years of BMP effectiveness monitoring in Plumas National Forest and throughout the Sierra Nevada more broadly has documented that properly implemented BMPs are highly effective for protection of soil and water quality.

Alternative 1 includes mechanical thinning; mechanical grapple piling and mastication; hand thinning and pile burning of smaller-diameter vegetation to reduce fuel loading; and prescribed fire as a standalone treatment to reduce understory vegetative cover or as a combination treatment following mechanical or manual thinning. Ground-based mechanical equipment would be used to treat vegetation on up to 175,980 acres. Such equipment travels overland on tracks or wheels and may include feller bunchers, skidders, masticators, excavators, bulldozers, and chippers. Activities that would be carried out with each type of treatment (mechanical, manual, and prescribed burn) could degrade conditions on the forest floor and in the broader watershed by impacting soil cover and hydrological regime, as described in the sections that follow.

Mechanical Treatment Activities

Mechanical fuels treatments under Alternative 1 include mechanical thinning and mechanical treatment of heavy brush and small diameter trees through mastication or grapple piling. In units identified for mechanical treatment, feller bunchers, skidders, grapple pilers, masticators, excavators, bulldozers, and chippers would be used to fell, process, and remove vegetation. During implementation of Alternative 1, trees would be cut and moved along skid trails to landings for processing. Landings are open areas used to cut and stack logs and other biomass before being

loaded onto log trucks and chip vans. Landings typically range from one half acre to one acre in size, and placement depends on topography, safety, accessibility to treatment units, and proximity to roads. Design features would be followed during mechanical treatment activities, including adherence to equipment exclusion zones and evaluation of steep slopes during implementation planning; and using existing skid trails, roads, and landings.

Mechanical treatments could be used as both a stand-alone treatment and in combination with other treatments (e.g., manual treatment, prescribed burn). Material resulting from fuels treatments may be removed, piled and burned, lopped and scattered, or masticated. Trailer-mounted chippers are commonly used at landings to chip and remove the material. In areas where vegetation removal is not feasible due to accessibility or site sensitivity, a masticator or self-propelled chipper may be used to shred or grind vegetation and leave it on site.

Of the treatments proposed in Alternative 1, mechanical thinning poses the greatest risk of impacts to hydrology and soils, largely due to the necessary use of landings to process logs, skid trails, and road maintenance to access units. Grapple piling and mastication would also involve the use of mechanical equipment, but because these activities involve the use of track-mounted equipment and do not inherently require the use of skid trails, landings, or roads, would result in less impacts on soil and hydrological resources than mechanical thinning. Track-mounted equipment results in the lower ground pressure because the weight of the machinery is distributed along a track and is not concentrated as it is on rubber-tired equipment, resulting in less downward force on soils and therefore less compaction and displacement, and less erosion and sedimentation. Mastication increases effective soil cover and fine organic matter because masticated debris is broadcast away from the machine and leaves a layer of ground cover. In areas that have been covered with masticated material, post-treatment conditions related to soil and hydrological resources are often improved from pre-treatment conditions.

Effects on Soil Resources

Adverse effects of mechanical fuels treatment on soil quality within typical treatment parameters are well documented. In 1999, the Herger-Feinstein Quincy Library Group (HFQLG) Forest Recovery Act pilot project was signed into law and provided an opportunity to document the effects of resource management activities including fuelbreak construction, group and individual tree harvest, and riparian management and restoration projects. The Long-Term Soil Productivity (LTSP) study, a national study initiated in 1989 and concluded in 1999, and comprised of more than 60 sites, including sites in the Sierra Nevada (Powers 2005) provides valuable information on soil indicators under various environmental stressors that can be extrapolated to understand how soils quality is affected by various activities, such as by mechanical fuels treatments.

Soil monitoring results from the HFQLG pilot project have documented a statistically significant decrease in effective soil cover immediately following mechanical treatments from 2007 and 2011 monitoring results (Forest Service 2008; 2012b). Following the initial reduction in effective soil cover, soil cover increases substantially in the years post-treatment due to needle cast and natural re-vegetation of the treated units. Typically, areas proposed for mechanical thinning across the project exhibit robust levels of pre-project effective soil cover, due to live vegetation, surface rock content, and the presence of duff and forest litter that naturally occur in forested stands. Temporary reductions in soil cover from mechanical treatment would temporarily increase the risk of surface soil erosion in affected areas. While the average areal extent of effective soil cover for a unit is a good proxy for evaluating soil productivity, actual soil erosion is dependent upon the size and

distribution of bare areas post-treatment, as well as site-specific factors such as soil erodibility, slope magnitude, slope length, and configuration of the unit. Overall, adverse effects from short-term reductions in soil cover from mechanical equipment would be minor because bare areas would be isolated, small, and well dispersed across the treated unit, and would therefore have a very limited effect on soil erosion and productivity. However, contiguous areas of exposed soil would be required for landings and skid trails. Design features such as waterbars would be implemented and have been demonstrated as effective at preventing concentrated runoff that causes rill erosion. Additionally, placement of slash mulch is effective in preventing erosion on landings, skid trails, temporary roads (Olsen et al. 2020), and areas that are especially vulnerable to erosion, such as steep slopes, near streams, and on highly erodible soils. These design features are included as a part of this Project (Appendix A). Effective soil cover would be expected to return to pre-project conditions within a few years due to natural forest processes such as needle scatter and re-growth of vegetation in disturbed areas. Therefore, it is expected that soil productivity standards would be met in across mechanical thinning units following treatment.

Like effective soil cover, surface organic matter would be affected by mechanical thinning treatments due to landing, skid trail, and road maintenance and utilization, equipment traffic associated with the removal of trees, and treatment of slash material. Operation of equipment would be expected to disturb or overwhelm discontinuous areas of shrubs and grasses and displace existing surface fine organic matter; for example, humus-enriched topsoil would be cast aside where new skid trails or temporary roads are carved into hillsides. Detrimental soil displacement is defined as areas where either 4 inches or half the total thickness of topsoil is removed from a contiguous area larger than 100 square feet. Because topsoil removal can cause a long-lasting reduction in nutrient availability for plants, large areas of topsoil displaced by mechanical thinning treatments can adversely affect soil productivity within a forest stand.

For proposed treatment units on slopes less than 35 percent, treatment effects on surface fine organic matter would be expected to be consistent with those observed for effective soil cover in the 2007 HFQLG soil monitoring report (Forest Service 2008). Given the modest and short-term reductions of fine organic matter that may be experienced due to mechanical thinning treatments, those reductions would not significantly change the soil production potential for plant growth within the treated units. These reductions would be expected to be ameliorated over one to three years post-treatment as live vegetation, duff, and forest litter accumulate. The post-treatment depth and distribution of the organic layer depends on the slash treatment method selected to attain the ground cover and fuel loading design elements of the project. Reductions in large woody material would cause minor, localized changes to soil microhabitat. Where pre-project levels of large down wood exceed desired fuel loadings, mechanical thinning would reduce these loadings while maintaining the minimum level of large down wood required by the 2004 SNFPA: within eastside vegetation types, an average of three large down logs per acre would be retained, and within westside vegetation types, an average over the treatment unit of 10 to 15 tons of large wood per acre would be retained.

Apart from legacy skid trails and roads on steep slopes in forest stands, existing soil displacement levels are typically low, with the thickness and color of the upper soil layer within the normal range of characteristics for the site and distributed normally across the area. Localized areas of displacement are often observed to have occurred but are typically not widespread enough to affect the productivity of desired plant species. Design features call for use of existing skid trails and landings, which limits the level of detrimental soil displacement. Equipment operating in the

perimeter of RCAs (the area outside of equipment exclusion zones) is not permitted to turn around while off a skid trail, which would effectively limit soils displacement within RCAs.

Project design features would not restrict mechanical equipment traffic based on the steepness of slope or length of the pitch. While HFQLG soil quality monitoring indicates that standard timber harvest practices typically result in less than 10 percent of the total extent of treated units having displaced soils and that displacement levels are typically similar to pre-harvest levels (Forest Service 2008), traditional ground-based mechanical thinning practices have limited the use of equipment to slopes less than 35 percent and on a restricted basis on slopes between 35 and 50 percent. Steep slopes do not readily support accumulation of thick soils, and therefore are often covered with a very thin soil layer or exposed bedrock. Additionally, drainages on steep slopes are more likely to be ephemeral because gravity works to move flow along both on the surface and below ground; therefore, drainages may not be readily detected in the field. This can cause problems if precipitation events occur during mechanical thinning activities because rapid runoff can accumulate on these slopes unexpectedly and cause ground failure. Examples of the mechanism by which risks to soils occur when using equipment on steep pitches include turning equipment, which can cause wheels or tracks to readily dislodge soil, leading to larger-scale mass failure of ground cover; and placement of skid trails created to access harvested vegetation from steep slopes, which pose a threat to slope stability by scraping surface soils. Surface organic matter on steep slopes is exceptionally fragile and takes longer to reestablish than on shallow slopes. To reduce the risk of ground failure and prevent a long-term reduction in surface organic matter on steep slopes, design feature HYD-21 has been developed for the Project that would require a soil scientist or hydrologist to survey units greater than 45 percent in slope that would be proposed for mechanical treatment and provide recommendations that limit or modify the use of equipment within the unit, if necessary, or provide other restrictions based on site-specific conditions. This would allow efficient harvest of material on steep slopes where conditions allow but would protect sensitive areas where slope conditions would not be conducive to the use of such equipment.

The use of heavy mechanical equipment and repeated stand entries increases the potential for a reduction of soil porosity and increase of soil compaction. The degree of soil compaction varies with soil texture and moisture content, while plant responses to compaction depend strongly on changes in the soil water regime (Gomez et al., 2002). Ongoing research has focused on the effects of soil compaction on long term soil productivity. The LTSP study provides insight on the effects of soil compaction on surface organic matter as a soil productivity indicator. Results of the LTSP study indicate that soil compaction effects on total biomass productivity differ depending upon soil texture, initial bulk density, rock content, and climate. Results from test plots located in California were subjected to extreme levels of compaction that would be expected to occur under normal timber operations in high-traffic areas such as landings or heavily used skid trails; for the LTSP study, soils were wetted to near field capacity and a mechanical roller, typically used for compaction of highway subgrades, was utilized. Despite the severity of compaction, significant adverse effects to soil productivity were not observed for sites with sandy or loamy soils and positive tree biomass response was observed at most monitoring sites, presumably due to improved water-holding capacity (Forest Service 2016). Soil profiles in the Project area exhibit sandy and loamy texture profiles, which are the dominant soil textures within northern Sierra Nevada forests.

Soil porosity and compaction monitoring results reported in the 2007 HFQLG Soil Monitoring report indicate that legacy compaction is commonplace throughout the Plumas National Forest (Forest Service 2008). Most of the detrimental compaction observed post-pilot project also existed

pre-project. The extent of pre-project compacted soil for areas proposed for mechanical thinning varies depending on the presence of existing skid trails, landings, and temporary roads available for use during Project implementation. Temporary haul roads may be required to access mechanical thinning units to provide access to the landings (either new or existing) from National Forest System roads. Design features state that, to the extent possible, existing landings, roads, and skid trails would be used. Additionally, design features require that, unless District specialist staff determine that subsoiling could exacerbate soil erosion, skid trail and temporary road approaches within 200 feet of landings would be subsoiled and recontoured, as needed. Design features also require that all landings be subsoiled. For units that indicate widespread compaction under the pre-project condition, subsoiling design features would likely result in a decrease in the extent of detrimentally compacted soil, which would be an improvement to existing conditions.

For any mechanical harvest, the extent and degree of compaction depends on site-specific soil conditions such as texture and stoniness, moisture content at the time of operations, and harvest equipment features. Clayey soils are particularly susceptible to detrimental compaction when soil moisture content is near field capacity. Design features for wet weather operations minimize soil compaction in those units. The LTSP study indicates negligible effects to soil productivity for sites with sandy or loamy soils, even under extreme compaction. By following the design features and utilizing existing skid trails where feasible, effects associated with detrimental compaction due to project activities are not expected to be of a size or pattern that would result in a significant change to soil production potential or soil hydrologic function and would therefore not have adverse effects on soil resources.

Adverse effects on soil moisture due to mechanical treatments would be prevented in special aquatic features such as wetlands, wet meadows, and fens by adherence to equipment exclusion zones. In forested areas, removal of canopy cover may result in increased temperatures at the forest floor as well as reduced moisture content of forest floor materials (Erickson 1985); however, more precipitation would pass through the canopy layer and be available for groundwater recharge.

The detrimental effects of grapple or machine piling on soil characteristics would be less than from mechanical thinning. Contract specifications for grapple pile activities include requirements to leave the required amounts of effective soil cover and surface fine organic matter. These requirements are typically readily achieved since the grapple hooks are ineffective at piling all fine fuels. Grapple pilers also travel on low-pressure mounted tracks that do not stress soils as much as wheel-mounted equipment.

Effects on Water Quality and Hydrology

Delivery of fine sediment to hydrologically connected stream channels and aquatic features from landings, skid trails, and temporary roads is the primary concern for water quality within mechanical thinning treatment units. Design features for the Project are largely focused on measures that disperse drainage over and away from these features so that runoff is not concentrated, reducing the likelihood that surface soil would be eroded and carried to streams. Design features include use of waterbars on skid trails and temporary roads and at the drainage outlet of landings, as well as using slash as ground cover on those features, where deemed necessary due to the presence of erodible soils or steep slopes. Equipment exclusion zones would also help protect water quality by preventing direct erosion and sedimentation, providing an overland, hydrologically discontinuous buffer between disturbance areas and receiving waterbodies, and preventing spills or other direct discharges to waterbodies. While no equipment

travel would be allowed within the equipment exclusion zone, a boom arm could be used to reach into the exclusion zone to cut and remove vegetation to meet treatment objectives. Excluding equipment from these streamside areas provides a buffer of undisturbed forest floor that acts as an effective attenuation zone for sediment or other surface water constituents that may be generated from mechanical activities outside of the streamside zone (Sweeney 2014). Monitoring has demonstrated that the effectiveness of design features and Forest Service BMPs in mitigating direct and indirect effects is related to correct implementation and the magnitude of climatic events the first several seasons after Project completion. Very heavy precipitation events in the years following treatment could overwhelm erosion control structures; however, increased sediment delivery to channels would be temporary and localized.

Extensive monitoring of the BMP Evaluation Program within Plumas National Forest has robustly demonstrated that the types of design features that are included in this Project are effective at preventing erosion and sedimentation from mechanical fuels treatments (Forest Service 2012a). The 2012 BMP effectiveness report summarized results from over 320 individual BMP sites (including skid trails, landings, streamside zones, prescribed burn areas, and road drainage) completed between 2007 and 2012. BMPs were rated as effective for 91 percent of these evaluations. For the nine percent of BMPs rated as not effective, none of the sites evaluated exhibited significant or long-term impacts to water quality or state-designated beneficial uses of water in the Basin Plan. Excluding road-related sites, BMPs were rated as effective for 96 percent of 222 sites, indicating that BMPs are exceptionally effective at preventing water quality impacts from mechanical fuels and prescribed burning treatments, precisely the types of activities that this Project would be implementing. Road BMP deficiencies and typical treatments are addressed below. Monitoring shows that standard BMPs such as placing waterbars along skid trails, temporary roads, and at landings disperse runoff and prevent erosion rills that deliver sediment from waterbar outlets to adjacent stream channels. Streamside protection evaluations demonstrated that equipment exclusion zones provide an effective buffer of undisturbed ground to prevent sediment from reaching streams and special aquatic features.

In addition to the BMP Evaluation Program, Plumas National Forest has carried out a forest-specific BMP effectiveness monitoring program to satisfy the annual monitoring and reporting requirements of the General Order for waste discharges related to timberland management activities. The monitoring method employed under the General Order attempts to cover more project units and features (for example skid trails, landings, temporary roads, haul roads) by streamlining documentation of BMP effectiveness compared with prior methods of evaluation. Monitoring carried out between 2017 and 2019 pursuant to the General Order, evaluated 150 BMPs either directly or tangentially related to 27 mechanical thinning units. The units surveyed had been harvested the previous season and had the greatest water quality risk to beneficial uses of water, due to proximity of mechanical treatment to larger streams. A total of 69 skid trail segments (representing six miles of skid trails), 51 landings, and 16 temporary roads (representing two miles of road) were evaluated in relation to the mechanically treated units. Altogether, these features were associated with potential discharge to 46 individual streams, including six perennial streams, 10 intermittent streams, and 30 ephemeral streams.

Of the skid trail segments surveyed, only two of the trails exhibited evidence of sediment entering nearby stream channels. Other than those two exceptions, waterbars on skid trails were frequent and effective at dispersing runoff. Similarly, no sediment delivery was observed for the 51 landings reviewed. For the 16 temporary roads reviewed, no sediment delivery was observed, and surfaces

were found to be stable. The two problem skid trails were located on a wildfire salvage harvest project. One problem was caused by a lack of water bars on a temporary road used on an adjacent private land salvage harvest. The other problem skid trail had BMP water bars installed per specification but still erosion occurred due to high runoff from the burned area. One other BMP problem was observed at a skid trail stream crossing where temporary fill was left in the ephemeral channel above the natural channel grade. The remaining 13 temporary crossings all had stable rehabilitation of the crossings, with approaches waterbarred and stable and the channel stable and excavated to natural channel grade so that no significant scour was observed.

Of the 150 BMP features evaluated, only three (two percent) showed any sign of deficient water quality protection. Further, none of the three BMPs showing sedimentation issues were of significant duration or magnitude. All three were expected to resolve within no more than two wet seasons and none were of a magnitude that would impact state-designated beneficial uses of water.

In summary, ample monitoring data demonstrates that BMPs and other Project design features for mechanical fuels treatment activities effectively prevent adverse water quality effects and protect state-designated beneficial uses of water. For grapple piling and mastication activities, post-treatment areas of concentrated runoff that may cause soil erosion and stream sedimentation are much less likely than for mechanical thinning treatments because such treatments typically do not require use of skid trails, temporary roads, or landings. Therefore, water quality impacts due to sedimentation for these treatments are less likely than mechanical thinning treatments. Additionally, mechanical fuels treatments, as well as the manual fuels treatments and prescribed fire treatments described below, are implemented for the purpose of reducing the likelihood of high-intensity wildfire in the treated forest stands and support protection of communities and critical infrastructure. In the event of a severe wildfire in untreated stands, moderate and high burn severities would impact soil cover and generate substantially increased runoff and erosion that would measurably impact water quality in streams within and near the burned area and have a significant adverse effect on beneficial uses of water (Forest Service 2005).

While design features and BMPs are robust and effectively prevent impacts to water resources, for Alternative 1 Project design features would not restrict mechanical equipment traffic based on the steepness of slope or length of the pitch. Traditional design for fuels treatment projects limits the use of mechanical equipment on steep slopes, so programs that evaluate implementation of BMPs demonstrate effectiveness under those conditions and the discussion above is therefore limited to mechanical treatment on shallower slopes. As discussed above, drainages on steep slopes are more likely to be ephemeral and therefore drainages may not be detected in the field. Precipitation events lead to rapid, high-energy flow over steep slopes. Moreover, because soils tend to be thinner and less stable, erosion is more likely. Therefore, improper mechanical treatment on steep terrain could lead to detrimental erosion and mass wasting. Catastrophic ground failure could result from dislodged ground cover or boulders that have been disturbed by improper operation of mechanical equipment, particularly if there is heavy precipitation following treatment activities. To reduce the risk of ground failure on steep slopes and keep them hydrologically stable, a design feature has been developed that would require a soil scientist or hydrologist to survey units greater than 45 percent slope that would be proposed for mechanical treatment and provide recommendations that limit or modify the use of equipment within the unit, if necessary, or provide other restrictions based on site-specific conditions. By limiting equipment in these sensitive areas, effects would also be limited.

Manual Treatment Activities and Pile Burning

Manual treatments (i.e., hand thinning) would be used during implementation of Alternative 1 on at least 31,682 acres where mechanical treatments are not proposed. In addition, hand thinning would be possible in any of the planning units except for Bucks Lake Wilderness. Generally, manual treatments involve the use of chainsaws to cut trees up to 10 inches dbh. Manual treatments may also be used to clear dead and downed trees or dense understory vegetation. Cut trees and slash would either be piled for burning later, bucked for firewood, or chipped and removed.

Soil Quality Effects

Detrimental soil quality effects related to manual treatments would be less likely and of a lower intensity than those observed with mechanical treatment. Ground cover and surface organic matter standards are generally always met with manual treatment because the forest floor is substantially less disturbed relative to mechanical thinning and because hand-piling limits the amount of slash that can be cost-effectively removed from the treated units. Soil compaction and topsoil displacement caused by hand thinning treatments do not occur in any meaningful way, since no heavy equipment traffic is involved and entry by treatment crews would not measurably affect soil resources.

Pile burning would be implemented in units where manual treatment has occurred and can result in a temporary reduction of soil cover beneath burn piles and a risk of nutrient pollution from ash migrating into waterbodies. However, burn piles are limited in size and scattered throughout the treated area. Undisturbed ground between the piles will act as a buffer to capture any localized soil erosion occurring within the footprint of the burned piles. A recent study conducted in the Tahoe Basin showed that although the water repellency of soils directly under burn piles is increased, the small areal extent of piles on the landscape ensured that nutrients did not move downhill more than a few meters (Hubbert 2015). Monitoring of pile burning treatments on National Forests in California has also shown that following the management requirements and BMPs to protect water quality are effective 98 percent of the time in meeting water quality protection objectives and has resulted in no adverse impacts to beneficial uses (Forest Service 2013).

Water Quality Effects

Burn piles are not allowed within the minimum buffer established for various types of aquatic features (see Appendix A) to ensure that direct impacts to water quality are minimized. The small physical extent of piles on the landscape ensures that runoff in the treated areas is not substantially increased. Accessing the burn pile work areas in fall, winter, and spring (when fuel and weather conditions are favorable for burning) can result in vehicle traffic on wet native surface roads. Wet weather restrictions are placed in the contracts to protect the road system from rutting and forming areas where runoff can be concentrated, which risks sedimentation to streams.

Prescribed Fire

Prescribed fire aims to reduce surface accumulation of vegetative material and provide ecological benefits such as recycling nutrients, reducing inter-tree competition by maintaining spacing, creating snags beneficial to wildlife, and removing pine litter suppressing native grass and forb growth. Prescribed fire can be used as a stand-alone treatment where it can be safely applied to achieve objectives. Prescribed fire would also be employed as a follow-up treatment to burn existing surface fuels, small diameter conifer trees, and slash created by thinning treatments.

Prescribed fire is planned to burn in forest stands at low to moderate intensity. Burn plans are developed to identify consumption goals, acceptable levels of tree mortality, large tree and snag protection, and large debris retention. Areas to be underburned may receive hand thinning pretreatments to meet burn plan goals. Existing roads and natural barriers would be utilized as fire lines to minimize new ground disturbance, although additional improvements or fire line construction around the planned burn area perimeter would likely be necessary.

Soil Quality Effects

Prescribed fire can decrease soil cover since the duff layer and fine organic matter would be partially consumed by fire, but these treatments are designed and timed to burn at low severity so that effective soil cover and surface organic matter are not heavily impacted. In fact, the purpose of using prescribed fire as a follow up treatment is in part to protect soils from burning at high intensity during wildfires, which severely damages soil productivity. Additionally, specifications would be included in contracts or direction to crews to ensure that minimum soil cover and surface organic matter standards are met. Soil compaction and topsoil displacement are not expected in prescribed fire units because no heavy equipment is involved.

Water Quality Effects

Forest Service standard BMPs related to prescribed fire and Project-specific design features would be followed to ensure that any fire lines constructed by hand or mechanically will have adequate drainage structures installed to protect water quality. These features would be rehabilitated, blocked, and disguised after use to prevent them from becoming non-system motorized trails after prescribed fire projects. BMP effectiveness monitoring on PNF has demonstrated that these BMPs are highly effective. Sixty-five prescribed fire units were evaluated for BMP effectiveness from 2007 to 2012 (Forest Service 2012b). Only two of these evaluations indicated deficient BMP application, due to the treatment burning at a higher intensity than planned, resulting in reduction of ground cover below standard. However, for these sites, ground cover was re-established within a few growing seasons and there was no permanent impact to water quality. It is anticipated that water quality impacts related to prescribed fire implemented under Alternative 1 would be similar and would not be adverse.

Herbicide Application

Herbicide application is proposed to eradicate small areas of invasive plant species, to reduce flammable vegetation and promote conifer regeneration by controlling shrub growth, and as a follow-up to prevent resprouting of some target native plants and limit future fuel loading. Herbicide application would occur using stump painting, hand spraying, or down-directed spray wands mounted on small vehicles, so treated areas would be targeted and small in size.

Soil Quality Effects

Herbicide application may affect soil directly via short-term adverse impacts on soil microbes. Applied chemicals would likely experience leaching; hydrolysis; adsorption on to, and desorption from, soil particles; and biological degradation during soil exposure to the herbicide. Soil characteristics affect the herbicide residency time through drainage and cation exchange capacities.

The herbicide application rates proposed by Alternative 1 are low enough to facilitate decay by soil microbes, in some cases increasing microbial activity (see Appendix G). Therefore, detrimental effects to soil productivity would be very limited and transient.

Water Quality Effects

Design features are included in the Project to protect water quality from spills and exposure to herbicide in the field. The risk of detrimental effects to water quality is very low given that herbicide treatments target only the plant species to be treated, the short decay times of the herbicides proposed for use, and implementation of design features that limit exposure by avoiding use of herbicides during precipitation events and including containment measures (Appendix G).

Road Maintenance and Water Drafting

Alternative 1 would include construction of temporary roads for access to treatment units where no access currently existing, and reconditioning roads that do not meet standards for use by fuel treatment equipment. The direct effects of constructing temporary roads are the removal of the topsoil layer and compaction of the road surface. This reduces aeration, porosity, infiltration rates, and soil moisture as well as increasing runoff (Reid and Dunne 1984).

Erosion from temporary roads is typically much greater than adjacent hillside erosion rates and is highly variable, depending on factors such as hillside gradient, location on slope, soil parent material, and bedrock exposure. Generally, soil loss is greatest during and immediately after temporary road construction (McCashion and Rice 1983). Drainage from temporary roads can also cause gullies and debris flows (Amaranthus et al. 1985) and alter the landscape distributions of the starting and stopping points of debris flows (Jones et al. 2000). On constructed temporary roads that have cut and fill slopes, these can be more susceptible to erosion and debris flows (Reid and Dunne 1984). Research conducted on roads on the west slope of the Sierra Nevada, mainly on the Eldorado National Forest, found that sediment averaged 7 tons per mile in the first winter following construction, then was reduced to less than 3 tons per mile in following years (Coe 2006).

All temporary roads would be closed and rehabilitated following completion of fuel treatment activities. This would include, for example, subsoiling to minimize compaction, reshaping to facilitate drainage and closure to eliminate further use. These treatments would facilitate revegetation of the road surface to minimize long term soil erosion and potential sediment.

Existing Forest Service system roads would be used during implementation of Alternative 1 and traffic would therefore temporarily increase on these roads. The role of traffic in increasing sediment production on unpaved roads is well-recognized. Increased traffic loosens unpaved road surfaces and increases their susceptibility to erosion. Research by Reid and Dunne (1984) and Ziegler et al. (2001) report sediment production on unpaved roads increased two to 30 times due to increased traffic. While Project implementation would temporarily increase traffic during implementation, most of the roads are currently open to use by the public year-round. Therefore, increased erosion and sediment caused by Alternative 1 on these open roads will be on the lower end of the expected ranges.

Prior to hauling, roads would be maintained by grading and shaping to provide a suitable haul road surface for anticipated mechanical equipment. Grading road surfaces and cleaning ditches loosens and exposes bare ground, temporarily increasing erosion (Coe 2006). However, existing drainage features, such as cross drains or culverts on unmaintained roads, regularly plug with debris and fail. Failure of a drainage feature can lead to concentration of flow on the road surface that may

cause significant erosion of the road prism and damage to the infrastructure. These erosion features can become permanent and continuously supply sediment. Proposed road maintenance would improve conditions on existing roads and decrease erosion, including installation of new drainage features, outsloping, mulching eroding slopes, culvert cleaning, and spot rocking.

Drafting sites for trucks that water roads during timber haul and road maintenance activities can also be a source of sedimentation to streams. A comprehensive BMP for water source drafting has been included as an amendment to the *Soil and Water Conservation Handbook* (Forest Service 2011). Water truck drafting pads, located adjacent to the water source, as well as the road approach to the water source would have surface aggregate gravel applied or rolling dips to prevent sediment production and delivery to the nearby stream. Developed areas subject to high flood events would be armored to prevent erosion. Where feasible, water sources would be constructed or reconstructed to be hydrologically disconnected from streams, with small supply flows diverted to the water source during the time that it is used.

Road maintenance activities included as a part of Alternative 1 would have minimal direct or indirect effects on soil and hydrological resources with implementation of design features, adherence to RCA Standards and Guidelines in the SNFPA, and implementation of Forest Service BMPs. Road maintenance would have direct and indirect benefits to stream systems by reducing erosion and sediment sources coming from the road system, reducing the hydrological connectivity of the existing road system, and improving road-related effects on downstream beneficial uses.

Alternative 2: Vegetation Treatments to Protect Communities Consistent with the Existing Forest Plan

Alternative 2 would result in approximately 9,524 fewer acres mechanically treated than under Alternative 1 and 4, with a corresponding increase in manual treatments. The same treatment methods would be used, although the location of mechanical and manual treatments would vary somewhat due to the different approaches to mechanical treatment in PACs under each alternative. However, Alternative 2 includes post-treatment targets for canopy cover, while Alternatives 1 and 4 includes post-treatment targets for rSDI in some units (see Chapter 2). Generally, the canopy cover targets in Alternative 2 would result in denser stands after treatments than the rSDI targets in Alternatives 1 and 4, which would be reflected in a lower overall intensity of mechanical treatment under Alternative 2. Alternative 2 would implement the same design features as Alternatives 1 and 4 (Appendix A).

Alternative 2 would include 9,524 fewer acres of ground-based mechanical treatment area than Alternatives 1 and 4. This would result in a reduced level of direct and indirect effects on soil quality, water quality, hydrologic function, and in RCAs from treatments under Alternative 2 than Alternatives 1 and 4. For the same reasons described for Alternatives 1 and 4, implementation of the design features would result in Forest Service water quality and hydrological standards being met under Alternative 2. The design features included for the Project are so successful in minimizing adverse effects to soil and hydrological resources that it is likely that the net difference in treated acres and treatment intensity between Alternatives 1 and 2 would be negligible. Therefore, net effects would be very similar for these alternatives. Legacy soil compaction and surface runoff would be the same under Alternative 2 as described for Alternatives 1 and 4. Road maintenance and water drafting would also be the same as Alternatives 1 and 4. Therefore, the

same effects on hydrology, water quality, and RCAs would be expected with implementation of Alternative 2 as with Alternatives 1 and 4.

Alternative 3: Vegetation Treatments to Protect Communities with Reduced Intensity Treatments

Alternative 3 represents a lower-intensity treatment scenario to meet desired conditions for the project area. As with Alternatives 1, 2, and 4, Alternative 3 includes the same planning units and the same mix of treatment methods; however, this alternative would limit disturbance associated with mechanical treatment in PACs HRCAs, and mature forests (see Chapter 2). This would result in 76,370 fewer mechanically treated acres than Alternatives 1 and 4. Like Alternative 2, treatments would seek to achieve canopy cover targets; however, higher residual canopy cover targets would be used in some planning units, resulting in lower treatment intensity. Therefore, Alternative 3 represents the lowest relative treatment intensity and fewest number of mechanically treated acres of all the action alternatives. The same design features would apply to Alternative 3 as Alternatives 1 and 2 (Appendix A).

Because Alternative 3 would treat fewer acres and at a lower intensity than Alternative 2, but would use the same treatment types, the evaluation of effects is similar to Alternative 2. This would result in a reduced level of direct and indirect effects on soil quality, water quality, hydrologic function, and disturbance in RCAs from treatments under Alternative 3 than under Alternatives 1, 2 or 4. For the same reasons described for Alternatives 1 and 4, implementation of the design features would result in Forest Service water quality and hydrological standards being met.

Legacy soil compaction and surface runoff would be the same under Alternative 3 as described for Alternatives 1 and 4. Road maintenance, and water drafting would also be the same as Alternatives 1 and 4. Because there would be fewer mechanically treated acres, and because the intensity of treatments under Alternative 3 would, overall, be lower related to implementation of higher canopy cover targets, more of the project area would be susceptible to high-intensity wildfire under post-treatment conditions (see Section 3.1, “Fire, Fuels, and Forest Health”), which would negatively affect hydrologic resources, including water quality and RCA function and health. Thus, the direct adverse effects of treatment activities would be less under Alternative 2 than the other action alternatives, the indirect effects associated with the risk of a high-severity wildfire would be greater.

Alternative 4: Vegetation Treatments to Protect Communities and CSO Territories

Alternative 4 would result in the same mechanically treated acres as Alternative 1. There would be no difference in mechanical versus manual vegetation treatment methods between Alternatives 4 and 1 and comparable treatment intensity. There would be comparable application of prescribed fire, herbicide applications, roadside maintenance, and water-drafting activities, as well as Project design features for minimizing adverse effects to soil and hydrological resources. Effects of Alternative 4 on soil quality, water quality, and hydrologic resources would be comparable to those described for Alternative 1.

Cumulative Effects for Alternatives 1, 2, 3, and 4

To evaluate cumulative effects, a cumulative watershed effects (CWE) analysis was carried out using standardized Forest Service methodology employing an ERA model (see Appendix F). When using the ERA model, all landscape disturbances are evaluated in comparison to a completely impervious or roaded surface. Road surfaces are considered to represent maximum hydrologic disturbance and rainfall-runoff potential. Other ground-disturbing activities assessed in CWE analysis areas include timber harvest and related silvicultural treatments on private and public lands, residential development, mines, wildfire, grazing, prescribed burning, and off-highway vehicle trails. The activities that are a part of the proposed Project were assigned disturbance coefficients that represent a typical ratio of their hydrologic impact compared to the same, or equivalent, roaded area. This numeric value is compared against a pre-established threshold of concern (TOC) for each watershed affected by Project activities. Because Alternative 1 and Alternative 4 are comparable in acres of mechanical treatment and intensity of treatments and would include the most acres of mechanical treatments and the highest intensity of treatments, the CWE incorporates the treatments activities proposed under Alternative 1 as a conservative approach to evaluate the worst-case-scenario that could occur under any action alternative.

The TOC for a watershed is based on its sensitivity, or tolerance for disturbance. Watershed sensitivity is an estimate of a watershed's natural ability to tolerate land use impacts without increasing the risk of cumulative impacts to unacceptably high levels. Measures used to evaluate watershed sensitivity for individual watersheds included the potential for (1) soil erosion; (2) high-intensity and/or long-duration precipitation events, including rain-on-snow; (3) landslides and debris flows; and (4) channel erosion within alluvial stream channels. Watershed response to elevated levels of ground disturbance may begin to negatively impact downstream channel stability and water quality. To describe the level of disturbance when such impacts may begin to occur, upper estimates of watershed “tolerance” to land use are established based on basin-specific experience, comparison with similar basins, and modeling of watershed response. These indices of tolerable levels of disturbance are the TOCs for each watershed. The tolerance of a watershed is used to determine acceptable levels of disturbance and prescribe mitigation measures to prevent detrimental responses from an activity or project. The TOC does not represent an exact level of disturbance above which cumulative watershed effects would occur. Rather, it serves as an indicator of increased risk of potentially significant adverse cumulative effects occurring within a watershed.

As with the direct and indirect effects, CWE for project area watersheds are evaluated at the 7th level (HUC-14). This scale watershed is the appropriate analysis scale based on the size of the project area and treatment areas.

Existing watershed conditions in analysis area drainages are generally below the TOCs; however, five watersheds exceed their respective TOCs under existing conditions. The CWE analysis identified 17 additional HUC-14 drainages that would exceed their corresponding TOCs with treatment activities under Alternative 1, for a total of 22 out of 130 analysis watersheds that are over TOC (Appendix F). Project ERAs for watersheds generally only modestly exceeded the TOC. The highest exceedances were observed in Headwaters South Fork Feather River, Bullards Bar Reservoir-Lower North Yuba River, Lost Creek Reservoir, and Slate Creek-Rabbit Creek.

The calculations for the CWE assume that all treatments and follow-up treatments (i.e., mechanical thinning and follow-up prescribed burning) would be accomplished in a single treatment year. While it would not be practical nor effective to carry out treatments at this rate, this scenario creates a

conservative framework for analysis of potential hydrological effects and establishes an absolute upper bound. Initial treatments under all action alternatives would be implemented over at least three years. Secondary treatments (e.g., pile burning, prescribed burning, or herbicide application) would be implemented after the first three years of treatments. Therefore, only a portion of the total treatments would be implemented within the same year, allowing disturbed areas to recover as treatments in other locations proceed. Additionally, the analysis considered an activity coefficient of 0.3 (equivalent to tractor yarding with follow up prescribed burn) to calculate ERA for all treatment areas, the highest coefficient of proposed treatment methods planned for the action alternatives. Finally, during treatment planning, watershed evaluation would be carried out and treatment units would be planned to prevent excessive disturbance to any single receiving waterbody (see below regarding the BMP Evaluation Program). Treatment activities associated with the action alternatives are therefore anticipated to have a net lower effect on watersheds than the CWE analysis suggests.

The TOC serves as a yellow flag indicator of elevated risk for any particular watershed and warrants further consideration. The Headwaters South Fork Feather and Bullards Bar Reservoir-Lower North Yuba River watersheds both have privately owned timberland and fairly high road densities. They have been mostly unaffected by recent high severity wildfire, therefore hydrologic function – especially within RCAs – in these watersheds is in good condition.

The Lost Creek Reservoir watershed has a high amount of privately owned and actively managed land with a high road density. The Slate Creek-Rabbit Creek watershed has an extensive history of mining. Streams within proposed Protect treatment units in both of these watersheds are stable, unburned, and in functional condition. Lost Creek and Slate Creek (and the smaller tributary Rabbit Creek, to a lesser extent) all support a healthy riparian plant community and are well armored by bedrock and cobble substrate.

Overall, these four watersheds have a network of functional riparian corridors capable of tolerating the elevated risk highlighted by the model results. Stream channels are in relatively stable condition with plenty of riparian vegetation. Risk of cumulative impacts is determined to be at an acceptable level and downstream beneficial uses are not expected to be adversely affected.

Project implementation would be monitored following the BMP Evaluation Program in accordance with Chapter 10 of the *Soil and Water Conservation Handbook* (Forest Service 2011). This would involve randomly selecting and monitoring Project activities with the objective of confirming that appropriate BMPs were implemented and determining whether those measures are effective in controlling erosion and protecting water quality and would identify watersheds at risk of detrimental effects. The Forest Service has been monitoring the implementation and effectiveness of BMPs for many years, as discussed above. The results of this monitoring show that, overall, the BMP program is adequately protecting water quality.

Given the multiple conservative assumptions used in the CWE analysis and the implementation and monitoring of design features associated with the Project, the action alternatives would not make a substantial contribution to an adverse watershed impact.

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3.5. Recreation and Visual Resources

3.5.1. Introduction

This section describes the existing recreation resources and opportunities, visual setting, Recreation Opportunity Spectrum (ROS) designations, and designated Visual Quality Objectives (VQO) within the project area. It evaluates each alternative's consistency with the applicable ROS and VQOs. A related analysis of the alternatives' effects on the Outstandingly Remarkable Values (ORVs) of the recreational river segments of the Feather River, and the wilderness characteristics of Buck's Lake Wilderness is included in Section 3.7, "Special Land Designations".

3.5.2. Current Management Direction

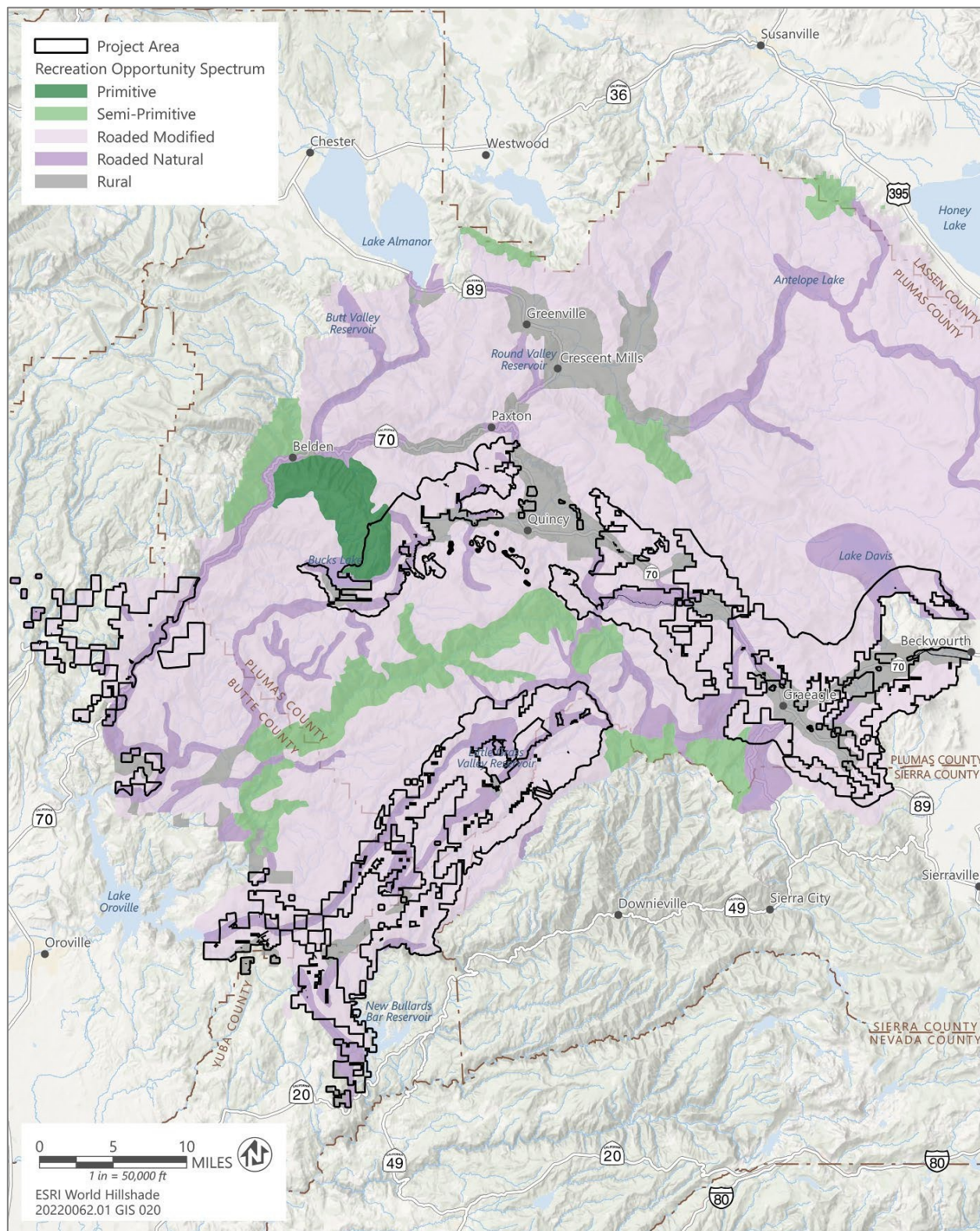
The Forest Plan directs PNF to provide a variety of forest-related recreation opportunities and coordinate recreation with other resource use through the ROS system. The ROS divides PNF into recreational opportunity areas based on area size, distance from roads, and degree of development. Categories range from primitive to rural and each provides indicators for physical settings, social settings, and managerial settings. Forest-wide Standards and Guidelines in the Forest Plan provide management guidance, which includes managing all Forest lands according to ROS designations. ROS designations are shown on Figure 3.5-1.

The Forest Plan also identifies applicable VQOs for each portion of PNF. The VQO categories are preservation, retention, partial retention, modification, and maximum modification. Each of the VQOs describes a different degree of acceptable alteration of the undisturbed landscape, with the least amount of visual alteration acceptable in preservation areas and the most alteration acceptable in maximum modification areas. Specific prescriptions within the Forest Plan provide additional guidance for achieving high and moderately high VQOs including Rx-7 Minimal Management, Rx-10 Visual Retention, and Rx-14 Visual Partial Retention Prescriptions. These prescriptions provide for natural-appearing landscapes where management and other activities are generally not evident and apply to areas with a VQO of retention or partial retention.

3.5.3. Affected Environment

Recreation

As identified in Figure 3.5-1 and Tables 3.5-1 and 3.5-2, most of the project area is designated in the ROS as Roaded Modified (RM). Areas with the ROS designations Roaded Natural (RN) and Rural (R) comprise the next largest portions of the project area. Recreation Opportunity Spectrum designations of Primitive (P) and Semi Primitive (SP) represent approximately 2 percent and less than 1 percent of the project area, respectively.



Source: Data received from US Forest Service in 2022.

Figure 3.5-1 Recreation Opportunity Spectrum in the Project Area

Table 3.5-1 Distribution of ROS Designations in Project Planning Units for Alternatives 1, 2, and 3

Planning Unit	Roaded Modified (acres)	Roaded Natural (acres)	Rural (acres)	Primitive (acres)	Semi-Primitive (acres)
General Forest -Westside	13,121	2,190	741	35	139
General Forest -Eastside	8,067	2,186	2,005	0	0
Mature Forest	25,338	6,902	2,685	136	133
PAC	27,541	9,055	885	17	0
HRCA	33,162	8,939	959	0	0
Bucks Lake Wilderness	68	132	4	4,381	0
Feather River - Recreational	3,721	2,848	2,820	0	0
Feather River – Scenic	1,731	1,755	29	0	0
Feather River - Wild	343	123	0	0	0
Post Wildfire Area	24,153	6,172	919	0	0
Shrub and Early Seral	9,654	1,316	347	79	3
Existing Fire Control Lines	3,423	1,256	174	0	19
Other Areas	3,595	2,803	287	1	7
Total	153,917	45,677	11,855	4,649	301

Source: Compiled by USDA FS in 2024.

Table 3.5-2 Distribution of ROS Designations in Project Planning Units for Alternative 4

Planning Unit	Roaded Modified (acres)	Roaded Natural (acres)	Rural (acres)	Primitive (acres)	Semi-Primitive (acres)
General Forest -Westside	13,155	2,377	773	26	139
General Forest -Eastside	7,719	2,090	1,928		
Mature Forest	18,343	4,602	2,371	97	57
PAC	27,541	9,055	885	17	
Territory	24,866	6,470	688	48	1
Wildlife Corridor	18,238	6,240	774		88
Bucks Lake Wilderness	68	132	4	4,381	
Feather River - Wild	343	123			
Feather River – Recreational and Scenic	7,546	5,121	2,850		
Post Wildfire Area	19,567	4,332	801		0
Shrub and Early Seral	9,654	1,316	347	79	3
Existing Fire Control Lines	3,283	1,017	146		7
Other Areas	3,594	2,803	287	1	7
Total	153,917	45,677	11,855	4,649	301

Source: Compiled by USDA FS in 2024.

Plumas National Forest Visitation

The total estimated visitation and numbers of visitors for various types of visits recorded in the PNF during fiscal years 2005, 2010, 2015, and 2020 are shown in Table 3.5-3. As shown in the table, overall visitation has declined from 2005 through 2020 with peak visitation in 2010. Although visits to designated day-use developed sites, overnight use developed sites, and general forest area visits have declined, visits to designated wilderness have increased over this period.

Table 3.5-3 Estimated Visitation in the Plumas National Forest (2005-2020)

Visit Type	2005	2010	2015	2020
Day-use Developed Site Visits	114,000	104,000	124,000	111,000
Overnight Use Developed Site Visits	107,000	120,000	108,000	113,000
General Forest Area Visits	335,000	439,000	166,000	168,000
Designated Wilderness Visits	6,000	7,000	6,000	18,000
Total Estimated Site Visits¹	562,000	670,000	404,000	410,000
Total Estimated National Forest Visits¹	414,000	526,000	357,000	347,000

¹ A site visit is the entry of one person onto a National Forest site or area to participate in recreation activities for an unspecified period of time. A National Forest visit is defined as the entry of one person upon a national forest to participate in recreation activities for an unspecified period of time. A National Forest visit can be composed of multiple site visits; thus, the total estimated site visits may be greater than the total estimated national forest visits.

Sources: USFS 2022a, 2022b, 2022c, and 2022d.

The project area serves a mostly local visitor base. In 2020, about 59 percent of visitors to the PNF were people living within 50 miles of the national forest and another 12.1 percent of visitors were people living 51 to 75 miles away. Most visits were short, day-use visits that lasted 6 hours or less. The average duration was about 18 hours associated with overnight stays in developed sites. About 52 percent are people who visit at most five times per year (USFS 2022d).

In 2020, the five recreation activities with the highest participation rates were hiking/walking (42.7 percent), viewing natural features (36.6 percent), relaxing (34.2 percent), viewing wildlife (26.0 percent), and fishing (22.6 percent). The most common winter activities reported in 2020 were snowmobiling (2.4 percent) and cross-country skiing (1.1 percent; USFS 2022d).

Recreation Resources

The project area contains numerous recreation facilities and a wide range of year-round recreation opportunities. Recreation activities in the project area include camping, hiking, backpacking, fishing, nature viewing, horseback riding and camping, picnicking, off-highway vehicle (OHV) riding and camping, mountain biking, motorized and non-motorized boating, swimming, snowmobiling, cross-country skiing, snowshoeing, and interpretation activities. A list of recreation facilities and associated recreation opportunities in each ranger district of the project area is included in Table 3.5-4.

Table 3.5-4 Recreation Resources in the Project Area by Ranger District

Recreation Facilities	Recreation Opportunities	Number of Cabin Units/Campsites	ROS Designation	Planning Units – Alternatives 1, 2, and 3	Planning Units – Alternative 4
Beckwourth Ranger District					
Camp Layman	Cabin rentals, fishing, swimming	13 cabin units	RN	General Forest Eastside, Feather River Recreational	General Forest Eastside, Feather River Recreational
Coot Bay	Fishing site	NA	RN	General Forest Eastside	General Forest Eastside
Crocker Campground	Campground	10 campsites	RN	Existing Fuel Breaks, General Forest Eastside, Other Areas, Shrub and Early Seral	Existing Fuel Breaks, General Forest Eastside, Other Areas, Shrub and Early Seral
Crocker Guard Station	Historic cabin adjacent to Crocker Campground	1 cabin unit	RN	Shrub and Early Seral	Shrub and Early Seral
Eagle Point Fishing Access	Fishing site	NA	RN	General Forest Eastside, Other Areas	General Forest Eastside, Other Areas
Gold Lake Staging Area	Snowpark	NA	RN	Mature Forest	Territory
Grasshopper Flat Campground	Campground	71 campsites	RN	General Forest Eastside, Other Areas	General Forest Eastside, Other Areas
Grizzly Campground	Campground	55 campsites	RN	General Forest Eastside	General Forest Eastside
Honker Cove Boat Ramp	Boating site	NA	RN	General Forest Eastside	General Forest Eastside
Jackson Creek Picnic Area	Picnic site	NA	RN	General Forest Eastside, HRCA	Wildlife Corridor
Portola Family Picnic Grounds	Picnic site	NA	R	General Forest Eastside	Feather River Rec and Scenic
Feather River Ranger District					

Recreation Facilities	Recreation Opportunities	Number of Cabin Units/Campsites	ROS Designation	Planning Units – Alternatives 1, 2, and 3	Planning Units – Alternative 4
American House OHV Camp	Camping, access to OHV trails	5 campsites	RM	PAC	PAC
Black Rock Boat Ramp	Boating site	NA	RN	Existing Fuel Breaks, Mature Forest	Existing Fuel Breaks, Other Areas
Black Rock Walk-In Tent Campground	Camping area	20 campsites	RN	Existing Fuel Breaks, Mature Forest	Existing Fuel Breaks, Mature Forest
La Porte Staging Area	Snowpark	NA	R	Existing Fuel Breaks	Existing Fuel Breaks
Little Grass Valley Fishing Access	Fishing site	NA	RN	Existing Fuel Breaks, Mature Forest, Other Areas	Existing Fuel Breaks, Mature Forest, Other Areas
Little Beaver Campground	Campground	120 campsites	RN	General Forest Westside	General Forest Westside, Mature Forest
Little Grass Valley Horse Camp	Horse camp	10 campsites	RN	HRCA, Mature Forest, Other Areas	Territory, Other Areas
Maidu Amphitheater	Interpretive site	NA	RN	Mature Forest, PAC	Mature Forest, Territory, PAC
Maidu Boat Ramp	Boating site	NA	RN	Mature Forest, Other Areas, PAC	Mature Forest, Territory, Other Areas, PAC
Mooreville Boat Ramp/Picnic Area	Picnic site	NA	RN	General Forest Westside, Other Areas	General Forest Westside, Other Areas
Mooreville Warming Hut	Snowpark	NA	RM	Existing Fuel Breaks	Existing Fuel Breaks
Pancake Swimming	Swimming site	NA	RN	PAC	PAC
Paradise Picnic Area	Picnic site, fishing site	NA	RN	Mature Forest, Other Areas	Mature Forest, Other Areas
Peninsula Tent	Campground	25 campsites	RN	PAC	PAC
Red Feather Campground	Campground	60 campsites	RN	Mature Forest	Mature Forest

Recreation Facilities	Recreation Opportunities	Number of Cabin Units/Campsites	ROS Designation	Planning Units – Alternatives 1, 2, and 3	Planning Units – Alternative 4
Running Deer Campground	Campground	40 campsites	RN	Mature Forest	Mature Forest
Sawmill Ridge Warming Hut	Snowpark/snowplay area	NA	RN	Existing Fuel Breaks, Feather River Recreational - Eligible Recreational, Mature Forest, General Forest Westside	Existing Fuel Breaks, Feather River Rec and Scenic, Territory, Wildlife Corridor
Sly Creek Campground	Campground	23 campsites	RN	General Forest Westside, HRCA, Other Areas	General Forest Westside, Mature Forest, Other Areas
South Fork Warming Hut	Snowplay area	NA	RN	HRCA	Territory
Strawberry Campground	Campground	17 campsites	RN	HRCA	Territory
Strawberry Cartop Boat Launch	Boating site	NA	RN	HRCA, Mature Forest, Other Areas	Territory, Other Areas
Tooms Boat Launch	Boating site	NA	RN	Other Areas, PAC	Other Areas, PAC
Tooms RV Campground	Campground	20 campsites	RN	PAC	PAC
Wyandotte Campground	Campground	28 campsites	RN	PAC	PAC

**Mt. Hough
Ranger
District**

Big Creek Staging Area	Access for snowmobiling, cross-country skiing, and snowshoeing	NA	RN	Mature Forest, Other Areas	Mature Forest, Other Areas
Bucks Kiosk	Interpretive site	NA	RM, R	Mature Forest	Mature Forest
Bucks Lake Overlook	Observation site	NA	R	Mature Forest, Other Areas	Mature Forest, Other Areas
Bucks Summit	Snowpark	NA	RN	General Forest Westside,	General Forest Westside,

Recreation Facilities	Recreation Opportunities	Number of Cabin Units/Campsites	ROS Designation	Planning Units – Alternatives 1, 2, and 3	Planning Units – Alternative 4
				Mature Forest, Other Areas, Shrub and Early Seral	Mature Forest, Other Areas, Shrub and Early Seral
Indian Rocks	Day-use area	NA	R	General Forest Westside, Other Areas	General Forest Westside, Other Areas
Red Bridge Campground	Campground	6 campsites	RN	Feather River Scenic	Feather River Scenic
Snake Lake Campground and Equestrian Camp	Campground and day-use area, OHV trail access	17 campsites	RN	HRCA, Other Areas, Mature Forest	Wildlife Corridor, Other Areas, Mature Forest
West End Cove	Day-use area	NA	R	General Forest Westside, Other Areas	General Forest Westside, Other Areas
Whitehorse Campground and Equestrian Camp	Campground	19 campsites	RN	HRCA	Territory

Source: Compiled by Ascent Environmental in 2023. Updated by USDA FS in 2024.

Hiking

Approximately 115 miles of trails that may be used for day hiking or backpacking across the project area. The Pacific Crest Trail (PCT) spans 2,650 miles from Mexico to Canada. About 75 miles of the PCT crosses the PNF, with 16 miles passing through the project area.

Camping

As noted in Table 3.5-4, there are 18 campgrounds in the project area with approximately 566 campsites. A range of camping options are available, including RV camping, walk-in tent campsites, or car camping. Some campgrounds may provide amenities that include potable water, showers, flush toilets, trash service, picnic tables, paved parking, fire rings, and grills.

Fifty of the developed recreation sites (including campgrounds) in the PNF are operated and maintained by a concessionaire. In the project area, campgrounds operated by a concessionaire include Crocker Campground and Guard Station, Grasshopper Flat Campground, Grizzly Campground, Snake Lake Campground and Equestrian Camp, and Whitehorse Campground and Equestrian Camp. Other lodging facilities in the project area include Red Bridge, all the campgrounds listed on the Feather River Ranger District, and Camp Layman, which is a privately owned facility.

Off-Highway Vehicle Use

Facilities for OHV-related activities include dirt roads, 4-wheel drive (4WD) trails, unimproved roads, dirt roads, and gravel roads. Over an estimated 1,000 miles of roads and trails for OHV riding are in the project area. There are over an estimated 5,400 miles of OHV roads and trails in the PNF.

Winter Recreation

Snow play (e.g., sledding), cross-country skiing, snowshoeing, and snowmobiling (i.e., over snow vehicle [OSV] use) are enjoyed by visitors in the winter. Many miles of trails and numerous areas are available for visitors to use for cross-country skiing, snowshoeing, and snowmobiling throughout the project area.

Visual Resources

The majority of the project area consists of land designated as VQO modification (Table 3.5-5, Figure 3.5-2). Modification VQOs allow for management activities to visually dominate the original characteristic landscape; however, vegetative and landform alteration must be designed so that the visual characteristics of management are consistent with natural conditions within the surrounding area.

Table 3.5-5 Acres of the Project Area within Each VQO Class

	Preservation	Retention	Partial Retention	Modification	Maximum Modification
Acres within project area	4,695	42,250	60,195	110,485	97

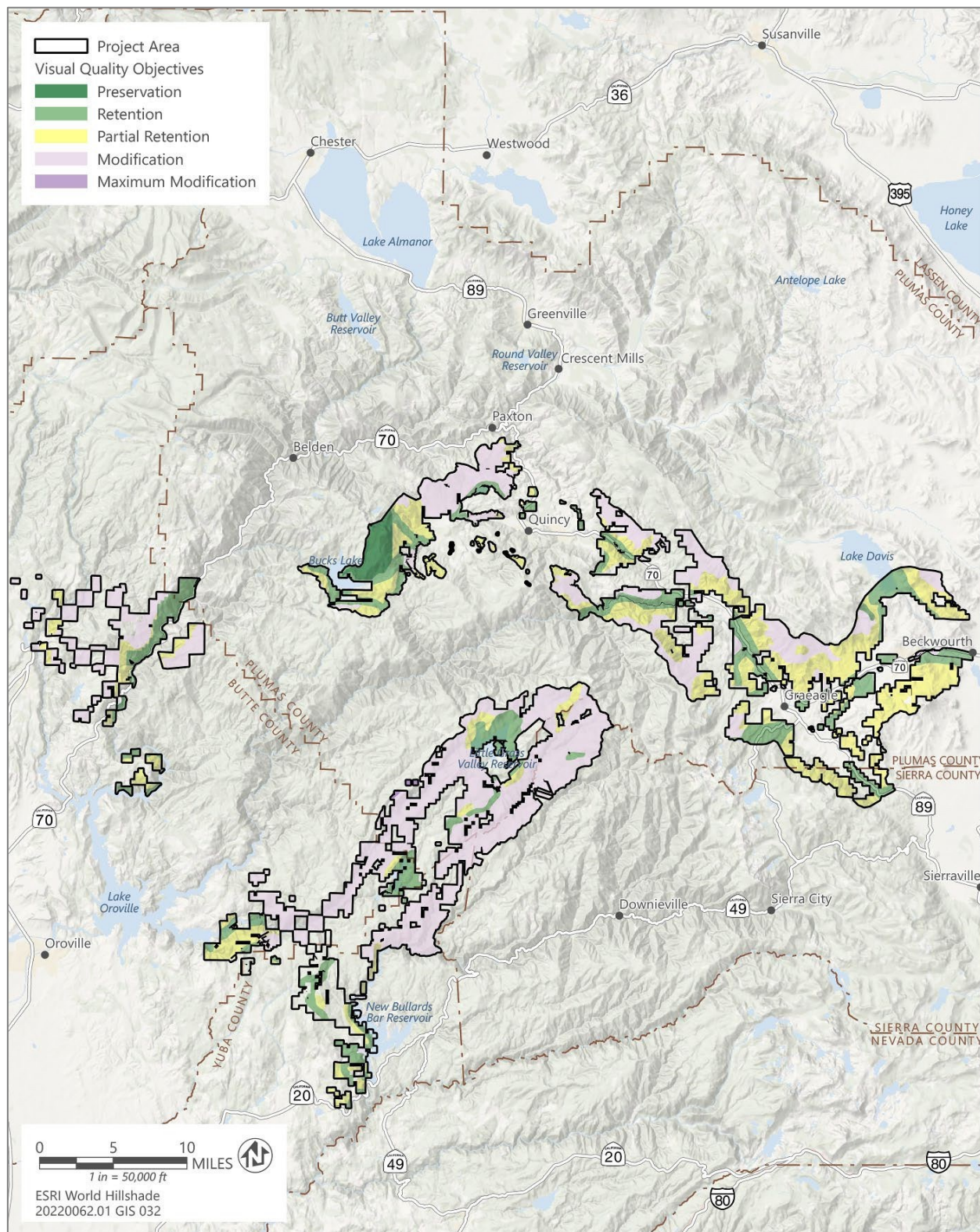
Source: Compiled by Ascent Environmental in 2023.

Approximately 42,250 acres of the project area are designated as retention, and 60,195 acres are classified as partial retention. The retention and partial retention VQOs include areas along the Middle Fork of the Feather River that have been designated or are eligible for designation as a Wild, Scenic, or Recreational River. The river runs from its headwaters near Beckwourth to Lake Oroville. The river provides an outstanding scenic landscape including a deep, U-shaped, glacially carved canyon. The surrounding mountain scenery attracts thousands of visitors each year. The scenic quality of the river and its canyon is a major attraction (USFS 2023). Two sensitive visual corridors pass through the project area, including State Route 70/89 from approximately Quincy southeast through Graeagle, from Graeagle east through Beckwourth, and from Butte Valley northeast through Parkhill. The VQO along the foreground of these travel routes is retention, requiring a natural-appearing landscape where management activities are not visually evident to the casual forest visitor. The middle ground and background as seen from these routes are designated partial retention, requiring a natural-appearing landscape where management activities may be evident but must remain visually subordinate to the characteristic landscape.

The Bucks Lake Wilderness is designated as preservation VQO, the most visually sensitive VQO. This visual quality objective allows ecological changes only, and only very low visual-impact management activities are allowed.

The project area contains a small amount (97 acres) of maximum modification VQO, near Lumpkin Ridge Road between Little Grass Valley Reservoir and Lake Oroville. The visual character of this area has been heavily modified by past forest management. In the maximum modification VQO, management activities may dominate the landscape. However, the maximum

modification areas must appear consistent with the natural visual characteristics of the landscape when viewed in the background.



Sources: Data received from U.S. Forest Service in 2022.

Figure 3.5-2 Visual Quality Objectives

3.5.4. Design Features

Design features would be implemented to protect recreation and visual resources. Applicable design features are described in Appendix A. The recreation and visual impact analysis accounts for implementation of the applicable design features.

3.5.5. Environmental Consequences

Direct and Indirect Effects

Consistency with Recreation Opportunity Spectrum Designations

No Action Alternative

The No Action Alternative would not implement new vegetation management treatments. There would be no direct or indirect effects from treatment activities that could be inconsistent with ROS designations. However, the risk of catastrophic wildfire would remain and would increase over time (see Section 3.1, “Fire, Fuels, and Forest Health”), resulting in an increase in the risk of damage or loss of recreation facilities and opportunities due to a catastrophic wildfire.

Alternative 1 - Vegetation Treatments to Protect Communities and Achieve Landscape Resilience

Alternative 1 would result in an overall long-term beneficial effect on recreation by reducing hazardous fuels, removing hazard trees, and improving forest health. The reduction of hazardous fuels in overstocked stands would reduce the risk of high severity wildfire. This would result in a beneficial indirect effect on recreation opportunities by helping to maintain and preserve the landscape of existing recreation sites and areas, and protecting recreation infrastructure.

The ROS system is used to categorize and manage different recreation settings in the project area because people choose a specific setting for recreation activities based on a desired set of experiences.

The distribution of ROS designations and their locations are listed in Table 3.5-1 and shown in Figure 3.5-1, above. Each of the planning units are located in areas with the ROS designations Roaded Modified (RM) and Roaded Natural (RN), with the exception that the Feather River-Wild planning unit only contains the RM designation and Bucks Lake Wilderness planning unit does not contain either of these designations. The RM and RN designations comprise the majority of the project area (see Table 3.5-1). In areas with these designations, the sights and sounds of people are moderate. Each of the proposed treatment methods under Alternative 1 would be implemented in areas with the RM and RN designations; however, the treatments in some portions of RM and RN areas would be limited by the allowable treatment methods for each planning unit. For example, mechanical treatments and grapple piling would be limited in the PACs planning unit; herbicide application and reforestation would not be implemented in the Feather River-Recreational or Scenic and Feather River-Wild planning units; and mechanical treatments, grapple piling, and mastication would not be implemented in the Feather River-Wild planning unit (see Table 2-3).

Approximately 6 percent of the project area has the ROS designation of Rural (R). In areas with the R designation, the sights and sounds of people are evident and the natural environment is culturally modified, yet attractive. These areas exhibit more human use than areas with the RM and RN

designations. All planning units except for Feather River-Wild, Feather River-Scenic, and Eligible Wild contain areas with the R designation. Each of the proposed treatment methods under Alternative 1 would be implemented throughout the areas with the R designation, subject to limitations described in Chapter 2 and Appendix A.

The treatment activities proposed under Alternative 1 would be consistent with the RM, RN, and R designations because these areas are characterized by the presence of people and include some modifications to the natural environment. None of the treatment methods would convert a forested area to a non-forested landscape. Although there would be temporary closures to recreation areas while treatments are implemented, the closures would be short-term and would not permanently affect the recreational opportunities within the project area. Additionally, the Alternative 1 would implement Design Features REC-3, REC-4, and REC-5 (see Appendix A) such that recreation facilities or resources would be protected, replaced, or reinstalled and no new access points, roads, or trails would be created resulting in no changes to the ability of visitors to recreate in these areas after completion of the project.

The portion of Bucks Lake Wilderness in the project area has the ROS designation of Primitive (P), which represents approximately 2 percent of the total project area. In areas with the P designation, the landscape is essentially unmodified and is isolated from the sights and sounds of people. Treatment activities that could occur in Bucks Lake Wilderness would be limited to pile burning of existing piles; thus, the treatment activities proposed under Alternative 1 would be consistent because changes to the landscape would be limited to burn piles that have already been created and only a minimal number of people would be working to complete this treatment activity over a short period of time.

Approximately 300 acres of the project area with the Semi Primitive (SP) designation is located north of the Lakes Basin in the Beckwourth Ranger District. Recreation facilities in this SP-designated area includes the Smith Creek Trail. This SP area contains the General Forest Eastside, Mature Forest, Shrub and Early Seral, and Existing Fire Control Lines planning units. The SP designation is applied to areas that provide moderate opportunity for isolation from sights and sounds of people and has a natural appearing environment. Although all treatment activities are allowed in these planning units (with the exception of reforestation in General Forest Eastside and Mature Forest), implementation of Design Feature REC-2 would require signage to be posted at nearby trailheads, parking lots, and or campgrounds notifying recreation users of planned treatment activities in the area.

In 2020, approximately 350,000 people visited PNF to participate in recreation activities (see Table 3.5-3). Some minor direct effects, such as noise, smoke, and dust from treatment activities and equipment use would cause minor, short-term disruptions of recreation use or degradation of the quality of recreation experience. These effects would be most noticeable in developed recreation areas identified in Table 3.5-4 during treatment implementation. Implementation of Design Feature REC-1 would result in the temporary closure of recreation areas to provide for the safety of recreation users, would reduce their exposure to noise, smoke, and/or dust from treatment activities. This design feature, which includes implementing treatments outside of busy visitation periods when feasible, and Design Feature REC-2, which includes notifying visitors of planning fuels treatments, would reduce the number of visitors that could be exposed to these nuisances.

Implementation of Alternative 1 could also result in short-term, adverse direct and indirect effects to recreationists related to the application of herbicides. The Human Health Risk Assessment for

herbicide treatments (Appendix G), provides a detailed summary of the risk that these chemicals could present to human health and safety. Under normal conditions, members of the public would not be exposed to substantial levels of any of the herbicides that could be potentially used in the Project. In most cases, herbicides would be applied in relatively remote areas where it is unlikely that members of the public would be exposed to plants shortly after treatment. As summarized in Appendix G, potential herbicide exposure risk would be reduced through implementation of standard Forest Service safety protocols and project design features. While these protections cannot eliminate all risk to human health, they would reduce the potential for adverse health effects to an acceptable level.

As described above, Alternative 1 would maintain consistency with all applicable ROS designations for the following reasons: 1) the project would implement Design Features REC-3, REC-4, and REC-5 such that recreation facilities or resources would be protected, replaced, or reinstalled; 2) no new access points, roads, or trails would be created or decommissioned resulting in no changes to the existing level of isolation within each ROS designation; 3) changes in the recreational experience due to equipment and crews during project implementation would be temporary and short term; and 4) the alternative would result in a less dense forest, but would not fundamentally change the character of the recreation experience, because it would not convert any forested area to a non-forested condition. In addition, direct effects of treatment activities, including herbicide application, would not result in long-term or substantial adverse impacts.

Alternative 2 - Vegetation Treatments to Protect Communities Consistent with the Existing Forest Plan

The potential direct and indirect effects from treatment activities under Alternative 2 would be very similar to those for Alternative 1 in the areas where project activities would occur. Compared to Alternative 1, the intensity of forest thinning associated with Alternative 2 would result in slightly denser forests due to the post-treatment canopy cover targets included in Alternative 2. Thus, the short-term effects related to changes in the forested environment would be slightly less. With implementation of Alternative 2, the locations and intensity of mechanical treatments in PACs and HRCAs would be slightly different from Alternative 1. Thus, nuisance effects from equipment noise in some recreation areas would be slightly different than Alternative 1. However, the same design features as Alternative 1 would apply to Alternative 2, and Alternative 2 would maintain consistency with all ROS designations for the same reasons described above for Alternative 1.

Alternative 3 - Vegetation Treatments to Protect Communities with Reduced Intensity Treatments

The types of effects on ROS designations and recreation users would be similar to those described above for Alternative 1. However, because Alternative 3 would result in less mechanical treatment and more manual treatment than Alternatives 1 or 2, the magnitude of the effects of treatment activities on recreation resources and visitors would be less under Alternative 3. Because Alternative 3 treatment activities would maintain a greater proportion of dense forest habitat with greater canopy cover than Alternatives 1 or 2, the magnitude of the change in the appearance of the forest from densely forested areas to thinned forests would be less than Alternatives 1 and 2. However, as described in Section 3.1, “Fire, Fuels, and Forest Health,” Alternative 3 would be less effective in reducing wildfire risk than Alternatives 1 or 2, and would therefore result in a greater risk of recreation resources being lost to a catastrophic wildfire. The same design features would

apply to Alternative 3 as Alternative 1, and Alternative 3 would maintain consistency with all ROS designations for the same reasons described above for Alternative 1.

Alternative 4 - Vegetation Treatments to Protect Communities and CSO Territories

The potential direct and indirect effects from treatment activities under Alternative 4 would be very similar to those for Alternative 1 in the areas where project activities would occur. With implementation of Alternative 4, the locations and intensity of mechanical treatments in PACs and Territories would be slightly different from Alternative 1. Thus, nuisance effects from equipment noise in some recreation areas would be slightly different than Alternative 1. However, the same design features as Alternative 1 would apply to Alternative 4, and Alternative 4 would maintain consistency with all ROS designations for the same reasons described above for Alternative 1.

Consistency with Visual Quality Objectives

No Action Alternative

The No Action Alternative would not implement new vegetation management treatments. There would be no direct or indirect effects from treatment activities that could be inconsistent with VQO designations. However, the risk of catastrophic wildfire would remain and would increase over time (see Section 3.1, “Fire, Fuels, and Forest Health”), resulting in an increase in the risk of damage or loss of visual resources due to a catastrophic wildfire.

Alternative 1 - Vegetation Treatments to Protect Communities and Achieve Landscape Resilience

The vegetation treatments included in Alternative 1 would increase tree, stand, and landscape resiliency by removing dead and dying trees, reducing competition between remaining trees, and producing variable densities of trees with an uneven arrangement of individual trees, small groups or clumps, and openings within the stand. A reduction in forest stand and crown density as well as an increase in the height to canopy would facilitate views farther into the forest but would not change the character of existing views, which would continue to appear as a natural forest landscape. Furthermore, the proposed alternative would reduce the risk of large-scale stand catching fire, therefore protecting the visual quality of the forest.

Thinning of stands would reduce competition and accelerate the growth rate of the remaining trees, resulting in the faster development of larger trees. These larger trees would add visual diversity and interest to the visual landscape in the future. Forests with a more open structure allow visual access through the understory. Stands of trees would be thinned leaving an attractive and well-maintained landscape, and large healthy trees would be retained. Implementation of design feature VQO-3 would ensure that tall cut stumps are not visible after treatment. The treatments proposed would benefit visual quality in the long term. Prescribed burning would cause short-term adverse effects on visual quality from ash and charred vegetation, especially along travel corridors and high use recreation sites. However, the signs of burning would disappear after a few years, particularly with implementation of design feature VQO-3, which includes targets to limit tree mortality from under burning and limit the amount of burned material visible after pile burning.

From roads and dispersed recreational areas within and directly adjacent to the project site, treated areas would be visible but would continue to resemble the surrounding natural areas. Reduction of

forest stand density and canopy cover would immediately open views farther into the forest but would not fundamentally alter the character of existing views. This would continue to reflect a natural-appearing forest landscape and meet or exceed the modification, retention, or partial retention VQOs that apply to the majority of the project site.

Within the Bucks Lake Wilderness, treatments would include pile burning of existing or hand stacked piles and prescribed fire; no live vegetation would be removed. This could alter the visual character of the Bucks Lake Wilderness; however, prescribed fire to remove understory vegetation would be consistent with the historical naturally occurring fire regime and would restore Bucks Lake Wilderness to these more natural conditions. Additionally, understory vegetation would recover naturally following prescribed fire, and the area would continue to be consistent with the strictest preservation VQO in the medium to long term.

During implementation of Alternative 1, mechanical equipment, landings, slash, and smoke from prescribed burns and pile burning would be visible. However, active treatment areas would be closed during the periods of implementation, so equipment and operations would not be readily visible to forest users. In addition, treatment activities would be conducted in accordance with design feature VQO-3, which would require, where practical, that slash piles be located where they are the least visible to forest users, and be removed at the earliest opportunity, thus minimizing potential adverse short-term visual effects. In addition, VQO-3 would ensure that landings are not readily visible from sensitive road corridors.

The use of mechanical equipment and prescribed burns would cause temporary visual disruptions in the form of wheel or track marks and burned areas, respectively. These effects would be quickly masked by understory growth. Also, the project design features would limit landings and primary skid trails within the immediate foreground, and limit stump height to 6 inches. Thus, the effects of forest management would be short-term until natural revegetation and litter fall occurs.

For these reasons, the short- and long-term indirect and direct effects on the visual characteristics of the forest would be negligible and the visual conditions following implementation of Alternative 1 would remain consistent with the applicable VQOs.

Alternative 2 - Vegetation Treatments to Protect Communities Consistent with the Existing Forest Plan

The potential direct and indirect effects from treatment activities under Alternative 2 would be very similar to those for Alternative 1 in the areas where project activities would occur. Compared to Alternative 1, the intensity of forest thinning associated with Alternative 2 would result in slightly denser forests due to the post-treatment canopy cover targets included in Alternative 2. Thus, the long-term effects related to changes in the forested environment would be slightly less. With implementation of Alternative 2, the locations and intensity of mechanical treatments in PACs and HRCAs would be slightly different from Alternative 1. Thus, changes to the visual characteristics of treated areas would be slightly different than Alternative 1. However, the same design features as Alternative 1 would apply to Alternative 2, and Alternative 2 would maintain consistency with all VQO designations for the same reasons described above for Alternative 1.

Alternative 3 - Vegetation Treatments to Protect Communities with Reduced Intensity Treatments

The types of effects on VQO designations and visual resources would be similar to those described above for Alternative 1. However, because Alternative 3 would result in less mechanical treatment and more manual treatment than Alternatives 1 or 2, the magnitude of the effects of treatment activities on visual resources would be less under Alternative 3. Because Alternative 3 treatment activities would maintain a greater proportion of dense forest habitat with greater canopy cover than Alternatives 1 or 2, the magnitude of the change in the appearance of the forest from densely forested areas to thinned forests would be less than Alternatives 1 and 2. However, as described in Section 3.1, “Fire, Fuels, and Forest Health,” Alternative 3 would be less effective in reducing wildfire risk than Alternatives 1 or 2 and would therefore result in a greater risk of visual resources being lost to a catastrophic wildfire. The same design features would apply to Alternative 3 as Alternative 1, and Alternative 3 would maintain consistency with all VQO designations for the same reasons described above for Alternative 1.

Alternative 4 - Vegetation Treatments to Protect Communities and CSO Territories

The potential direct and indirect effects from treatment activities under Alternative 4 would be very similar to those for Alternative 1 in the areas where project activities would occur. With implementation of Alternative 4, the locations and intensity of mechanical treatments in PACs and Territories would be slightly different from Alternative 1. Thus, changes to the visual characteristics of treated areas would be slightly different than Alternative 1. However, the same design features as Alternative 1 would apply to Alternative 4, and Alternative 4 would maintain consistency with all VQO designations for the same reasons described above for Alternative 1.

Cumulative Impacts

Recreation

No Action Alternative

The No Action alternative would not result in direct or indirect effects that could combine with other cumulative projects to result in cumulative effects to recreation resources because no new vegetation management treatments be implemented.

Alternative 1 - Vegetation Treatments to Protect Communities and Achieve Landscape Resilience

The geographic scope of the cumulative impact analysis for recreation encompasses the public recreation areas within the project area and within the PNF. The cumulative projects consist of fuels treatment projects that would implement similar treatment activities with the goal of reducing risk of catastrophic wildfire and retaining a forested landscape. These cumulative projects would result in similar direct and indirect effects on recreation resources as described above for Alternative 1. Because the cumulative projects would be located outside of the project area for the Community Protection – Central and West Slope Project, the cumulative projects and the Project would not likely result in closures of the same recreation areas affecting access to recreation resources. Individual projects that may be implemented at the same time as the Project could combine to result in an increase in nuisance effects related to smoke; however, the effects of

projects utilizing prescribed burning and pile burning would be limited by compliance with burn and smoke management plans.

Alternative 2 - Vegetation Treatments to Protect Communities Consistent with the Existing Forest Plan

The potential cumulative effects for Alternative 2 would be the same as those for Alternative 1 in the areas where project activities would occur.

Alternative 3 - Vegetation Treatments to Protect Communities with Reduced Intensity Treatments

The potential cumulative effects for Alternative 3 would be similar to those for Alternative 1 in the areas where project activities would occur.

Alternative 4 - Vegetation Treatments to Protect Communities and CSO Territories

The potential cumulative effects for Alternative 4 would be similar to those for Alternative 1 in the areas where project activities would occur.

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3.6. Air Quality and Climate Change

3.6.1. Introduction

This section analyzes the potential effects of the alternatives on air quality and climate change. The analysis has been completed using the Council on Environmental Quality (CEQ) guidance in effect, including interim Guidance on Consideration of Greenhouse Gas Emissions and Climate Change (88 FR 1196) consistent with Executive Order (EO) 13990.

3.6.2. Current Management Direction

Federal laws and regulations that pertain to air quality and greenhouse gas (GHG) emissions and climate change provide management direction. California Air Resources Board and air quality management/air pollution control districts implement federal laws and regulations at the state and local levels. The regulatory environment that pertains to the proposed action and associated action alternatives is summarized below.

Clean Air Act

The Clean Air Act (CAA) is the primary legal instrument for air resource management. It requires that the U.S. Environmental Protection Agency (EPA) identify pollutants that have adverse effects on public health and welfare and to establish national ambient air quality standards (NAAQS). If the NAAQS are violated in an area, that area is designated as “nonattainment” for that pollutant, and the state must develop a plan for bringing that area back into “attainment.” EPA also approves and oversees State Implementation Plans (SIPs) and conducts major enforcement actions.

The 1990 amendment of the CAA published the General Conformity Determination. It states that in federal nonattainment areas, before federal actions that have the potential to emit pollutants into the atmosphere can be taken on federal lands, a determination must be made that the emissions would not exceed a de minimis level measured in tons per year. If the project emissions would exceed the de minimis level, then a conformity determination is required to document how the federal action would not (1) cause or contribute to any new violation of any standard in any area, (2) increase the frequency or severity of any existing violation of any standard in any area, or (3) delay timely attainment of any standard or any required interim emission reductions or other milestones in any area. If the project emissions would be below de minimis levels, the project would be considered exempt from conformity determination with the SIP. De minimis levels are determined based on the attainment designation of the region, with lower levels for areas of extreme nonattainment and higher levels in areas of moderate or less severe attainment designations.

Council on Environmental Quality

The CEQ coordinates the federal government’s efforts to improve, preserve, and protect America’s public health and environment. On January 9, 2023, it released interim guidance to assist agencies in their consideration of the effects of GHG emissions and climate change when evaluating proposed actions in accordance with NEPA. The new guidance explains that when analyzing proposed actions, agencies need to include an assessment of both GHG emissions and reductions from the proposed action, evaluate the effects of climate change on a proposed action and its environmental impacts, disclose and contextualize GHG emissions and climate impacts, and

analyze reasonable alternatives and mitigation methods. Contextualizing GHG emissions and climate impacts can involve monetizing climate damages using estimates of social cost associated with those GHG emissions (SC-GHG), placing emissions in the context of relevant climate action goals and commitments, and providing common equivalents.

Additionally, the January 9, 2023 guidance explains that in NEPA reviews, agencies should include a comparison of net GHG emissions carbon stock when actions could potentially change the biological GHG sources and sinks. The analysis should consider the estimated GHG emissions, carbon sequestration potential, and the net change in relevant carbon stocks in light of the proposed actions and timeframes under consideration. Some resource management activities, such as a prescribed burn or certain non-commercial thinning of forests or grasslands conducted to reduce wildfire risk or insect infestations, might result in short-term GHG emissions or loss of stored carbon but greater long-term ecosystem health, including an overall net increase in carbon sequestration and storage.

Executive Order 14072

Executive Order 14072, *Strengthening the Nation's Forests, Communities, and Local Economies*, of April 22, 2022, promotes climate-smart forestry practices to improve the resiliency of national lands, waters, wildlife, and communities as disturbances and chronic stress increase from climate impacts. This includes managing forest on federal lands, which include mature and old-growth forests, to promote their continued health and resilience, retain and enhance carbon storage, conserve biodiversity, mitigate the risk of wildfires, enhance climate resilience, enable subsistence and cultural uses, provide outdoor recreational opportunities, and promote sustainable local economic development. To achieve this, the executive order provides investments in ecosystem restoration and wildlife risk reduction to create resilient forest conditions using active, science-based forest managements and prescribed fires. The Secretary of the Interior and the Secretary of Agriculture will also continue to pursue wildfire mitigation strategies.

State and Local Regulations

State and local air pollution control districts and air quality management districts are responsible for carrying out the development and execution of the SIP, which determines how federal air quality standards will be attained and maintained. Local districts develop programs and plans for achieving both federal and state air quality standards and implement control measures to reduce emissions of each nonattainment pollutant or its precursors. These programs and plans are implemented through rules and regulations.

In accordance with CCR Title 17 (Sections 80140 – 80170), entities proposing to conduct prescribed fire and pile burn treatments must submit a smoke management plan (SMP) to the air district of jurisdiction and (1) receive a permit to burn, (2) receive authorization to burn on a given day, and (3) maintain communication with the local air district and report on the status of the burn until it is concluded.

An SMP is required for all prescribed fire and pile burn treatments, and upon review and approval, a burn permit is issued with a fee for issuance. Participation in daily smoke management conference calls for burn project coordination is recommended daily before and during implementation. On the day of ignition, final approval must be received from the compliance officer in the district in which the burn would be located. Pile burning approval is received through the Prescribed Fire Information Reporting System website daily.

Plumas National Forest Land and Resource Management Plan

Under the LRMP, PNF adheres to state and county standards for air resource management. The east side of the Plumas National Forest is located in Sierra, Plumas, and Lassen Counties, where prescribed burning operations are allowed during narrow window and a permit is needed, mostly during fire season. Counties on the western side of the Plumas National Forest, Butte and Yuba, have much more stringent rules because of adverse effects of smoke on the Sacramento Valley. Prescribed burning operations are timed to minimize smoke in sensitive areas.

3.6.3. Affected Environment

Air Quality

The Project area is located within the jurisdiction of three air quality districts: Northern Sierra Air Quality Management District, which includes Nevada, Sierra, and Plumas Counties; Feather River Air Quality Management District, which includes Yuba and Sutter Counties; and Butte County Air Quality Management District covering Butte County. These districts have rules in place that are tied to federal and state statutes pertinent to air quality and California Air Resources Board (CARB) policies and regulations.

Vehicular traffic in the Project area increases during summer, when visitors travel to the region. Communities, roadways, and recreation sites contain sensitive receptors where smoke and air pollutants can adversely affect public health. These areas can be affected by smoke if weather patterns produce a stable air mass, and smoke is unable to vent into the upper atmosphere. The communities of Portola, Quincy, Janesville, Graeagle, and Magalia are all within 10 miles of the Project area boundary. The closest sensitive receptors include residential areas in the urban portion of the Quincy community, which is located approximately 5 miles from the Project area.

The primary existing activities in the Project area that affect air quality are (1) prescribed burning on national forest lands; (2) wood burning for domestic heating; (3) dust-generating construction activities, (4) use of unpaved roads; and (5) wildfire. As identified later in this section, air quality conditions outside the Project area have a substantial effect on air quality conditions in the Project area.

Current Conditions

The current attainment status for Sierra, Plumas, Butte, and Yuba Counties, the four counties in which the Project area is located, is summarized in Table 3.6-1, below. Attainment is the category assigned to an area with no violations (a pollutant concentration higher than state or national standards not to be determined by an exceptional event) in the last 3 years. Nonattainment is the category for an area that has one or more violations within the last 3 years. Unclassified is the category given to an area for which insufficient data exist to determine attainment.

Table 3.6-1 Current (2022) State and Federal Attainment Status

Criteria Pollutant	County	State	Federal
Ozone	Sierra	Unclassified	Unclassified
	Plumas	Unclassified	Unclassified
	Butte	Nonattainment	Nonattainment - Marginal
	Yuba	Nonattainment	Unclassified
PM ₁₀	Sierra	Nonattainment	Unclassified
	Plumas	Nonattainment	Unclassified
	Butte	Nonattainment	Unclassified
	Yuba	Nonattainment	Unclassified
PM _{2.5}	Sierra	Unclassified	Unclassified
	Plumas	Nonattainment	Nonattainment - Serious
	Butte	Unclassified	Attainment
	Yuba	Attainment	Unclassified
Carbon Monoxide	Sierra	Unclassified	Unclassified
	Plumas	Attainment	Unclassified
	Butte	Attainment	Maintenance - Moderate
	Yuba	Unclassified	Unclassified

Notes: PM₁₀= particulate matter with an aerodynamic diameter of 10 microns or less; PM_{2.5}= particulate matter with an aerodynamic diameter of 2.5 microns or less.

Sources: EPA 2022; CARB 2020; Butte County AQMD 2018.

Emissions of Concern in the Project Area

Ozone is an oxidant that can irritate eyes, the nose, the throat, and lungs and in relatively low concentrations can cause damage to vegetation. Ozone is classified as a secondary pollutant, which means that it is not directly emitted into the atmosphere by cars or factories. Ozone is produced by photochemical reactions between oxides of nitrogen (NO_x) and volatile organic compounds (VOCs), referred to as “precursor pollutants.” Within the project area ozone pollution levels are due to overwhelming air pollution transport from upwind urban areas, i.e., the Sacramento and Bay areas. Improvements in air quality, with respect to ozone, depend largely on the success of air quality programs in upwind areas (Northern Sierra Air Quality Management District 2005).

CO is a colorless, odorless gas produced by incomplete combustion of wood or other organic materials. CO levels are highest during the smoldering stages of a fire, especially close to the fire. CO is a poisonous gas but usually reaches toxic levels only above and adjacent to prescribed fires and wildland fires (Countryman 1964).

Inhalable particulate matter (PM₁₀ and PM_{2.5}) are tiny particles of solid matter suspended in air. Sources of particulate matter can be human made or natural. Naturally occurring PM₁₀ may originate from dust, wildfires, or plant pollen. Human activities, such as the burning of fossil fuels

in vehicles, prescribed fire, and heavy traffic on dirt roads, can also generate significant amounts of PM₁₀. Increased levels of fine particles in the air are linked to health hazards, such as heart disease, altered lung function, and lung cancer.

Climate Change

Certain gases in the atmosphere, classified as GHGs, play a critical role in determining the earth's surface temperature. Prominent GHGs contributing to the greenhouse effect are carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Anthropogenic emissions of these GHGs in excess of optimal ambient concentrations are responsible for intensifying the greenhouse effect and leading to a trend of unnatural warming of the earth's climate. It is "extremely likely" that more than half of the observed increase in global average surface temperature from 1951 to 2010 was caused by the anthropogenic increase in GHG concentrations and other anthropogenic forcing (IPCC 2014).

Climate change is a global problem. GHGs are global pollutants, unlike criteria air pollutants and toxic air contaminants, which are pollutants of regional and local concern. Whereas most pollutants with localized air quality effects have relatively short atmospheric lifetimes (approximately 1 day), GHGs have long atmospheric lifetimes (1 year to several thousand years). GHGs persist in the atmosphere long enough to be dispersed around the globe. Although the lifetime of any GHG molecule depends on multiple variables and cannot be determined with any certainty, it is understood that more CO₂ is emitted into the atmosphere than is sequestered by ocean uptake, vegetation, and other forms of sequestration. Of the total annual human-caused CO₂ emissions, approximately 55 percent are estimated to be sequestered through ocean and land uptake every year, averaged over the last 50 years, whereas the remaining 45 percent of human-caused CO₂ emissions remain stored in the atmosphere (IPCC 2013).

Greenhouse Gas Emissions

Emissions of CO₂ are byproducts of fossil fuel combustion. Methane, a highly potent GHG, primarily results from off-gassing (the release of chemicals from nonmetallic substances under ambient or greater pressure conditions) and is largely associated with agricultural practices and landfills. Nitrous oxide is also largely attributable to agricultural practices and soil management. CO₂ sinks, or reservoirs, include vegetation and the ocean, which absorb CO₂ through sequestration and dissolution (CO₂ dissolving into the water), respectively, two of the most common processes for removing CO₂ from the atmosphere.

As discussed previously, GHG emissions are attributable in large part to human activities. The GHG inventory for California in 2020 estimated a total of 370 million metric tons of carbon dioxide equivalent per year from human activities (CARB 2022). As shown in Table 3.6-2, transportation, industry, and electricity generation are the largest GHG emission sectors directly attributable to human activities.

Wildfires are a substantial source of GHG emissions. While wildfire smoke is not included in the CARB GHG inventory, a recent study estimated that wildfires in California released approximately 127 million metric tons of carbon dioxide equivalent in 2020 (Jerrett et al. 2022). This estimate likely undercounts the GHG emissions resulting from wildfire because it includes only direct emissions and does not include the additional indirect emissions associated with wildfire suppression, evacuation, restoration, and rebuilding that would also be attributable to a wildfire. When direct wildfire emissions are considered along with human activities, wildfires

accounted for approximately 26 percent of all GHG emissions in California in 2020 (Table 3.6-2). Wildfire emissions were second only to emissions from the transportation sector and represented more GHG emissions than all industrial activity and in state electricity generation combined.

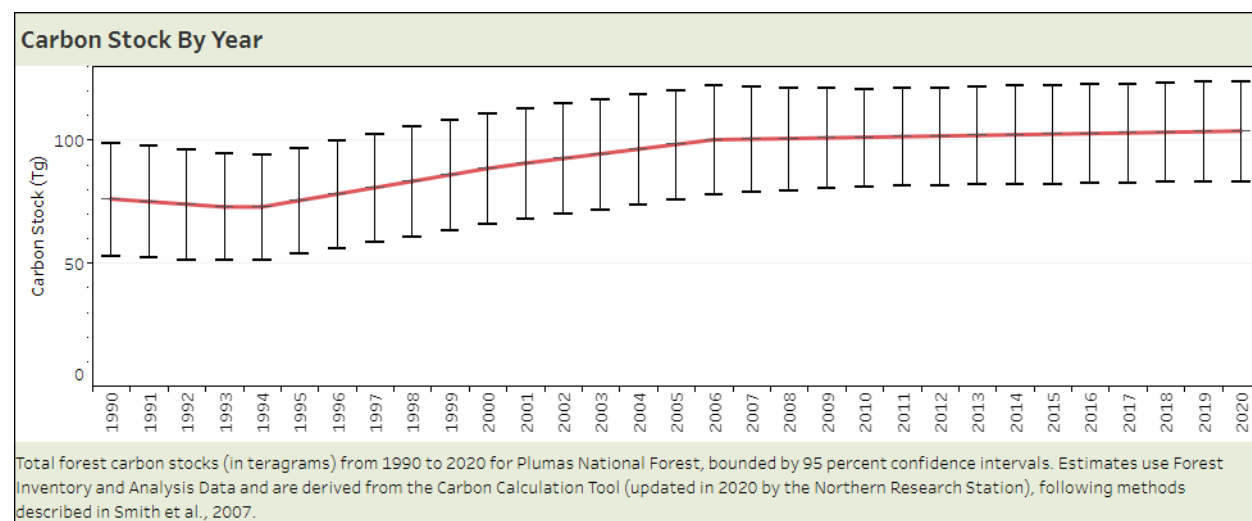
Table 3.6-2 Statewide GHG Emissions by Sector (2020)

Sector	Emissions (MMTCO ₂ e)	Percent of Total Emissions
Transportation	141	28%
Wildfire	127	26%
Industrial	85	17%
Electricity generation (in state)	41	8%
Agriculture and Forestry	33	7%
Residential	30	6%
Commercial	22	4%
Electricity generation (imports)	19	4%
Total	498	100%

Note: MMTCO₂e = million metric tons of carbon dioxide equivalent.

Sources: CARB 2022, Jerrett et al. 2022.

According to results of the Baseline Report (Forest Service, 2022), carbon stocks (i.e., carbon sequestered in vegetation and soil) in the Plumas NF increased from 75.9 ± 23.1 teragrams of carbon (Tg C) in 1990 to 103.5 ± 20.3 Tg C in 2020, a 36.4 percent increase in carbon stocks over this period (Figure 3.6-1). For context, 103.5 Tg C is equivalent to the emissions from approximately 82.6 million passenger vehicles in a year. Despite some uncertainty in annual carbon stock estimates, reflected by the 95 percent confidence intervals, there is a high degree of certainty that carbon stocks on the Plumas NF have been stable or increased from 1990 to 2020. However, in 2021 and 2022 carbon stocks likely decreased due to recent large wildfires.



Source: USFS 2022.

Figure 3.6-1 Plumas National Forest Carbon Stock by Year

Effects of Climate Change

Changes in surface temperature, along with changes in the weather patterns, could greatly affect the Project area. Hotter surface temperatures and longer drought periods create forest conditions that increase the fire risk. Wildfire simulations have projected that the annual average area burned in many parts of the Sierra Nevada could double or quadruple by end of century

(comparing 2070-2099 to 1961-1990) under the most extreme warming scenario (Westerling 2018). The same study found that extreme wildfire events would increase in frequency, with fires greater than 10,000 hectares occurring nearly 50 percent more often (Westerling 2018). By 2040 the Sierra Nevada is projected to experience a 2° Celsius increase in mean summer temperatures compared to those in the 2010s. This increase, coupled with extended drought, will contribute to a decrease in live fuel moistures, resulting in conditions that lead to extreme wildfire behavior. Researchers estimate that by 2040, the number of summer wildfires in the Sierra Nevada will increase by 19 to 83 percent and burned area will increase by 26 to 92 percent from existing conditions (Gutierrez et al. 2021).

Recent climate trends for the Plumas National Forest, as outlined by the Forest Service Region 5 Ecology Program, are as follows (USDA 2022):

- Nighttime temperatures have increased by approximately 3 degrees Fahrenheit (°F) since 1958 and are predicted to increase by an additional 14°F by the end of the century.
- Average snowpack has declined by almost 30 inches over the past 100 years and is predicted to decline 95 percent more by the end of the century.
- Days with extreme heat are expected to increase by up to 44 days per year, and warm nights could increase by 50 days per year by the end of the century.
- Most (99 percent) of the meadows and almost half (44 percent) of the forest on the Plumas National Forest are projected to be highly stressed by the changes in temperature and snowpack by the end of the century.
- Vegetation is expected to become increasingly stressed by drought, fire, and declining snowpacks, resulting in shifts in species composition and distribution.

3.6.4. Design Features

Design features would be implemented to limit air pollutant and GHG emissions. Applicable design features are described in Appendix A. The analysis below accounts for implementation of the applicable design features.

3.6.5. Analytical Approach

The predicted emissions from prescribed fire and pile burning were estimated using emission factors from EPA Document 42 and from the NEPA Air Quality Desk Reference Guide (CH2M Hill 1995). It is assumed that prescribed fire would be conducted over a period of 10 years. The Piled Fuels and Biomass Emissions Calculator was used to determine the tonnage of piled biomass per pile per acre (Forest Service 2014). All acres eligible for prescribed burning under each alternative were assumed to be burned, and pile burning was assumed to occur on all acres manually treated under each alternative. For prescribed burning emissions factors from EPA's

Document AP-42 were applied based on a mass of pollutant per ton of biomass burned. See model inputs and outputs in Appendix H.

All initial treatment activities (e.g., mechanical treatments, manual treatments) were assumed to occur on all acres eligible for these treatments within the first three years of implementation. Exhaust and dust emissions associated with the use of off-road equipment, worker commute travel, and hauling activity were modeled using the Sacramento Metropolitan Air Quality Management District's (SMAQMD's) Road Construction Emissions Model (RCEM) Version 9.01 based on the 2017 Orion Database (SMAQMD 2018). It should be noted that although the Project is not located within the jurisdiction of SMAQMD, RCEM uses emissions factors from the state's OFFROAD model for off-road equipment that can be used for jurisdictions other than SMAQMD. Because of limitations in RCEM that do not allow the user to input two pieces of the same equipment type with different horsepower ratings, RCEM was run twice with two separate sets of equipment. Dust and mobile source exhaust (i.e., worker commute, hauling activities) were modeled based on anticipated project size and material hauling activities. Exhaust emissions from the use of non-diesel equipment, (e.g., chainsaws, chippers) were modeled using emissions factors obtained from the 2017 Orion Database for off-road gasoline equipment. Anticipated daily and annual equipment hours were multiplied by emissions factors to obtain annual emissions. Annual gasoline-related emissions were summed with the RCEM annual emissions outputs.

To calculate the total annual emissions by alternative, the tons per year of criteria air pollutants and ozone precursors pollutant calculated from the pile calculator, prescribed burning, RCEM, and gasoline equipment were summed.

In addition to emissions of criteria air pollutants and ozone precursors, GHG emissions were also estimated using available emissions factors for prescribed burning (NWCG 2020). To estimate carbon dioxide equivalent (CO₂e), Global Warming Potentials consistent with Version 2022.1.14 of the California Emissions Estimator Model (CalEEMod) were used. The SC-GHG cost, the total tons of CO₂, N₂O, and CH₄ were multiplied by the appropriate discount rate and year, consistent with current CEQ guidance (CEQ 2023). Although costs for 2.5-percent, 3-percent, and 5-percent discount rates were calculated, the 3-percent discount rate bracket is recommended by the CEQ. For each model inputs, outputs, equivalents, and calculations, refer to Appendix H.

3.6.6. Environmental Consequences

Emissions of Smoke and Air Pollutants

Direct and Indirect Effects

No Action Alternative

Under the No Action Alternative, no increase in ozone precursors or PM₁₀ emission levels would be produced from prescribed burning, off-road equipment usage, and worker commutes. The No Action Alternative would not result in a reduction of fuels, so the potential for substantial degradation of air quality from future wildfire would not be reduced. Air quality can be severely degraded by particulate matter and other pollutants during large wildfires. Impacts from the 2021 Dixie Fire on the Plumas and Lassen National Forests affected air quality more than 1,000 miles away. During the flaming phase of a stand-replacing wildfire, air quality degradation can exceed federal and state standards hundreds of miles downwind (Albeck-Ripka et al. 2021). Table 3.6-3 shows the CO₂, PM₁₀, and PM_{2.5} emissions and acreage of the eight largest California forest fires

in just 2020 and 2021. While the exact emissions from a future wildfire cannot be known, the recent wildfires shown in table 3.6-3 provide an indication of the order of magnitude of emissions that could be generated by a wildfire under the No Action Alternative. As a point of reference, the Project area is slightly larger than the area burned by the Caldor Fire in 2021, which produced nearly 10 million metric tons of CO₂, 147 tons of PM₁₀, and 124 tons of PM_{2.5}.

Table 3.6-3 California Wildfire 2020 and 2021

Fire Name	Wildfire Area Burned (Acres) ¹	CO ₂ (Million Metric Tons)	PM ₁₀ (Tons)	PM _{2.5} (Tons)
August Complex	1,032,700	27.7	368	312
Dixie	934,564	37.4	575	487
SCU Complex	396,399	4.6	34	29
Creek	379,822	13.8	190	161
North Complex	318,777	10.9	132	112
Hennessey	305,352	3.5	27	23
Monument	220,888	4.7	61	51
Caldor	215,733	9.9	147	124

Notes: CO₂ = carbon dioxide; PM₁₀ = particulate matter with an aerodynamic diameter of 10 microns or less; PM_{2.5} = particulate matter with an aerodynamic diameter of 2.5 microns or less.

Source: CARB 2022.

Alternative 1: Vegetation Treatments to Protect Communities and Achieve Landscape Resilience

Alternative 1 would result in the most acreage subjected to mechanical thinning and the least amount of manual thinning and pile burning of the action alternatives. The pollutants emissions under Alternative 1 were estimated based on the anticipated acreage that would be burned by prescribed fire, the estimated number of piles that would be burned to dispose of biomass generated from initial treatments, and the estimated number of worker crews and associated daily use of off-road equipment for all treatment methods. It was assumed that all initial treatments would occur over a period of 3 years with follow up prescribed burning, pile burning, and herbicide application occurring over 10 years. Each year, burning would take place over a period of months, with treated areas spread throughout the Project area.

Based on the attainment status information provided above in Table 3.6-1, de minimis levels applicable to the Project would be 50 tons per year for ozone. Because NO_x and VOCs are the criteria air pollutants that result in the formation of ozone, the de minimis levels are applied to these two pollutants. Table 3.6-4 summarizes annualized emissions of NO_x and VOCs for Alternative 1 in comparison to the applicable de minimis levels. This alternative would exceed the de minimis thresholds established under 40 CFR 93.153, however, the Project would conform with the law and meet the requirements under section (i)(2) as the project would conduct prescribed fires in accordance with the SMP of EPA's Interim Air Quality Policy on Wildland and Prescribed Fire.

Table 3.6-4 Alternative 1 Pollutant Emissions per Year (Tons per Year)

	CO	NO _x	PM ₁₀	PM _{2.5}	VOC
Annual Emissions 2023 - 2025					
Pile Burning	2,351	138	480	418	682
Prescribed Fire	11,078	599	1,497	1,198	2,970
Offroad Equipment	13.16	2.24	9.02	1.94	3.76
Total	13,442	739	1,986	1,618	3,656
De Minimis Level	N/A	50	N/A	N/A	50
Annual Emissions 2026 - 2030					
Pile Burning	2,351	138	480	418	682
Prescribed Fire	11,078	599	1,497	1,198	2,970
Offroad Equipment	1.75	0.16	4.47	0.94	0.61
Total	13,431	737	1,981	1,617	3,653
De Minimis Level	N/A	50	N/A	N/A	50
Annual Emissions 2031 - 2032					
Pile Burning	0	0	0	0	0
Prescribed Fire	11,078	599	1,497	1,198	2,970
Offroad Equipment	1.75	0.16	4.47	0.94	0.61
Total	11,080	599	1,501	1,199	2,971
De Minimis Level	N/A	50	N/A	N/A	50

Notes: CO = carbon monoxide; NA = not applicable; NO_x = oxides of nitrogen; PM₁₀ = particulate matter with an aerodynamic diameter of 10 microns or less; PM_{2.5} = particulate matter with an aerodynamic diameter of 2.5 microns or less; VOC = volatile organic compound.

Source: Modeled by Ascent Environmental in 2022.

As discussed above, all prescribed burning activities would be required to adhere to an SMP, which undergoes review and approval by the local air district. The approved SMP outlines the appropriate atmospheric and environmental conditions that must be met such that smoke disperses adequately to limit potential effects to sensitive receptors. In addition, because the local air district must approve and issue burn permits, additional conditions, including limits on the rate of burning or quantity of material burned at any one time, may also be applied to ensure that local, state (i.e., California ambient air quality standards [CAAQS]), and federal (i.e., NAAQS) standards are not violated. Because prescribed fire smoke emissions would be included in an approved SMP and are therefore presumed to conform to the SIP, the Project has been determined to conform to the CAA and SIP. In addition, adherence to design features described in Appendix A would minimize emissions from fugitive dust, smoke, and equipment operations.

Alternative 1 would reduce the number and intensity of catastrophic forest wildfires, which would avoid potential wildfire emissions exceeding operational treatment emissions associated with the Project activities. Fuel treatments, such as those proposed under Alternative 1, have been shown to reduce the area burned in the Sierra Nevada (e.g., Kesterling 2018). As discussed in Section 3.1, “Fire, Fuels, and Forest Health,” Alternative 1 would substantially reduce the risk of a catastrophic wildfire. For these reasons, the net effect of Alternative 1 on the local and regional air quality would be beneficial.

Alternative 2: Vegetation Treatments to Protect Communities Consistent with the Existing Forest Plan

Alternative 2 would result in slightly fewer acres of mechanical treatments and slightly more acres of manual thinning and pile burning than Alternative 1. The pollutant emissions under Alternative 2 was estimated based on the anticipated acreage that would be burned by prescribed fire, the estimated number of piles that would be burned to dispose of biomass generated from initial treatments, and the estimated number of worker crews and associated daily use of off-road equipment for all treatment methods. The same treatment timing assumptions described for Alternative 1 were applied to Alternative 2. Table 3.6-5 summarizes annualized pollutant emissions under Alternative 2 in comparison to the applicable de minimis levels. Similar to Alternative 1, Alternative 2 would exceed the de minimis thresholds established under 40 CFR 93.153, however, the Project would conform with the law and meet the requirements under section (i)(2) as the project would conduct prescribed fires in accordance with the SMP of EPA's Interim Air Quality Policy on Wildland and Prescribed Fire.

Table 3.6-5 Alternative 2 Pollutant Emissions per Year (Tons per Year)

	CO	NO _x	PM ₁₀	PM _{2.5}	VOC
Annual Emissions 2023 - 2025					
Pile Burning	2,987	175	610	530	867
Prescribed Fire	11,078	599	1,497	1,198	2,970
Offroad Equipment	13.16	2.24	9.02	1.94	3.76
Total	14,078	776	2,116	1,730	3,841
De Minimis Level	N/A	50	N/A	N/A	50
Annual Emissions 2026 - 2030					
Pile Burning	2,987	175	610	530	867
Prescribed Fire	11,078	599	1,497	1,198	2,970
Offroad Equipment	1.75	0.16	4.47	0.94	0.61
Total	14,067	774	2,111	1,729	3,838
De Minimis Level	N/A	50	N/A	N/A	50
Annual Emissions 2031 - 2032					
Pile Burning	0	0	0	0	0
Prescribed Fire	11,078	599	1,497	1,198	2,970
Offroad Equipment	1.75	0.16	4.47	0.94	0.61
Total	11,080	599	1,501	1,199	2,971
De Minimis Level	N/A	50	N/A	N/A	50

Notes: CO = carbon monoxide; NA = not applicable; NO_x = oxides of nitrogen; PM₁₀ = particulate matter with an aerodynamic diameter of 10 microns or less; PM_{2.5} = particulate matter with an aerodynamic diameter of 2.5 microns or less; VOC = volatile organic compound.

Source: Modeled by Ascent Environmental in 2022.

Alternative 2 would be required to adhere to an SMP and design features, as described above for Alternative 1. For the same reasons as Alternative 1, Alternative 2 would not violate local, state (i.e., CAAQS), and federal (i.e., NAAQS) standards. Like Alternative 1, Alternative 2 would

substantially reduce the risk of a catastrophic wildfire (see Section 3.1, “Fire, Fuels, and Forest Health”). For the same reasons as Alternative 1, the net effect of Alternative 2 on the local and regional air quality would be beneficial.

Alternative 3: Vegetation Treatments to Protect Communities with Reduced Intensity Treatments

Alternative 3 would have the least amount of mechanical treatment and the most manual treatment and pile burning of the action alternatives. The emissions from Alternative 3 were modeled based on the same assumptions described for Alternative 1, above. While Alternative 3 would result in less emissions from mechanical equipment than Alternatives 1 and 2, it would result in more emissions overall due to the emissions from additional pile burning. Table 3.6-6 summarizes annualized emissions for Alternative 3 in comparison to the applicable de minimis levels. As with the other action alternatives, Alternative 3 would exceed the de minimis thresholds established under 40 CFR 93.153, however, the Project would conform with the law and meet the requirements under section (i)(2) as the project would conduct prescribed fires in accordance with the SMP of EPA's Interim Air Quality Policy on Wildland and Prescribed Fire.

Table 3.6-6 Alternative 3 Pollutant Emissions per Year (Tons per Year)

	CO	NO _x	PM ₁₀	PM _{2.5}	VOC
Annual Emissions 2023 - 2025					
Pile Burning	5,453	319	1,112	968	1,582
Prescribed Fire	11,078	599	1,497	1,198	2,970
Offroad Equipment	13.16	2.24	9.02	1.94	3.76
Total	16,544	920	2,618	2,168	4,556
De Minimis Level	N/A	50	N/A	N/A	50
Annual Emissions 2026 - 2030					
Pile Burning	5,453	319	1,112	968	1,582
Prescribed Fire	11,078	599	1,497	1,198	2,970
Offroad Equipment	1.75	0.16	4.47	0.94	0.61
Total	16,533	918	2,613	2,167	4,553
De Minimis Level	N/A	50	N/A	N/A	50
Annual Emissions 2031 - 2032					
Pile Burning	0	0	0	0	0
Prescribed Fire	11,078	599	1,497	1,198	2,970
Offroad Equipment	1.75	0.16	4.47	0.94	0.61
Total	11,080	599	1,501	1,199	2,971
De Minimis Level	N/A	50	N/A	N/A	50

Notes: CO = carbon monoxide; NA = not applicable; NO_x = oxides of nitrogen PM₁₀ = particulate matter with an aerodynamic diameter of 10 microns or less; PM_{2.5} = particulate matter with an aerodynamic diameter of 2.5 microns or less; VOC = volatile organic compound.

Source: Modeled by Ascent Environmental in 2022.

Alternative 3 would be required to adhere to an SMP and design features, as described above for Alternative 1. Because prescribed fire smoke emissions would be included in an approved SMP and are therefore presumed to conform to the SIP, Alternative 3 has been determined to conform to the CAA and SIP.

For the same reasons as Alternative 1, Alternative 3 would not violate local, state (i.e., CAAQS), and federal (i.e., NAAQS) standards. Alternative 3 would reduce the risk of a catastrophic wildfire, though to a lesser extent than Alternatives 1 and 2 (see Section 3.1, “Fire, Fuels, and Forest Health”). Because a catastrophic wildfire would result in substantially more emissions than treatment activities, Alternative 3 would also have a net beneficial effect on the local and regional air quality. However, the beneficial effect of Alternative 3 would be less than Alternatives 1 or 2 due to the increase emissions associated with additional pile burning under Alternative 3, and the less effective reduction in wildfire risk.

Alternative 4: Vegetation Treatments to Protect Communities and CSO Territories

Alternative 4 includes similar acreage subjected to mechanical thinning, manual thinning and pile burning as Alternative 1. The pollutants emissions under Alternative 4 were estimated based on the anticipated acreage that would be burned by prescribed fire, the estimated number of piles that would be burned to dispose of biomass generated from initial treatments, and the estimated number of worker crews and associated daily use of off-road equipment for all treatment methods. It was assumed that all initial treatments would occur over a period of 3 years with follow up prescribed burning, pile burning, and herbicide application occurring over 10 years. Each year, burning would take place over a period of months, with treated areas spread throughout the Project area.

Based on the attainment status information provided above in Table 3.6-1, de minimis levels applicable to the Project would be 50 tons per year for ozone. Because NO_x and VOCs are the criteria air pollutants that result in the formation of ozone, the de minimis levels are applied to these two pollutants. Table 3.6-7 summarizes annualized emissions of NO_x and VOCs for Alternative 4 in comparison to the applicable de minimis levels. This alternative would exceed the de minimis thresholds established under 40 CFR 93.153, however, the Project would conform with the law and meet the requirements under section (i)(2) as the project would conduct prescribed fires in accordance with the SMP of EPA's Interim Air Quality Policy on Wildland and Prescribed Fire.

Table 3.6-7 Alternative 4 Pollutant Emissions per Year (Tons per Year)

	CO	NO _x	PM ₁₀	PM _{2.5}	VOC
Annual Emissions 2023 - 2025					
Pile Burning	2,351	138	480	418	682
Prescribed Fire	11,078	599	1,497	1,198	2,970
Offroad Equipment	13.16	2.24	9.02	1.94	3.76
Total	13,442	739	1,986	1,618	3,656
De Minimis Level	N/A	50	N/A	N/A	50
Annual Emissions 2026 - 2030					
Pile Burning	2,351	138	480	418	682
Prescribed Fire	11,078	599	1,497	1,198	2,970
Offroad Equipment	1.75	0.16	4.47	0.94	0.61
Total	13,431	737	1,981	1,617	3,653
De Minimis Level	N/A	50	N/A	N/A	50
Annual Emissions 2031 - 2032					
Pile Burning	0	0	0	0	0
Prescribed Fire	11,078	599	1,497	1,198	2,970
Offroad Equipment	1.75	0.16	4.47	0.94	0.61
Total	11,080	599	1,501	1,199	2,971
De Minimis Level	N/A	50	N/A	N/A	50

Notes: CO = carbon monoxide; NA = not applicable; NO_x = oxides of nitrogen; PM₁₀ = particulate matter with an aerodynamic diameter of 10 microns or less; PM_{2.5} = particulate matter with an aerodynamic diameter of 2.5 microns or less; VOC = volatile organic compound.

Source: Modeled by Ascent Environmental in 2022.

As discussed above, all prescribed burning activities would be required to adhere to an SMP, which undergoes review and approval by the local air district. The approved SMP outlines the appropriate atmospheric and environmental conditions that must be met such that smoke disperses adequately to limit potential effects to sensitive receptors. In addition, because the local air district must approve and issue burn permits, additional conditions, including limits on the rate of burning or quantity of material burned at any one time, may also be applied to ensure that local, state (i.e., California ambient air quality standards [CAAQS]), and federal (i.e., NAAQS) standards are not violated. Because prescribed fire smoke emissions would be included in an approved SMP and are therefore presumed to conform to the SIP, the Project has been determined to conform to the CAA and SIP. In addition, adherence to design features described in Appendix A would minimize emissions from fugitive dust, smoke, and equipment operations.

Alternative 4 would reduce the number and intensity of catastrophic forest wildfires, which would avoid potential wildfire emissions exceeding operational treatment emissions associated with the Project activities. Fuel treatments, such as those proposed under Alternative 4, have been shown to reduce the area burned in the Sierra Nevada (e.g., Kesterling 2018). As discussed in Section 3.1, “Fire, Fuels, and Forest Health,” Alternative 1 would substantially reduce the risk of a catastrophic wildfire. For these reasons, the net effect of Alternative 4 on the local and regional air quality would be beneficial.

Cumulative Effects

The temporal scope for cumulative effects analysis of air quality is bound by the implementation timeframe for the Project, which is 10 years. For this cumulative analysis, the spatial analysis area is bound by the local air basin.

Alternatives 1, 2, 3, and 4

The cumulative effects analysis for air quality considers ongoing, proposed, and reasonably foreseeable future actions. Impacts on air quality from prescribed burning in the Project area and adjacent areas during the last 5 years have been minimal, and no Notice of Violation of air quality standards has been issued to the PNF during this period. Implementation of all the action alternatives would generate emissions and temporarily affect air quality. Prescribed fire emissions can be mitigated by burning when atmospheric conditions are conducive to the transport and dispersion of smoke. There would be a short-term cumulative impact on air quality if several prescribed burns occur in the same air basin at the same time. Impacts on air quality from future wildfires in treated areas would be reduced because decreased fuel loading would generate lower emissions. The action alternatives would be implemented in a controlled environment, whereas a wildfire would not, potentially leading to much higher emissions and worse air quality for an extended duration.

Although these alternatives would add to the cumulative effects on air quality in the Project area and local air basin, the effects would be managed to be within the regulatory standards of CARB and the local air districts. The air districts would also regulate other emissions sources (e.g., other prescribed burns in the project vicinity) in their jurisdictions and manage those emissions in a manner to maintain air quality standards in the entire air basin. Because air quality is already managed to prevent cumulative adverse effects, Alternatives 1, 2 and 3 would not make a substantial contribution to an adverse cumulative effect.

Emissions of Greenhouse Gases

Direct, Indirect, and Cumulative Impacts

No Action Alternative

Under the No Action Alternative, no increase in GHG emissions would result from prescribed burning, pile burning, off-road equipment usage, and worker commutes. The No Action Alternative would not result in a reduction of fuels, so the potential for substantial degradation of GHG emissions from future wildfire would not be reduced. Large wildfire events can emit great amount of GHGs. For example, the 2021 Dixie Fire engulfed 934,564 acres and emitted more than 37,400,000 metric tons of CO₂ (CARB 2022). As noted above, the Project area is slightly larger than the area burned by the Caldor Fire in 2021, which produced nearly 10,000,000 metric tons of CO₂ (see Table 3.6-3).

The No Action Alternative would not provide opportunities for reducing existing forest fuels. Wildfire risk would not be reduced, and the risk of catastrophic wildfire would continue to increase as a result of climate change, as described above. Therefore, the No Action Alternative would potentially have an adverse effect on GHG emissions due to the increasing risk of a catastrophic wildfire.

Alternative 1: Vegetation Treatments to Protect Communities and Achieve Landscape Resilience

GHG emissions resulting from forest treatment activities may vary according to multiple factors, including the amount of vegetation treated per acre, the number of workers and equipment needed for each treatment project, and the types of equipment used. In addition to short-term treatment-related emissions, the Alternative 1 is intended to decrease the severity of wildfires over the long term, resulting in the potential for reduced GHG emissions and increased levels of sequestered carbon. The state of science, however, makes it infeasible to develop reliable, quantified estimates of potential long-term changes in GHG emissions or carbon sequestration that may result from these treatments over time. The effect of vegetation treatment on the carbon content of the landscape over the long term—by reducing occurrences of high-severity wildfires and/or by increasing the carbon sequestration potential of vegetated landscapes—continues to be the focus of scientific research and model development, particularly in tree-dominated landscapes. The current body of research presents various and inconsistent findings regarding the effects of treatments on the long-term carbon emission or sequestration of forested lands. A review of the scientific literature in the *Draft California 2030 Natural and Working Lands Climate Change Implementation Plan* indicates that, in a broader context, treatment activities reduce vegetation densities and fuel loads, restore the structure and composition of ecosystems, and may lower the potential for damaging, high-severity fire, which is currently the primary source of GHG emissions and carbon loss from the natural and working lands sector (Stephens et al. 2007; Campbell et al. 2007; Hurteau et al. 2008; Hurteau and North 2009; and North et al. 2009—all cited in CalEPA et al. 2019: 14). Additionally, it finds that future vegetative growth on treated acres would result in carbon sequestration over time. Consequently, the carbon sequestration effects of implementing Alternative 1 are not well understood but would likely range from neutral to modestly beneficial.

The amount of GHG emissions emitted under Alternative 1 was estimated based on the anticipated acreage that would be burned under prescribed burns, the estimated number of piles that would be burned to eliminate biomass generated from initial treatments, and the estimated number of worker crews and associated daily use of off-road equipment for all treatment methods. It was assumed that all initial treatments would occur over a period of 3 years with pile burning and prescribed burning occurring over 10 years. Each year, burning would take place over a period of months, with treated areas spread throughout the Project area. Table 3.6-8 shows the yearly and total quantity of GHG emissions, CO₂e, and the SC-GHG for Alternative 1.

To help contextualize the emissions generated by the proposed action, GHG emissions were converted to SC-GHG, which is an estimate of the economic costs, net harm, or benefits of emitting or reducing an additional ton of GHGs into the atmosphere. This number is calculated mainly on factors such as agricultural production, human health effects, property damage from increased flood risk natural disasters, disruption of energy systems, risk of conflict, and the value of ecosystem services. Federal agencies began regularly incorporating SC-CO₂ estimates in regulatory impact analyses in 2008, following a court ruling in which an agency was ordered to consider the SC-CO₂ in the rulemaking process (IWG 2022). The cost for each GHG varies, and values and calculations can be found in Appendix H.

Table 3.6-8 Alternative 1 GHG Emissions per Year

Year	CO ₂ e (metric tons/year)	SC-GHG (\$USD)
2023	611,966	\$33,657,101
2024	611,966	\$34,357,763
2025	611,966	\$35,058,426
2026 ¹	611,433	\$35,728,230
2027	611,433	\$36,428,848
2028	611,433	\$37,128,935
2029	611,433	\$37,829,022
2030	611,433	\$38,529,108
2031 ²	510,967	\$32,881,308
2032	510,967	\$33,524,506
Total	5,914,997	\$355,123,247

Notes: CO₂e = carbon dioxide equivalent; SC-GHG = social cost of greenhouse gas.

Source: Data compiled by Ascent Environmental in 2022

¹ Decrease in GHG emissions in 2026 due to less offroad equipment usage

² Decrease in GHG emissions in 2031 due to pile burning concluding in 2030.

While Alternative 1 would result in more emissions from mechanical treatments than Alternatives 2 and 3, it would result in fewer acres subject to pile burning. Due to the reduced amount of pile burning, Alternative 1 would have lower overall GHG emissions than the other action alternatives.

The effects of climate change will also have an indirect adverse impact on the economy as more severe natural disasters such as frequent and catastrophic wildfires cause expensive, physical damage to communities. Climate change has led to the exacerbation of wildfire conditions in two major ways: earlier spring snowmelt and reduced winter precipitation has resulted in a longer wildfire season, and cycles of heavy precipitation followed by drought conditions increase fuel loading in wet years and reduce moisture-content during droughts. According to California's Fourth Climate Change Assessment, *Statewide Summary Report* (CFCCA 2018), if GHG emissions continue to rise, the frequency of extreme wildfires burning over 25,000 acres could increase by 50 percent by 2100 and the average area burned statewide could increase by 77 percent by the end of the century. Alternative 1 proposes beneficial fuel reduction treatments that would likely contribute to a reduction in GHG emissions by reducing the occurrence of or limiting the size and intensity of potential future wildfires. While Alternative 1 would result in the release of GHG emissions from treatment activities, these emissions would likely be offset by reduced emissions from avoided and reduced-intensity wildfire, from use of biomass for treatment activities to generate electricity, and from a potential increase in carbon sequestration.

Alternative 2: Vegetation Treatments to Protect Communities Consistent with the Existing Forest Plan

Similar to Alternative 1, emissions associated with Alternative 2 were estimated based on the anticipated acreage that would be subject to prescribed burning, the estimated acres treated through pile burning, and the estimated number of worker crews and associated daily use of off-road equipment for all treatment methods. As stated previously, it was assumed that all initial treatments

would occur over the first 3 years, with pile burning occurring in 2025 through 2030, and prescribed burning occurring over 10 years. Each year, treatments would take place over a period of months, with treated areas spread throughout the Project area. Table 3.6-9 shows the yearly and total quantity of GHG emissions, CO₂-equivalent, and the SC-GHG for Alternative 2.

Table 3.6-9 Alternative 2 GHG Emissions per Year

Year	CO ₂ E (metric tons/year)	SC-GHG (\$USD)
2023	639,162	\$35,149,284
2024	639,162	\$35,880,078
2025	639,162	\$36,610,872
2026	638,628	\$37,310,808
2027	638,628	\$38,041,583
2028	638,628	\$38,771,801
2029	638,628	\$39,502,019
2030	638,628	\$40,232,238
2031	510,967	\$32,881,308
2032	510,967	\$33,524,506
Total	6,132,561	\$367,904,496

Notes: CO₂e = carbon dioxide equivalent; SC-GHG = social cost of greenhouse gas.

Source: Data compiled by Ascent Environmental in 2022.

¹ Decrease in GHG emissions in 2026 due to less offroad equipment usage

² Decrease in GHG emissions in 2031 due to pile burning concluding after 2030.

Alternative 2 would result in slightly less emissions from mechanical treatments than Alternative 1 because it would involve slightly fewer acres subject to mechanical treatments. However, it would result in slightly more acres subject to pile burning, which would result in more GHG emissions overall than Alternative 1.

Given the predicted increase in frequency and size of intense wildfires in California with climate change (CFCCA 2018), Alternative 2 proposes beneficial fuel reduction treatments that would likely contribute to a reduction in GHG emissions by reducing the occurrence of or limiting the size and intensity of potential future wildfires. While Alternative 2 would result in the release of GHG emissions from treatment activities, these emissions would likely be offset by reduced emissions from avoided and reduced-intensity wildfire and a potential increase in carbon sequestration.

Alternative 3: Vegetation Treatments to Protect Communities with Reduced Intensity Treatments

As with the other action alternatives, emissions associated with this alternative were estimated based on the anticipated acreage that would be subject to prescribed burns, the estimated number of acres subject to pile burning, and the estimated number of worker crews and associated daily use of off-road equipment for all treatment methods, following the same assumptions described for Alternatives 1 and 2. Table 3.6-10 shows the yearly and total quantity of GHG emissions, CO₂-equivalent, and the SC-GHG for Alternative 3.

Table 3.6-10 Alternative 3 GHG Emissions per Year

Year	CO ₂ e (metric tons/year)	SC-GHG (\$USD)
2023	744,493	\$40,928,397
2024	744,493	\$41,775,822
2025	744,493	\$42,623,248
2026	743,960	\$43,439,815
2027	743,960	\$44,287,320
2028	743,960	\$45,134,169
2029	743,960	\$45,981,019
2030	743,960	\$46,827,869
2031	510,967	\$32,881,308
2032	510,967	\$33,524,506
Total	6,975,213	\$417,403,472

Notes: CO₂e = carbon dioxide equivalent; SC-GHG = social cost of greenhouse gas.

Source: Data compiled by Ascent Environmental in 2022.

¹ Decrease in GHG emissions in 2026 due to less offroad equipment usage

² Decrease in GHG emissions in 2031 due to pile burning concluding after 2030.

Alternative 3 would result in less emissions from mechanical treatments than Alternatives 1 and 2 because it would involve fewer acres of mechanical treatments. However, it would result in more acres that are manually treated and subsequently pile burned. The emissions from pile burning would result in more GHG emissions overall than Alternatives 1 and 2.

Given the predicted increase in frequency and size of intense large wildfires in California from climate change (CFCCA 2018), Alternative 3 proposes beneficial fuel reduction treatments that would likely contribute to a reduction in GHG emissions by reducing the occurrence of or limiting the size and intensity of potential future wildfires. While Alternative 3 would result in the release of GHG emissions from treatment activities, these emissions would likely be offset by reduced emissions from avoided and reduced-intensity wildfire and a potential increase in carbon sequestration. However, Alternative 3 would be less beneficial than Alternatives 1 or 2 because it would result in more GHG emissions from treatment activities and would be less successful in reducing the risk of a catastrophic wildfire.

Alternative 4: Vegetation Treatments to Protect Communities Consistent with the Existing Forest Plan

Like Alternative 1, emissions associated with Alternative 4 were estimated based on the anticipated acreage that would be subject to prescribed burning, the estimated acres treated through pile burning, and the estimated number of worker crews and associated daily use of off-road equipment for all treatment methods. As stated previously, it was assumed that all initial treatments would occur over the first 3 years, with pile burning occurring in 2025 through 2030, and prescribed burning occurring over 10 years. Each year, treatments would take place over a period of months, with treated areas spread throughout the Project area. Table 3.6-11 shows the yearly and total quantity of GHG emissions, CO₂-equivalent, and the SC-GHG for Alternative 4.

Table 3.6-11 Alternative 4 GHG Emissions per Year

Year	CO ₂ e (metric tons/year)	SC-GHG (\$USD)
2023	611,966	\$33,657,101
2024	611,966	\$34,357,763
2025	611,966	\$35,058,426
2026 ¹	611,433	\$35,728,230
2027	611,433	\$36,428,848
2028	611,433	\$37,128,935
2029	611,433	\$37,829,022
2030	611,433	\$38,529,108
2031 ²	510,967	\$32,881,308
2032	510,967	\$33,524,506
Total	5,914,997	\$355,123,247

Notes: CO₂e = carbon dioxide equivalent; SC-GHG = social cost of greenhouse gas.

Source: Data compiled by Ascent Environmental in 2022

¹ Decrease in GHG emissions in 2026 due to less offroad equipment usage

² Decrease in GHG emissions in 2031 due to pile burning concluding in 2030.

Alternative 4 would result in the same emissions from mechanical treatments as Alternative 1 because it involves the same number of acres of mechanical treatments. Given the predicted increase in frequency and size of intense wildfires in California with climate change (CFCCA 2018), Alternative 4 proposes beneficial fuel reduction treatments that would likely contribute to a reduction in GHG emissions by reducing the occurrence of or limiting the size and intensity of potential future wildfires. While Alternative 4 would result in the release of GHG emissions from treatment activities, these emissions would likely be offset by reduced emissions from avoided and reduced-intensity wildfire and a potential increase in carbon sequestration.

Carbon Sequestration

Direct, Indirect, and Cumulative Impacts (All Alternatives)

Fuel treatments involve a tradeoff between the loss or conversion of the carbon stored within the biomass that is removed, improved growth potential of residual trees due to increased light and water availability, and the potential carbon saved from release by wildfire due to the decrease in fire risk. While fuel treatments affect the stand level carbon stored due to the vegetation removed, they provide greater potential for future carbon sequestration through increased vigor and growth in the remaining trees (Moghaddas et al. 2018). During fuel treatments, approximately 30-40% of tree carbon is typically removed (North and Hurteau 2009). Live tree carbon represents the largest carbon pool within the forest and is lost directly due to fuel treatments. Belowground soil carbon, however, is not affected by fuel treatments. Studies have noted that with overstory thinning and prescribed burn treatments, the soil carbon pool can even become the largest pool of carbon within a stand (North et al. 2009). Further, in McCauley et al. 2019 it was found that in assessing forest fuel treatments over time, under several climate models, nearly half of the carbon was stored in more stable carbon pools in the soil that would be largely unaffected by fuels treatments.

Although aboveground live carbon is lost immediately through fuel treatments, the remaining trees are less vulnerable to disturbance and stressors (Collins 2014). Stephens et al. (2012) found that with a relatively small decrease in carbon due to fuels treatment can result in the benefit of increased fire resistance. Fuel treatments are often beneficial in the instance of high severity wildfires because of their effectiveness in reducing tree mortality. Treated forest stands also experience recovery rates of baseline carbon that are 10-35 years quicker than untreated stands (Carlson et al. 2012).

Specifically, fuel treatments that use a combination of thinning from below and prescribed fire or prescribed fire alone to allow for adequate consumption of the surface fuels and lead to crown separation (such as the treatments proposed in the action alternatives) have been shown to reduce fire severity within and adjacent to treated areas. Stephens et al. (2012) noted that previous research has determined that post-treatment stands with large, tall trees and small amounts of surface and ladder fuels are both resistant to fire and store large amounts of carbon. In general, treatments that included prescribed burns provided better carbon benefits than treatments that rely only on thinning (Moghaddas et al. 2018). Furthermore, McCauley et al. 2019 found that with real-world, large-scale thinning and prescribed burn projects, that overall carbon stock is likely to stabilize over time and the benefits are greater when the pace of these treatments is faster.

Overall, whether fuel treatments can safeguard enough carbon to offset their carbon cost depends on many factors such as forest structure, existing fuel loads, expected wildfire severity and frequency, fuel treatment type and intensity, regeneration rates, and the fate of merchantable forest products. One prominent difficulty is in assessing the probability of fire occurring after the treatment has been implemented. Treatment areas that are not impacted by wildfire will not result in decreased potential wildfire emissions. Further, treatment areas that are not impacted by wildfire represent a carbon source as opposed to a carbon sink (Moghaddas et al. 2018). While fuel treatments can ultimately cause a net increase in carbon stocks, Winford and Gaither (2012) point out that it is highly dependent on fire rotation in an area.

As described in Section 3.1, “Fuels, Fire, and Forest Resilience”, the current predicted fire behavior and the dominant fire type (torching and crown fire) in the project area would lead to

high tree mortality in forested areas. Fire behavior and postfire effects experienced during both the Dixie Fire and the North Complex fires would be expected under similar wind and weather conditions across forest areas in the project area. While the probability and severity of a future wildfire cannot be predicted with certainty, the existing fuels conditions indicate that there is a high potential for a severe wildfire under the No Action Alternative. Under Alternatives 1, 2, and 3, treatments would substantially reduce the potential for a high-severity wildfire in the project area (See Section 3.1). Therefore, it is likely that the action alternatives would protect enough sequestered carbon in treated stands to offset the carbon removed from the forest during treatments when compared with the No Action Alternative. However, the precise effects of the alternatives on carbon sequestration cannot be known with certainty.

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3.7. Special Land Designations

3.7.1. Introduction

This section addresses the alternatives' effects on Inventoried Roadless Areas (IRAs); designated and eligible wild, scenic, and recreational rivers; Designated Wilderness areas; and Special Interest Areas (SIAs) identified in the LRMP.

3.7.2. Current Management Direction

Inventoried Roadless Areas

The 2001 Roadless Rule (36 CFR 294, Subpart B) constituted an administrative change to the LRMP (36 CFR 219.13[c]). It identifies the boundaries of IRAs that occur in the Plumas National Forest (36 CFR 294.11) and prohibits road construction, reconstruction, or timber harvesting in IRAs with some designated exceptions (36 CFR 294.13). The prohibitions are intended to minimize the likelihood of landscape fragmentation and, therefore, the immediate or long-term loss of roadless area values and characteristics. Timber cutting and harvesting are allowed in IRAs, in accordance with 36 CFR Section 294.13, under the following condition: "Timber may not be cut, sold or removed unless small diameter timber is cut and removed to improve threatened, endangered, proposed, or sensitive species habitat; to reduce the risk of uncharacteristic wildfire effects..."

The 2001 Roadless Rule identifies specific values and features to characterize IRAs, referred to as roadless area characteristics (36 CFR 294.11) Resources or features that are often present in and characterize roadless areas include (1) high-quality or undisturbed soils, water, and air; (2) reference landscapes; (3) sources of public drinking water; (4) naturally appearing landscapes with high scenic quality; (5) diversity of plant and animal communities; (6) traditional cultural properties and sacred sites; (7) habitat for threatened, endangered, proposed, candidate, and sensitive species for those species dependent on large, undisturbed areas of land; (8) other locally identified unique characteristics; and (9) primitive, semiprimitive nonmotorized, and semiprimitive motorized classes of dispersed recreation.

Wild and Scenic Rivers

To be eligible for inclusion in the National Wild and Scenic Rivers System pursuant the Wild and Scenic Rivers Act (Public Law 90-542; 16 U.S. Code 1271 et seq.), a river segment must be free-flowing and, in combination with its adjacent land area, possess one or more outstandingly remarkable values (ORVs). "Free-flowing" as applied to any river or section of a river means existing or flowing in a natural condition without impoundment, diversion, straightening, riprapping, or other modification of the waterway. Categories of ORVs include scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values (Wild and Scenic Rivers Act, Section 1[b]). To maintain the ORVs, the LRMP includes RX-2, Wild and Scenic River Prescription, which directs PNF to "[h]arvest timber only to maintain or enhance use safety and scenic quality, protect special habitat, or prevent insect or disease epidemic."

Eligible rivers are categorized as either wild, scenic, or recreational. Wild rivers and river segments are free of impoundments and inaccessible except by trail, with watersheds or shorelines essentially primitive and waters unpolluted. Scenic rivers and river segments represent primitive

conditions. Scenic rivers and river segments are free of impoundments, with shorelines or watersheds still largely primitive and shorelines largely undeveloped, but these rivers and river segments are accessible in some places by road. Recreational rivers and river segments are readily accessible by road or railroad, may have some development along their shorelines, and may have undergone some impoundment or diversion in the past that has since been removed such that a natural flow regime has been restored.

Wilderness Areas

Wilderness areas were established through the enactment of the Wilderness Act of 1964 to protect designated areas in their natural condition. Through the act, Congress directed agencies to administer designated Wilderness areas to preserve their wilderness character (Public Law 88-577; 16 U.S. Code 1131–1136). Statutory language of the 1964 Wilderness Act identifies four qualities of wilderness: “natural,” “untrammeled,” “undeveloped,” and “solitude or a primitive and unconfined type of recreation” (Landres et al. 2008). The LRMP provides direction in RX-1, “Wilderness Prescription,” which directs PNF to harvest no timber except to control an insect and disease epidemic and only if significant resources outside of the Wilderness are threatened or an unnatural, significant loss of wilderness character will occur as a result of exotic pests.

Special Interest Areas

Established SIAs are managed to protect their unique resources and, where appropriate, to foster their public use and enjoyment. Forestwide guidelines in the LRMP direct PNF to protect unique botanical values for research purposes and protect areas of unique scenic, botanic, or geologic values in SIAs.

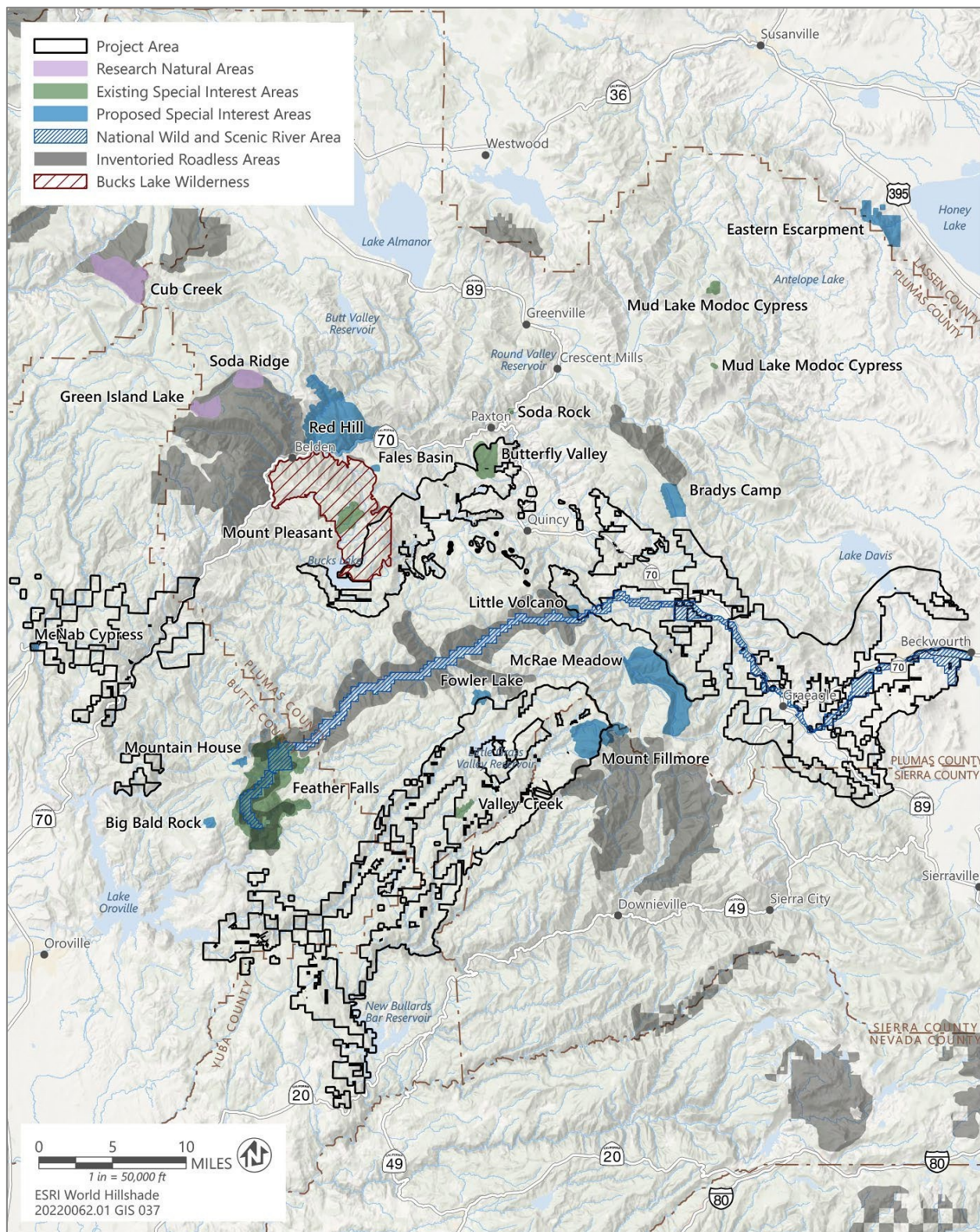
3.7.3. Affected Environment

Inventoried Roadless Areas

The Project area contains approximately 464 acres within the West Yuba IRA located approximately 13 miles north of Downieville and adjacent to the Lakes Basin Recreation Area (Figure 3.7-1).

Wild and Scenic Rivers

The Middle Fork of the Feather River, designated as a Wild and Scenic River, extends across the Plumas National Forest from Beckwourth in the Sierra Valley to Lake Oroville. The river is divided into Wild, Scenic, and Recreational Zones based on conditions along the various reaches. The Project area includes approximately 107 acres of designated Wild River areas, 1,625 acres of designated Scenic River areas, and 5,259 acres of designated Recreational River areas. The Project area also contains river segments that have been determined to be eligible for designation as Wild, Scenic, or Recreational River areas but that have not been formally designated at this time. These eligible areas are managed the same as formally designated areas and are analyzed along with formally designated areas in this EA. The eligible areas include approximately 431 acres eligible for designation as a Wild River area, 4,498 acres eligible for designation as a Scenic River area, and 6,744 acres eligible for designation as a Recreational River area. The ORVs for designated river segments are water quality, recreational values, and free-flowing condition.



Sources: Data received from U.S. Forest Service in 2022 and downloaded from U.S. Forest Service in 2022

Figure 3.7-1 Special Land Designations (Wild and Scenic Rivers, IRAs, Wilderness) and U.S. Forest Service Special Interest Area and Research Natural Area

Wilderness Areas

The Bucks Lake Wilderness was designated in the California Wilderness Act in 1984. The act designated a total of 23,578 acres of the Plumas National Forest to be set aside and protected as part of the National Forest Wilderness System. Approximately 4,585 acres of the designated Wilderness are in the Project area (Figure 3.7-1).

Special Interest Areas

The Project area contains approximately 1,959 acres of designated SIAs and 2,865 acres of proposed SIAs. As with Wild and Scenic Rivers, designated and eligible SIAs are managed the same and treated the same in this EA. The following SIAs are wholly or partly located in the Project area: Butterfly Valley Botanical Area, Fowler Lake, Little Volcano, McNab Cypress, McRae Meadow, Mount Fillmore, and Valley Creek (Figure 3.7-1).

3.7.4. Design Features

Design features would be implemented to protect resources and ensure consistency with the requirements of special land designations. Applicable design features are described in Appendix A. The special land designation analysis accounts for implementation of the applicable design features.

3.7.5. Direct and Indirect Environmental Consequences

No Action Alternative

Under the No Action Alternative, there would be no proposed treatments in IRAs, Wilderness areas, or SIAs or in areas adjacent to Wild and Scenic River segments. Current forest fuels conditions in the Project area would persist, with a trend toward increased risk of high-intensity fire. In the event of a high-intensity fire involving SLD lands, it is likely the unique resource values protected by their designations would be damaged or possibly destroyed.

Overall, elements of the special land designated areas described in this section would be unchanged from the current condition as long as no high-intensity wildfire occurs. Under the No Action Alternative, the qualities, values, and characteristics identified for each special land designation area would be degraded to various degrees in the event of a high-severity wildfire.

Alternative 1: Vegetation Treatments to Protect Communities and Achieve Landscape Resilience

Inventoried Roadless Areas

The IRA falls within Home Range Core Area (HRCA) and Protected Activity Center (PAC) planning units. Under Alternative 1, the full suite of treatment activities, except for reforestation, could occur in the IRA (mechanical treatments, manual treatments, grapple piling, mastication, prescribed fire, pile burning, herbicide application, and hazard tree removal). No permanent or temporary roads would be constructed in the IRA as part of the Project, which would limit the extent of mechanical treatment to areas with existing road access. Design Feature SD-1 would require that all treatment prescriptions and Project activities in special land designation areas to be carried out consistent with applicable prescriptions protecting the values of the areas in the LRMP. Alternative 1 would affect the roadless area characteristics (36 CFR 294.11) as follows:

- **High-Quality or Undisturbed Soils, Water, and Air.** As described in Section 3.4, “Hydrology and Soils,” temporary disturbance would occur during Project implementation. However, with implementation of prescribed design features and best management practices, implementing Alternative 1 would not substantially degrade soils or water quality and would maintain high-quality soils and water quality. Similarly, temporary air pollutant emissions would occur during Project implementation; however, the treatments would reduce the long-term risk of emissions from severe wildfires. With implementation of design features, Alternative 1 would not result in substantial deterioration of air quality in the IRA (see Section 3.6, “Air Quality and Climate Change”).
- **Reference Landscapes.** LRMP management guidelines allow for mechanical operation, vegetation management, and prescribed burning methods in the IRA if the semiprimitive character of the area is preserved. None of the prescribed treatment methods would involve construction of roads, nor would they convert forested areas to non-forested conditions. The IRA would be treated with a variable-density thinning approach that mimics the natural variability of a Sierra Nevada forest. Posttreatment canopy cover in the IRA would remain at least 50 percent in the portions of the IRA within a PAC. Portions of the IRA in an HRCA could be thinned to 40-percent canopy cover. These conditions would be representative of a reference landscape within the natural range of variability. Because no grading or other ground disturbance would occur and posttreatment conditions would remain within the natural range of variability, there would be no adverse effect on the IRA’s characteristic as a reference landscape under Alternative 1.
- **Sources of Public Drinking Water.** As described in Section 3.4, “Hydrology and Soils,” Implementing Alternative 1 would not substantially degrade water quality or affect beneficial uses of water in the Project area; therefore, the ability of the IRA to serve as a source of drinking water would not be diminished under Alternative 1.
- **Naturally Appearing Landscapes with High Scenic Quality.** Alternative 1 would maintain consistency with Visual Quality Objectives, including those applicable to the IRA (see Section 3.5, “Recreation and Visual Resources”). Thus, Alternative 1 would maintain a natural environment with a high scenic quality in the IRA.
- **Diversity of Plant and Animal Communities.** The effects of Alternative 1 on the diversity of native plant and animal communities are evaluated in Section 3.2, “Biological Resources.” As described in Section 3.2, implementation of Alternative 1, including applicable design features, would not have a substantial adverse effect on the diversity of plant and animal communities.
- **Traditional Cultural Properties and Sacred Sites.** Section 3.3, “Cultural Resources,” evaluates Alternative 1’s effects on traditional cultural properties and sacred sites. With implementation of the Heritage Implementation Plan and applicable design features for the Project, Alternative 1 would not have an adverse effect on traditional cultural properties or sacred sites.
- **Habitat for Threatened, Endangered, Proposed, Candidate, and Sensitive Species or for Those Species Dependent on Large, Undisturbed Areas of Land.** Section 3.2, “Biological Resources,” includes a detailed review of the effects of Alternative 1 on habitat for threatened, endangered, proposed, candidate, and sensitive species, including species dependent on large, undisturbed areas of land. As described in Section 3.2, implementation of Alternative 1, including applicable design features, would not have a substantial adverse effect on these species or their habitat.

- **Other Locally Identified Unique Characteristics.** No other unique characteristics have been identified for the IRA. Thus, implementing Alternative 1 would not affect any other unique characteristic of the IRA.
- **Primitive, Semiprimitive Nonmotorized, and Semiprimitive Motorized Classes of Dispersed Recreation.** Implementing Alternative 1 would not involve creating any roads or trails or decommissioning authorized roads or trails in the IRA. As further explained in Section 3.5, “Recreation and Visual Resources,” Alternative 1 is consistent with the Recreation Opportunity Spectrum designations and would not permanently alter access or recreation opportunities.

For the reasons described above, implementing Alternative 1 would not adversely affect the characteristics of the IRA.

Wild and Scenic Rivers

The Middle Fork of the Feather River, designated as a Wild and Scenic River, runs through the Project area. Designated Wild and Scenic land allocations are separate planning units under the action alternatives; therefore, this designation drives the mix of treatment methods that could be applied within them. Designated and eligible segments are managed by PNF in the same manner and would be treated the same under Alternative 1. Areas designated or eligible as Recreational and Scenic could be treated with mechanical, manual, and prescribed fire treatment methods, including grapple piling, mastication, hazard tree removal, and pile burning. Herbicide treatment and reforestation would not occur in these units. In areas designated or eligible for designation as Wild rivers, only manual treatments with follow-up prescribed burn and pile burning would be used. Hazard tree removal would also be permitted but would be carried out using manual treatment methods.

A summary of Alternative 1’s effects on the ORVs of water quality, recreational values, and free-flowing condition are summarized as follows:

- **Water Quality.** Impacts on water quality that could result from the various treatment methods proposed are addressed in Section 3.4, “Hydrology and Soils.” The analysis concludes that although some erosion and sedimentation could occur because of treatments proposed under Alternative 1, the impact would be dispersed and discontinuous across the landscape, of minimal magnitude, short term in duration, and effectively reduced through implementation of design features. Therefore, effects on water quality would not reduce the ORVs for which these river segments were determined to be eligible and suitable as Wild and Scenic Rivers.
- **Recreational Values.** Alternative 1 would have minor, short-term adverse effects on recreational values but long-term benefits from a reduced risk of severe wildfire. Closing areas temporarily for treatment could disrupt recreational use, but this disruption would be short term. Section 3.5, “Recreation and Visual Resources,” provides a detailed discussion of impacts on recreational attributes in the Project area, including effects on recreation resources in areas designated or eligible for designation as Wild and Scenic areas. Over the long-term recreational values would be improved from the current condition as overall forest health that supports these ORVs would improve following treatment. Implementing Alternative 1 would reduce the likelihood of stand-replacing fire, which would protect the recreational values along the river.
- **Free-Flowing Condition.** Maintaining the free-flowing condition of the Middle Fork of the Feather River is necessary to sustain Wild and Scenic River values. The treatments proposed

under Alternative 1 would not affect the existing flow regime, because these activities would not involve impounding, diverting, straightening, placing riprap along, or in any way modifying the waterway. The Feather River would not be traversed by mechanical equipment during Project implementation, and no new bridges, culverts, fords, or other crossing infrastructure would be constructed. Consequently, there would be no adverse effects on the free-flowing condition of the Middle Fork of the Feather River under Alternative 1.

Wilderness Areas

Under Alternative 1, treatment methods that would be carried out in the Bucks Lake Wilderness area include burning of existing piles of material from prior activities unrelated to the proposed Project, such as from fire suppression, and prescribed burning. Alternative 1 would affect the qualities that make up the wilderness character of Bucks Lake Wilderness as follows:

- **Untrammeled.** The “untrammeled” quality of Wilderness refers to the lack of manipulation or control of natural processes and ecological systems by people, which protects wilderness characteristics. This quality is typically preserved when no action is taken to control, hinder, or manipulate the natural functioning of an ecosystem. Pile burning and prescribed burn activities would be implemented to restore a natural wildfire regime and reduce surface fuels loading on the landscape and return the ecosystem to a more natural range of variability that is representative of conditions prior to disturbance by humans. This action would control fuel loads that have accumulated on the landscape through fire exclusion practices helps to return the ecosystem to a more natural condition. However, the act of burning piles and implementing prescribed burns would involve human manipulation of the environment within the Wilderness. Alternative 1 would, therefore, have a temporary negative effect on the untrammeled quality of wilderness character. However, this trammeling effect would be more pronounced early in the project during treatment activities and would lessen as fuel loads both inside and outside of Bucks Lake Wilderness are returned to a more natural range of variability. Furthermore, by reducing fuel loads on the wilderness landscape, the risk of high-intensity, catastrophic wildfire would be lessened, compared with taking no action and risking the possibility of stand-replacing wildfire in Bucks Lake Wilderness and adjacent areas.
- **Undeveloped.** The undeveloped quality of wilderness character indicates that the wilderness is essentially without permanent improvement or modern anthropogenic influence of any kind. Therefore, for wilderness to retain this quality, it must be void of modern structures, installations, habitations, use of motor vehicles or other motorized equipment, and use of other mechanical transport devices. Pile burning and prescribed burning under Alternative 1 would not affect the undeveloped quality of wilderness, because no permanent improvements would be associated with such treatment, and implementation would not involve the use of mechanized equipment or vehicles.
- **Natural.** A Wilderness area is to be protected and managed to preserve its natural condition. Preserving this quality ensures that indigenous species, patterns, and ecological processes are protected. Because implementing Alternative 1 would not introduce nonnative species, remove live vegetation, alter topography, or involve constructing human-made features, it would not adversely affect the natural quality of the Wilderness.
- **Solitude or Primitive and Unconfined Recreation.** As described in Section 3.5, “Recreation and Visual Resources,” implementing Alternative 1 would not introduce new access points or permanently alter visitation patterns in the Project area. It would also not alter the recreational opportunities currently afforded by the Wilderness. For these reasons, implementing

Alternative 1 would not adversely affect solitude or primitive unconfined recreation in the Wilderness.

Special Interest Areas

Treatments in SIAs would be designed to maintain the “integrity and suitability” for which the SIAs were proposed pursuant to Design Feature BOTANY-6 (see Appendix A). Many special-status plant species are known to occur in these SIAs (see Section 3.2, “Biological Resources”). The consistency of Alternative 1 with LRMP guidelines that require the protection of unique botanic values for research purposes and protection of areas of unique scenic, botanic, or geologic values in SIAs is summarized as follows:

- **Protect Unique Botanic Values for Research Purposes.** SIAs would be treated under Alternative 1 based on the corresponding planning unit identified for each area. New permanent fuel breaks and staging areas would be prohibited in these areas, and vegetation would be removed from the SIAs only for the purpose of reducing fuel loads. Fuel treatment methods would be used only insofar as they preserve the existing condition to allow present enjoyment, studies, and future studies of these areas. Section 3.2, “Biological Resources,” contains a detailed analysis of the potential effects on unique botanical species in the Project area.
- **Protect Areas of Scenic, Botanic, or Geological Value.** As stated above, fuel treatment methods would be employed in SIAs only insofar as they preserve the existing condition to allow present enjoyment, studies, and future studies of these areas, consistent with Design Feature BOTANY-6. Refer to Section 3.2, “Biological Resources,” for a detailed analysis of the potential effects on botanical species in the Project area and Section 3.5, “Recreation and Visual Resources,” for an evaluation of scenic resources in the Project area.

Alternative 2: Vegetation Treatments to Protect Communities Consistent with the Existing Forest Plan

Inventoried Roadless Areas

Direct and indirect effects on IRAs from treatment activities proposed under Alternative 2 would be similar in character and intensity to the effects under Alternative 1, described above. Approximately 99 acres of moderate-quality PACs are in the IRA area that would be mechanically treated under Alternative 1; 94 of these acres are in the wildland-urban interface (WUI) Defense Zone, so they would also be mechanically treated under Alternative 2. Six acres of high-quality PACs in the WUI Defense Zone in the IRA that would be treated under Alternative 2 would not be treated under Alternative 1, which brings the total number of mechanically treated acres in the IRA under Alternative 2 to 100 acres. Consequently, the effects of Alternatives 1 and 2 on IRAs would be equivalent.

Wild and Scenic Rivers

Direct and indirect effects on designated and eligible Wild and Scenic River area from treatment activities proposed under Alternative 2 would be similar in character to the effects under Alternative 1, described above, but they would be reduced under Alternative 2 commensurate with the reduced intensity of treatments along Wild and Scenic River segments. Under Alternative 2, approximately 525 fewer acres of PACs would be eligible for mechanical treatment methods than under Alternative 1; but would be eligible for manual treatments and stand-alone or follow-up

prescribed burn and pile burning. In addition, PAC treatments under Alternative 2 would be limited by canopy cover targets, which would result in lower-intensity treatments overall than under Alternative 1, which would use rSDI targets. For these reasons, the effects of Alternative 2 on Wild and Scenic Rivers would be similar to but less than those of Alternative 1.

Wilderness Areas

Under Alternative 2, Buck Lake Wilderness would not receive any treatment aside from burning of existing piles to reduce existing fuel loads. Therefore, the effects on Wilderness character under Alternative 2 would be similar to but less than those described above for Alternative 1.

Special Interest Areas

Direct and indirect effects on existing and proposed SIAs from treatment activities under Alternative 2 would be similar in character to the effects under Alternative 1, described above, but they would be reduced under Alternative 2 commensurate with the reduced intensity of treatments. Specifically, 183 fewer acres would be mechanically treated in SIAs under Alternative 2 compared with Alternative 1. In addition, in areas where mechanical treatments could occur, they would be of lower intensity because desired conditions would be driven by canopy cover targets under Alternative 2 and by rSDI targets under Alternative 1. Canopy cover targets tend to result in higher levels of residual biomass on the landscape than rSDI targets.

Alternative 3: Vegetation Treatments to Protect Communities with Reduced Intensity Treatments

Inventoried Roadless Areas

Alternative 3 would avoid all mechanical treatments in IRAs; therefore, effects on IRA areas would be less under Alternative 3 than under either of the other action alternatives. Manual treatments, prescribed fire, and pile burning would still be permitted under Alternative 3, but because these treatments create substantially less disturbance in treatment units than mechanical treatments, they would result in the lowest level of effect on IRA characteristics.

Wild and Scenic Rivers

Alternative 3 would avoid all mechanical treatments in the Middle Fork Feather River Wild and Scenic River designated and eligible areas; therefore, effects on Wild and Scenic River areas would be less under Alternative 3 than under either of the other action alternatives. Manual treatments, prescribed fire, and pile burning would still be permitted under Alternative 3, but because these treatments create substantially less disturbance in treatment units than mechanical treatments, they would result in the lowest level of effect on Wild and Scenic values.

Wilderness Areas

Under Alternative 3, Buck Lake Wilderness would not receive any treatment aside from burning existing piles to reduce existing fuel loads. Therefore, the effects on Wilderness character under Alternative 3 would be the same as described for Alternative 2.

Special Interest Areas

Alternative 3 would avoid all mechanical treatments in existing or proposed SIAs; therefore, effects on SIAs would be less under Alternative 3 than under either of the other action alternatives. Manual treatments, prescribed fire, and pile burning would still be permitted under Alternative 3,

but because these treatments create substantially less disturbance in treatment units than mechanical treatments, they would result in the lowest level of effect on scenic, botanical, and geological values preserved in these areas.

Alternative 4: Vegetation Treatments to Protect Communities and CSO Territories

Direct and indirect effects on IRAs from treatment activities proposed under Alternative 4 would be similar in character and intensity to the effects under Alternative 1. Consequently, the effects of Alternatives 1 and 4 on IRAs would be equivalent.

Wild and Scenic Rivers

Direct and indirect effects on designated and eligible Wild and Scenic River areas from treatment activities proposed under Alternative 4 would be similar in character to the effects described under Alternative 1.

Wilderness Areas

Under Alternative 4, Buck Lake Wilderness would not receive any treatment aside from burning of existing piles to reduce existing fuel loads. Therefore, the effects on Wilderness character under Alternative 4 would be similar to but less than those described above for Alternative 1.

Special Interest Areas

Direct and indirect effects on existing and proposed SIAs from treatment activities under Alternative 4 would be similar in character to the effects under Alternative 1.

3.7.6. Cumulative Effects

Inventoried Roadless Areas

All past, present, and reasonably foreseeable future projects with potential to cumulatively affect IRA values and features in the Project area have been assessed in this analysis. A list of past, present, and reasonably foreseeable future projects in the vicinity of the Project is included at the beginning of Chapter 3 of this EA. Not all cumulative projects listed are applicable to the cumulative effects analysis on IRAs because of the limited spatial extent of IRA overlap with the Project area (464 acres) and, therefore, limited ability for impacts from other projects to affect IRA-designated areas.

Because road construction and timber harvest activities are limited on lands in IRAs under the 2001 Roadless Rule, the primary type of activities that have the potential to cumulatively affect IRA values and features are forest health improvement projects. Given the limited Project activities that could foreseeably occur in the IRA, and because activities in the IRA would be limited by the 2001 Roadless Rule, it is expected that no adverse cumulative effects related to IRAs would occur in relation to this Project.

Wild and Scenic Rivers

Cumulative effects on Wild and Scenic Rivers are considered in the context of potential impacts on water quality, ORVs, and free-flowing conditions. The number of past, present, and reasonably foreseeable future activities that have occurred or are expected to occur in eligible or suitable Wild and Scenic River segments in the Project area is limited. Up to approximately 919 acres

(approximately 13 percent) of the area in the Wild and Scenic River corridor have been treated in the past 10 years. Based on the recovery timeframes for these past projects, there are currently no measurable effects from these past activities and therefore no cumulative effects resulting from past projects on Wild and Scenic River ORVs.

Cumulative projects include other forest health and fuels treatment projects. Although sedimentation could occur because of the action alternatives and other future activities, this sedimentation would be short term, minimal in magnitude, and not result in long-term impacts on ORVs of the Middle Fork of the Feather River. See Section 3.4, “Hydrology and Soils,” for a detailed analysis of the water quality and hydrology effects of the Project.

Past activities have not affected the free-flowing condition of the Wild and Scenic River segments, and areas on the Middle Fork of the Feather River that are designated or proposed have not been withdrawn. Proposed treatments, as well as other reasonably foreseeable future activities, would not affect the free-flowing conditions of the river, because no dam, diversion, or impoundment projects have been identified or would be included as a part of the proposed Project.

Wilderness Areas

Because of the limited nature of activities permitted on Plumas National Forest lands in Wilderness Areas, there are no projects proposed in Bucks Lake Wilderness that would combine with the proposed Project to generate adverse cumulative effects on Bucks Lake Wilderness character and qualities.

Special Interest Areas

Cumulative effects on SIAs are considered in the context of potential impacts on unique botanic value for research purposes, and the protection of valuable scenic, botanic, and geological resources. The number of past, present, and reasonably foreseeable future activities that have occurred or are expected to occur in SIAs in the Project area is limited. Cumulative projects adhere to LRMP direction to protect unique botanic values for research purposes and protect areas of unique scenic, botanic, or geologic values in SIAs. In-depth analysis of botanical resources and scenic resources in the Project area is included in Section 3.2, “Biological Resources,” and Section 3.5, “Recreation and Visual Resources,” respectively. There would be no adverse cumulative effects on unique botanical, scenic, or geological resources in SIAs as a result of Project implementation.

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3.8. Socioeconomics

3.8.1. Introduction

This section presents an assessment of the potential social and economic effects of implementing the alternatives. This analysis has been developed using the best available information, which provides a reliable evaluation of the relative costs and benefits of each alternative. Some social and economic assumptions, such as those related to treatment costs, inflationary forces, labor market fluctuations, and community health effects, are not known with a high degree of certainty, so future socioeconomic conditions could vary from the assumptions presented here. Consequently, the economic estimates presented herein provide a comparison of the relative costs and benefits of the alternatives but do not predict precise future costs.

3.8.2. Current Management Direction

The LRMP (Forest Service 1988) states that the hierarchy of management direction for the PNF includes all relevant federal law, the Forest Service Manual, the Pacific Southwest Regional Guide, PNF Forest Goals and Policies, and the Forest Plan. The Forest Plan identifies land allocations, standards, and guidelines. The LRMP does not provide specific management direction related to socioeconomics.

Executive Order (EO) 12898, “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,” requires federal agencies to identify and address the disproportionately high and adverse human health and environmental effects of their actions on minority and low-income populations, to the greatest extent practicable and permitted by law. EO 14096, “Executive Order on Revitalizing Our Nation’s Commitments to Environmental Justice for All” was issued on April 21, 2023. It requires [early and meaningful involvement in the environmental review process by communities with environmental justice concerns potentially affected by a proposed action](#). EO 14096 also requires [consideration of any disparate health effects \(including risks\) arising from exposure to pollution and other environmental hazards](#),

3.8.3. Affected Environment

Eighty-five percent of the Plumas National Forest is within Plumas County. The forest also extends into Butte, Lassen, Yuba, and Sierra Counties. Plumas County serves as the proxy for the overall economic conditions of the Project area because it represents most of the Project area and because socioeconomic conditions in adjacent portions of surrounding counties are not substantially different from those in Plumas County. Of the approximately 19,000 individuals who reside in Plumas County, approximately 6,200 rely on senior or disability services, and 2,500, or 13 percent of individuals, live in poverty (CDC 2022). The federal government is the largest single employer in the county. Other important industries in the county include agriculture and tourism (City-Data.com 2022). Timber sales have increased by 25 percent in the past year because of logging cleanup operations following wildfires in the county (Plumas News 2022).

Communities may qualify as “minority” under EO 12898 if either of the following characteristics applies: The cumulative percentage of minorities in the affected community is greater than 50 percent, or the cumulative percentage of minorities in the affected community is meaningfully greater than the minority population percentage in the general population or other appropriate unit

of geographic analysis. Plumas County has a total population of 19,286 persons and a 10.4-percent minority population (i.e., individuals reporting races as Black, Hispanic, Asian, Native American, other, and two or more races) (USA.com 2022a). California has a 37.9-percent minority population (USA.com 2022b). Therefore, the Project area does not qualify as a minority community under either criterion of EO 12898. A review of individual census tracts within and adjacent to the Project area also found that no individual census tracts would qualify as a minority community under either criterion of EO 12898.

When minority populations are considered at a finer scale by analyzing block groups, the smallest geographical unit that the U.S. Census Bureau publishes data for, several localized block groups within the project area include minority populations that exceeded the state averages. For example, the state's American Indian population is 0.8% and block groups 060630004001 (6%), 060630003004 (4%), 060070024021 (2%), 060630001002 (4%), 060630001005 (5%), 060630003003 (4%), and 060630003001 (16%) each have more than double the state percentage. In addition, the state's Black population is 12.6% and block groups 060630001001 (24%) and 060630001002 (24%) are nearly double the state average (EPA 2023). Therefore, implementing the Project could affect a minority community.

Communities may qualify as “low income” under EO 12898 if the community’s median household income is at or below the poverty level identified by the U.S. Department of Health and Human Services guidelines. According to the Centers for Disease Control and Prevention, in 2020 Plumas County’s annual median household income was \$59,000 (CDC 2022). The U.S. Department of Health and Human Services 2023 poverty level for a family of four is \$30,000 (HHS 2023), which is well below the median household income in the Project area. Thus, the Project area is not within a low-income community. A review of individual census tracts within or adjacent to the Project area identified five census tracts with a median income below the applicable county average (Census Tracts 3 and 4 in Plumas County, Census Tracts 17.04 and 24.02 in Butte County, and Census Tract 411.01 in Yuba County). However, no census tract had a median income below the relevant U.S. Department of Health and Human Services poverty level (US Census Bureau 2023). When low-income populations are considered at a finer scale by analyzing block groups, several localized block groups within the project area include low income populations that compose more than 50 percent of the population of the block ground (block group 060630001001 (69%); and 060070024021 (54%)) (EPA 2023). Therefore, implementing the Project could affect a low-income community.

3.8.4. Environmental Consequences

Vegetation Treatment Costs for All Action Alternatives

The cost of implementing the vegetation management treatments proposed under the action alternatives can vary substantially based on whether the work is performed under a timber sale contract, public works contract, or partnership. Average costs of proposed treatment methods were estimated based on available data and typical costs of past projects (Table 3.8-1). Mechanical treatments that occur as part of a timber sale may occur with little or no public funding because the value of the harvested timber can fund most or all the treatment activities. The cost of road maintenance also can vary substantially depending on the type of roadwork that may be needed. Treatments in the WUI directly adjacent to residential neighborhoods can be up to four times more expensive than treatments in non-WUI areas because more work is done manually (Forest Service 2014: 9-1). Table 3.8-1 presents the approximate estimated cost per acre or per mile for each of

treatment methods proposed under the action alternatives. Table 3.8-2 presents the estimated total cost for each treatment method for each of the action alternatives.

Table 3.8-1 Approximate Cost for Each Treatment Method per Acre or per Mile

Treatment Method	Approximate Treatment Cost
Mechanical Treatment	\$1,500–\$4,500 per acre
Manual (Hand) Treatment	\$1,500 per acre
Mastication or Grapple Piling	\$1,000 per acre
Pile Burning	\$1,150 per acre
Prescribed Burning (Understory/Broadcast)	\$500 per acre
Herbicide Application	\$450–\$950 per acre
Reforestation/Planting	\$150–\$200 per acre
Road Maintenance	\$2,500– \$17,000 per mile

Sources: Winford, pers. comm., 2022; CAL FIRE 2019; Holland, Evans, and Potts forthcoming; USFS 2022

Table 3.8-2 Estimated Total Cost for Each Treatment Method for Each Action Alternative

Treatment Methods	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Mechanical Treatment ¹	\$372,113,700	\$350,954,100	\$211,736,700	\$372,113,700
Manual (Hand) Treatment	\$92,144,325	\$104,991,225	\$173,547,075	\$92,144,325
Mastication or Grapple Piling ^{1,2}	\$26,579,550	\$25,068,150	\$15,124,050	\$26,579,550
Pile Burning ³	\$40,077,500	\$51,664,900	\$115,660,100	\$40,077,500
Prescribed Burning (Understory/Broadcast) ⁴	\$106,023,500	\$106,023,500	\$106,023,500	\$106,023,500
Herbicide Application ⁵	\$30,039,100	\$30,039,100	\$30,039,100	\$30,039,100
Reforestation/Planting ⁶	\$5,508,650	\$5,508,650	\$5,508,650	\$5,508,650
Road Maintenance ⁷	\$560,625	\$560,625	\$560,625	\$560,625
Estimated Total Cost	\$673,046,950	\$674,810,250	\$658,199,800	\$673,046,950

Notes: The following notes are all assumptions used in preparing this table:

¹ Areas eligible for all treatments (mechanical, hand thin, mastication, and grapple pile) would be 70% mechanical, 15% hand thin, 5% mastication, and 10% grapple pile.

² Shrub areas initial treatment would be 80% mastication and 20% hand thin.

³ All areas subject to hand thin or grapple pile would be pile burned.

⁴ Prescribed burning would occur in all areas where allowed.

⁵ Herbicide application would occur in all shrub and postwildfire areas.

⁶ Reforestation would occur in 50% of the postwildfire acres.

⁷ Road maintenance would be required on 5% of the 1,150 miles of National Forest System roads in the Project area.

Source: Data compiled by Ascent Environmental in 2022.

Economic Benefits of All Action Alternatives

Implementing any of the action alternatives would result in social and economic benefits. Economic benefits would include reduced wildfire suppression costs, reduced property damage from wildfires, reduced wildfire impacts on recreation and tourism, and reduced costs associated

with the human health impacts of wildfire, as described below. Landscape-level forest health would also be a benefit to the community by strengthening shared stewardship efforts and building long-term wildfire resilience. This would create a stronger, more resilient economy because people, economy, and the land are inextricably linked (Forest Service 2021: 6).

Reduced Wildfire Suppression Costs

As described in Section 3.1, “Fire, Fuels, and Forest Health,” implementing any of the action alternatives would reduce fuels accumulations, resulting in fewer and less severe wildfires. Although wildfire suppression might still occur in the Project area, it is reasonable to assume that wildfire suppression costs would be substantially reduced compared to current costs because there would be fewer and less severe wildfires. For example, a fire program analysis in 2014 found that for every \$1.00 spent on fuel treatment, \$1.70 would be spent on fire suppression (Forest Service 2014: 9-5). Table 3.8-3 presents reported wildfire suppression costs for the Dixie, Beckwourth Complex, and Camp Fires, which were located in the immediate vicinity of the Project area. These costs are primarily related to the location, terrain, weather conditions, equipment needs, available personnel, and other factors (Taylor et al. 2022). As shown in Table 3.8-3, the average suppression cost per acre for recent fires in the Project vicinity is \$2,472.

Table 3.8-3 Wildfire Cost per Acre in Plumas National Forest

Wildfire	Year	Total Suppression Cost Adjusted to 2022 USD	Suppression Cost per Acre Adjusted to 2022 USD
Dixie	2021	\$667 million ¹	\$667 per acre ¹
Beckwourth Complex	2021	\$599 million ¹	\$5,668 per acre ¹
Camp	2018	\$166 million ²	\$1,082 per acre ²
Average Cost	NA	NA	\$2,472 per acre

Notes: NA = not applicable; USD = U.S. dollar.

¹ Source: Taylor et al. 2022.

² Source: Dworetzky et al. 2018.

Reduced Property Damage

Implementing any of the action alternatives also would reduce the economic loss from potential damage to private property from wildfire. In Plumas County, the median home price in 2022 was \$422,000 (Zillow 2022). From the available data related to zip codes in the county, all the properties in the county have a moderate to severe risk of being affected by fire in the next 30 years (Risk Factor 2022). There are 268 structures within the Project boundary and 5,650 structures within a 1-mile radius of the Project area that could be reasonably expected to be affected by a large wildfire occurring in the Project area. Alternatives that reduce the risk of catastrophic wildfire would contribute to protecting approximately \$2.5 billion in property value.

Other recent fires in the Project vicinity can also provide context about the potential cost of property destruction that could occur from a catastrophic wildfire. The costs related to property damage from the Beckwourth Complex, Dixie, and Camp Fires were estimated at approximately \$33 million, \$524 million, and \$3.9 billion, respectively (CNRA 2022; CAL FIRE 2021; Siegler 2019; Zillow 2022). Some studies suggest that the insured and uninsured losses and cleanup costs of the Camp Fire, which destroyed the town of Paradise, were more than \$26 billion (Troy et al.

2022a, 2022b). In Greenville, 75 percent of the structures were lost to the Dixie Fire. Some of these owners decided to rebuild, but many chose not to rebuild (Albeck-Ripka and Correal 2021). When businesses and homeowners choose not to rebuild after a catastrophic wildfire, it reduces tax revenue and jobs and can weaken the regional economy.

Reduced Wildfire Impacts on Recreation and Tourism

Plumas National Forest and the surrounding area are a year-round recreational destination. Tourists from around the state are drawn by mountain biking, boating, snow sports, camping, and hunting opportunities and associated accommodation infrastructure. The direct effects of wildfires that have burned Plumas National Forest and the surrounding area include damaged and degraded trail corridors and special use recreational areas, such as campsites. Signs and infrastructure need to be replaced and rebuilt to resolve connectivity issues, improve the longevity of the trail systems, and accommodate the recreational use that the area is experiencing.

There is limited empirical evidence of the economic cost of wildfire to the tourism and recreation industries. In 2018, tourism in the Yosemite Valley area was substantially disrupted by the Ferguson Fire, which resulted in a loss of approximately \$1.7 million in entry fees. The same fire cost local businesses approximately \$50 million in tourism revenue (Siler 2018). El Dorado County initially estimated that at least \$50.3 million in economic activity was lost during the first 2 weeks of the Caldor Fire (Gedye 2021).

In Plumas County, recreation and tourism activities account for approximately 12 percent of the economy and employment (City-Data.com 2022). The total economic output in Plumas County in 2019 (the latest year not affected by COVID-19 or extreme wildfires) was \$1.2 billion (U.S. Bureau of Economic Analysis 2022). Thus, approximately \$144 million is generated by recreation and tourism in the county each year. This revenue is threatened by extreme wildfires and persistent smoke in the region. Smaller businesses, which make up a large portion of the businesses in the tourism and recreation industry in these mountainous regions, often have less capacity than larger businesses to recover from events like a wildfire or lost revenue associated with an entire season affected by persistent smoke (Gedye 2021). This revenue would be maintained and potentially increased in Plumas County if landscape-level fuel treatment projects are implemented on the unburned national forest land and wildfire resilience is improved as a result.

Reduced Cost Associated with Wildfire Impacts on Human Health

Smoke from wildfires causes primary and secondary health impacts on nearby and widespread population centers. Primary health effects experienced by firefighters and fire responders are easier to document and include smoke inhalation and burns. Secondary effects are not well tracked but typically are associated with elevated particulate matter from smoke in a community or region; these effects have monetary consequences depending on the size and severity of the wildfire and wind patterns (CCST 2020: 107). There are incomplete data about the full effects of wildfire on population health; however, some estimates and trends have been discovered that provide a clearer picture of the human health impacts and costs of wildfire smoke.

A report from the California Council on Science and Technology (CCST) found that although the data set is incomplete, wildfire smoke disproportionately places disadvantaged and minority communities at a higher risk (CCST 2020). The report also states that the full public health impact is underestimated because of the difficulty associated with measuring morbidity and indirect

mortality from wildfire smoke, which is not systematically tracked in California (CCST 2020: 103). While acknowledging the limitations of the data, several studies have attempted to estimate the cost of secondary health effects of wildfire smoke. One study from 2017 estimated the annual national short-term costs of wildfire smoke at between \$12 billion and \$20 billion and estimated the long-term costs related to fires in a single year at between \$76 billion and \$130 billion (Fann et al. 2017). Another study valued the smoke impacts from the 2009 Station Fire in southern California to be \$9.50 per person per day using a “cost of illness” method and \$84.42 per person per day using a “willingness to pay” method (Richardson et al. 2011). Those values converted to 2022 spending power are \$11.80 and \$105.00, respectively. Applying these 2022 values to Plumas County’s population of approximately 20,000 results in a cost of health from a wildfire event of between \$236,000 and \$2,100,000 per day. In addition, a study from San Diego County hospitals examined Medi-Cal use during peak fire periods in 2007 and attributed a 34-percent increase in hospital visits related to respiratory problems and a 112-percent increase in visits attributable to asthma complications (Hutchinson et al. 2018). With wildfires in the United States costing an estimated \$450 billion annually, proper forest management should be seen to protect public health and public health investment with substantial returns (CCST 2020). Although the direct, indirect, and cumulative health benefits of alternatives from a reduced risk of catastrophic fire cannot be quantified with available information, any alternative that reduces the number and severity of wildfires would be responsible for a corresponding decrease in the human health costs associated with wildfire smoke.

Other Economic Benefits

Completing landscape-level forest treatments would also have numerous other economic and intangible benefits. Community members are reliant on the health of the forest for recreation, cultural and quality of life. Land management activities can rarely be conducted solely by Forest Service staff but also must rely on local skills and equipment. (USFS 2021: 6)

Implementation of alternatives 1, 2, 3, or 4 would result in direct economic benefits by employing workers from many different sectors. Tree trimmers, equipment operators, loggers, certified burn bosses, mill operators, herbicide applicators, truck drivers, would be employed to implement the action alternatives. In addition, secondary economic benefits would be realized by workers who provide services to support these operations, such as grocery store and gas station employees. This increase in local employment would also support local hospitals, schools, and other essential community services. The personnel needed to implement the action alternatives would in large part be hired locally and have continuous work over several years as initial treatments are completed and additional rounds of treatments are required to maintain desired conditions.

Currently, Plumas County mining and logging industries employ approximately 70 full-time workers (EDD 2023). That number has risen in the past few years from its lower points in the early 2010s due in part to the rise in fuel management projects and renewed interest in domestic timber supplies (He et al. 2021). Implementation of one of the action alternatives would contribute to increasing employment.

As mentioned above, the project area does not qualify as low income, or a minority population. However, according to the CDC Environmental Health Tracking Network (CDC 2022), Plumas County was in the highest quintile of California counties for the following socioeconomic indicators in 2018:

- Percent population 65 or older: 28.4%
- Percent population aged 65 or older living alone in a non-family household: 15.5%
- Percent of population 5 years or older with a disability: 19.3%
- Percent households mobile home housing units: 12%
- Percent households with no internet: 20.3%

Thus, the economic and intangible benefits of the project would support disadvantaged communities.

Summary of Wildfire Costs

The cost of a wildfire depends on many factors, including the size, location, severity, and timing of the fire. Table 3.8-4 shows the estimated economic cost of a large wildfire burning for 95 days (the duration of the recent Dixie Fire) across the 217,721-acre Project area to provide an order-of-magnitude estimate of the potential cost of not reducing wildfire risk. This cost does not account for the potential loss of life that could result from a large wildfire. Furthermore, the direct monetary cost of such a wildfire would be higher than shown in Table 3.8-4 because this estimate does not account for damage to public infrastructure, suppression costs outside of the Project area, loss of timber value and ecosystem services, the economic costs of greenhouse gas emissions from wildfire, or indirect costs.

Table 3.8-4 Potential Direct Costs of a Severe Wildfire in the Project Area

Topic	Direct Economic Cost ¹
Suppression costs ²	\$538,000,000
Property loss ³	\$113,000,000
Recreation and tourism loss ⁴	\$37,000,000
Human health costs ⁵	\$111,000,000
Total Cost	\$800,000,000

¹ All costs are rounded to the nearest million.

² Suppression cost includes the average cost per acre from Table 3.8-3 multiplied by the number of acres in the Project area.

³ Property loss reflects the median home price in Plumas County multiplied by the 268 structures in the Project area.

⁴ Recreation and tourism losses assume 95 days of lost tourism revenue (based on the number of days the Dixie Fire burned) and a corresponding reduction in the \$144,000,000 generated by recreation and tourism in Plumas County.

⁵ Human health costs are based on a midpoint daily cost of \$58.40, adapted from Richardson et al. 2011, multiplied by 20,000 residents, multiplied by 95 days.

Source: Compiled by Ascent Environmental in 2022.

Direct, Indirect, and Cumulative Effects on Socioeconomics and Environmental Justice

No Action Alternative

Under the No Action Alternative, there would be no direct treatment costs; however, there would be a substantially higher chance of experiencing costs associated with a catastrophic wildfire (see Section 3.1, “Fire, Fuels, and Forest Health”). Costs associated with wildfire suppression, postfire recovery, loss of tourism and recreation, and impacts on community health would likely be higher under the No Action Alternative than under any of the action alternatives. As shown in Table 3.8-4, a large wildfire could cost approximately \$800,000,000. More importantly, a large wildfire could result in loss of life, as well as indirect and cumulative costs. Because the No Action

Alternative would not include treatment activities, it would not disproportionately affect low income or minority communities. However, the No Action Alternative would provide no wildfire protection benefits to communities.

Alternative 1: Vegetation Treatments to Protect Communities and Achieve Landscape Resilience

The analysis in Sections 3.1 through 3.7 indicates that implementing Alternative 1 would not result in substantial adverse effects. Similar treatment activities would occur throughout the project area, and effects on nearby residents would occur uniformly throughout the project area, which would not place a disproportionate burden on any individual community. For these reasons, implementing Alternative 1 would not result in disproportionately high and adverse human health or environmental effects on minority populations or low-income populations.

The medium household income in Plumas County is \$57,885. Although this income level is above the U.S. Department of Health and Human Services poverty level, approximately 11.9 percent of the county population lives in poverty. Two of the census tracts that the Project area overlaps have a higher poverty percentage than Plumas County as a whole. In addition, census tracts in Sierra, Yuba, and Butte Counties that overlap with the Project area have poverty rates higher than the county averages and average household incomes below their county averages (U.S. Census Bureau 2023). As described in Section 3.8.3, “Affected Environment”, specific census block groups in the project area include minority and low-income communities. This means that the Project would provide wildfire protection benefits to local low income and minority communities.

Implementing the Project could cause temporary effects on nearby residents, including increased noise levels from machinery, smoke exposure from prescribed burning, temporarily reduced access to the forest, and increased traffic near work sites in the Project area. These potentially disruptive activities would be temporary and would occur only during Project implementation. Because similar treatment activities would occur throughout the project area, effects on nearby residents would occur uniformly throughout the project area and would not place a disproportionate burden on any individual community. Thus, while low income and minority communities exist in the project vicinity, those communities would not be disproportionately affected under Alternative 1. The wildfire protection benefits of the alternative management and WUI protection measures may benefit low-income residents at a higher rate because these residents have less disposable income to spend on fire protection measures in and around their homes. In addition, the Project area encompasses a higher rate of communities that typically have lower incomes and higher rates of poverty than their respective county averages. Therefore, the benefits of the project would benefit low income and minority communities.

The total cost to implement Alternative 1, including follow-up maintenance prescribed burning, is estimated at approximately \$673,000,000 (see Table 3.8-2). As detailed in Section 3.1, “Fire, Fuels, and Forest Health,” Alternative 1 would substantially reduce the risk of catastrophic wildfire. Although the exact extent to which Alternative 1 would reduce the likelihood and severity of a wildfire cannot be known, the cost of implementing the Project would be substantially less than the estimated direct cost of a large wildfire in the Project area: approximately \$800,000,000. The indirect and cumulative cost of a severe wildfire in the project area would be substantially more than the direct costs. A community can take decades to recover from a large wildfire, which can create or exacerbate mental health problems, substance abuse, and poverty, particularly for the

elderly, economically disadvantaged groups, and the uninsured. Fire recovery can reduce long-term business opportunities and property tax revenues, in turn affecting all public services, including education, law enforcement, and community health services (Troy et al. 2022a).

Alternative 2: Vegetation Treatments to Protect Communities Consistent with the Existing Forest Plan

As described for Alternative 1, the Project area includes minority and low-income communities. However, similar treatment activities would occur throughout the project area, and effects on nearby residents would occur uniformly throughout the project area, which would not place a disproportionate burden on any individual community. Thus, implementing Alternative 2 would not result in disproportionately high and adverse human health or environmental effects on minority populations or low-income populations. Implementing Alternative 2 would result in approximately 10,000 fewer acres of mechanical treatments and 10,000 more acres of manual treatments and pile burning than Alternative 1 (see Table 2-10). The cost to implement Alternative 2 is estimated to be approximately \$675,000,000, including follow-up maintenance prescribed burning. This alternative is estimated to be approximately 1 percent more expensive than Alternative 1 because of the additional cost of manual treatments and pile burning on more acres. As detailed in Section 3.1, “Fire, Fuels, and Forest Health,” Alternative 2 would substantially reduce the risk of catastrophic wildfire. Although the exact extent to which Alternative 2 would reduce the likelihood and severity of a wildfire cannot be known, the cost of implementing the Project would be substantially less than the estimated direct cost of a large wildfire in the Project area: approximately \$800,000,000. As described above, the indirect and cumulative costs of a large wildfire would be substantially greater than the direct costs and would include the risk of loss of human life.

Alternative 3: Vegetation Treatments to Protect Communities with Reduced Intensity Treatments

As described above, the project area includes minority and low-income communities. However, similar treatment activities would occur throughout the project area, and effects on nearby residents would occur uniformly throughout the project area, which would not place a disproportionate burden on any individual community. Thus, implementing Alternative 3 would not result in disproportionately high and adverse human health or environmental effects on minority populations or low-income populations. Implementing Alternative 3 would result in approximately 77,000 fewer acres of mechanical treatments and 65,000 more acres of manual treatments, pile burning, and prescribed burning than Alternative 1 (see Table 2-10). Alternative 3 is estimated to cost approximately \$658,000,000, including follow-up maintenance prescribed burning. Alternative 3 is the least costly alternative to implement because of the fewer acres that will be treated by mechanical treatment than under Alternative 1 or 2. As detailed in Section 3.1, “Fire, Fuels, and Forest Health,” Alternative 3 would substantially reduce the risk of catastrophic wildfire, but to a lesser extent than Alternative 1 or 2. Although the exact extent to which Alternative 3 would reduce the likelihood and severity of a wildfire cannot be known, the cost of implementing the Project would be substantially less than the estimated direct cost of a large wildfire in the project area: approximately \$800,000,000. As noted above, the indirect and

cumulative costs of a large wildfire would be substantially greater than the direct costs and would include the risk of loss of human life.

Alternative 4: Vegetation Treatments to Protect Communities Consistent and CSO Territories

As described for Alternative 1, the Project area includes minority and low-income communities. However, similar treatment activities would occur throughout the project area, and effects on nearby residents would occur uniformly throughout the project area, which would not place a disproportionate burden on any individual community. Thus, implementing Alternative 4 would not result in disproportionately high and adverse human health or environmental effects on minority populations or low-income populations. The cost to implement Alternative 4 is estimated to be approximately \$673,000,000, including follow-up maintenance prescribed burning. As detailed in Section 3.1, “Fire, Fuels, and Forest Health,” Alternative 4 would substantially reduce the risk of catastrophic wildfire. Although the exact extent to which Alternative 4 would reduce the likelihood and severity of a wildfire cannot be known, the cost of implementing the Project would be substantially less than the estimated direct cost of a large wildfire in the Project area: approximately \$800,000,000. As described above, the indirect and cumulative costs of a large wildfire would be substantially greater than the direct costs and would include the risk of loss of human life.

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3.9. Roads

3.9.1. Introduction

This section describes the existing transportation system of National Forest System (NFS) roads, and other federal, state, local, and private roads within the Project area. It evaluates the effects of the action alternatives relative to the No Action Alternative, and consistency with the purpose and need.

3.9.2. Current Management Direction

The Forest Plan directs PNF to reconstruct roads to minimum standards achieving maximum economy and resource protection and reduce the impact on soils and water quality, air quality, and wildlife. It also directs PNF to close roads connecting management units and eliminate roads that are no longer needed. Protection measures, standards, and guidelines contained in the Forest Plan related to roadwork activities include the following:

- 1) Avoid or minimize road locations on steep slopes (greater than 60%).
- 2) Design cuts and fills for maximum stability and minimum soil loss. Stabilize road prisms to prevent sediment yield to watercourses. Avoid areas of instability where possible and proceed only upon recommendation by geotechnical personnel.
- 3) Abate dust to avoid unacceptable resource damage.
- 4) Adjust road location or use seasonal closures to avoid or reduce impacts on wildlife nesting areas, streamside management zones, sensitive plants, and other key wildlife.
- 5) Decommission roads that are no longer needed.
- 6) Design new stream crossings and replacement stream crossings for at least the 100-year flood, including bedload and debris.
- 7) Design stream crossings to minimize the diversion of streamflow out of the channel and down the road in the event of a crossing failure.
- 8) Design stream crossings to minimize disruption of natural hydrologic flow paths, including minimizing diversion of streamflow and interception of surface and subsurface water.
- 9) Avoid wetlands or minimize effects to natural flow patterns in wetlands.
- 10) Avoid road construction in meadows.
- 11) Require vehicles and equipment used for project implementation to be weed free.
- 12) Apply limited operating periods with buffers for road maintenance and use for fisher and marten den sites.
- 13) Implement corrective actions to restore hydrologic connectivity on roads that intercept, divert, or disrupt natural surface and subsurface water flow paths.
- 14) Ensure that existing roads meet BMPs used to access fuel treatments, harvest, or hazard tree removal.

The Access Travel Management Record of Decision for PNF (Forest Service 2010) specifies the NFS roads available for access by user, vehicle type, and season of use in compliance with 36 CFR 212.55 - Travel Management Rule, Subpart B. Access on NFS roads is displayed on the current Motorized Vehicle Use Map, which designates which NFS roads are open to the public by vehicle type and by season of use.

Forest Service Directives require transportation system planning, design, construction, operation, and management of roads follow current Forest Service Manual (FSM 7100 – Engineering Operations and FSM 7700 – Travel Management) and Forest Service Handbook (FSH 7709.55 – 7709.59) direction. Most current road activities consist of maintenance and repair, with occasional improvements or decommissioning, and minimal new permanent road construction. The Project would include maintenance, repair, improvements, and decommissioning. Each NFS road is managed according to its approved Road Management Objective (RMO), which documents the purpose of each road and sets the parameters for maintenance standards to meet user needs, resource protection, and public safety.

3.9.3. Affected Environment

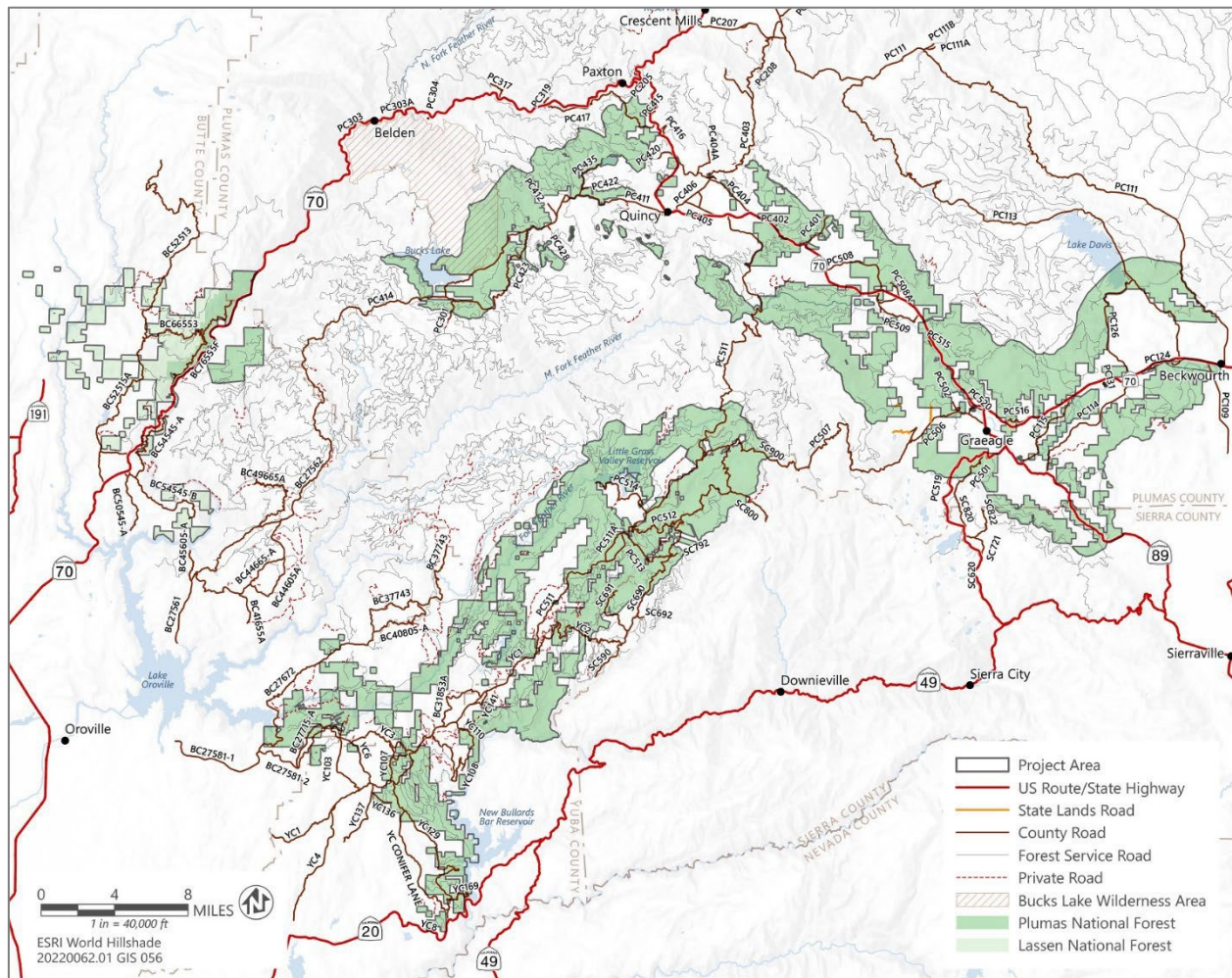
In total, there are approximately 3,850 miles of existing managed NFS roads on PNF lands and 1,290 miles of other federal, state, local and private roads (Figure 3.9-1). Approximately 930 miles of roads are within the Project boundary; of those 930 miles, approximately 720 miles are NFS roads. Details of roads within the Project boundary are included in Appendix I.

Road access outside the Project boundary would provide access to and serve as haul routes for removal of biomass from Project treatment areas, and these roads require routine maintenance. While support for their maintenance or improvements may be necessary to implement the Project, those activities are outside the scope of this analysis and are within the purview of PNF program management including cooperator agreements, or state or county road programs.

Funding Trends

In 2022, the Forest Service estimated it has a \$4.42 billion backlog of deferred road maintenance, which had grown continuously since the slowdown of timber sales in the 1980s and 1990s. That backlog for PNF alone currently stands at approximately \$39.24 million for NFS roads. The *2016 PNF Travel Analysis Report* included an estimate of the economic sustainability of NFS roads within PNF and, based on appropriated and other funding, PNF could expect to sustain eight percent of its NFS roads, annually.

Annual appropriations under the Department of the Interior Environment and Related Agencies Appropriations Act include funding for NFS road maintenance as capital improvement and maintenance. For NFS roads, those appropriations are typically reserved for roads falling under the Highway Safety Act (OpML 3-5). In 2021, there was an additional \$285 million provided to the Forest Service to apply to the backlog of deferred maintenance of the entire agency roads, trails, buildings, and other infrastructures. For 2023, the USDA budget summary proposes an annual \$140 million for the construction and maintenance of all infrastructure on all NFS lands. Of that \$140 million, PNF received just under \$120,000 for the construction and maintenance of approximately 570 miles of NFS passenger vehicle roads. That equates to roughly \$210 per mile of road per year for maintenance and repairs. The remaining 3,230 miles of high clearance roads within PNF are maintained with project funding. If the same sustainability estimate from the Travel Analysis Report was run today using 2023 allocations, PNF could expect to sustain only two percent of its NFS roads, annually.



Source: Data received from U.S. Forest Service in 2022.

Figure 3.9-1 Road Jurisdictions

The cost to restore roads only within the Project boundaries to approved RMOs through maintenance could approach \$16 million. Improvements, construction of temporary roads, and maintenance of critical access roads outside of the Project boundaries to support access to the Project area would require additional funding.

All NFS roads have several data elements, including road number, location on the forest, the operational maintenance level (OpML), and the objective maintenance level (ObML). The OpML is the maintenance level currently assigned to a road considering its need, condition, budget constraints, and environmental concerns and defines the level to which the road is currently being maintained (FSH 7709.59, 62.31). The ObML is the level to be assigned at a future date considering future road management objects, traffic needs, budget constructions, and environmental concerns. The transition from operational to objective depends on a variety of factors including the need for reconstruction or disinvestment. Maintenance levels may be one of five:

- ML-1 – Roads are placed in storage with ALL vehicular traffic eliminated (including administrative).

- ML-2 – Roads are passable by prudent drivers in high clearance vehicles (not maintained for standard four wheeled passenger cars). Mostly single lane, native surface. These roads are not subject to the Highway Safety Act.
- ML-3 – Roads are passable to prudent drivers in passenger vehicles, with reasonable expectations of predictable road conditions and traffic controls (signs and devices) when hazards are present. Typically, they are low speed, single lane with turnouts, have various surfacing material(s), and are subject to the Highway Safety Act.
- ML-4 – Roads provide a moderate degree of user comfort and convenience at moderate speeds with moderate traffic volumes. They may be single or double lane, typically have hardened surfaces, and are subject to the Highway Safety Act.
- ML-5 – Roads provide a high degree of user comfort and convenience, with higher traffic volumes. They are normally paved, double lane, and are subject to the Highway Safety Act.

All five maintenance levels are represented within the Project boundaries (Table 3.9-1).

Table 3.9-1 National Forest System Roads within Project Boundary

NFS Roads within Project Boundaries	Approx. Miles
OpML-1 - basic custodial care (closed)	32
OpML-2 - high clearance vehicles	580
OpML-3 - suitable for passenger cars	56
OpML-4 - moderate degree of user comfort	33
OpML-5 - high degree of user comfort	17
Other (data field inconclusive)	1
Total Miles	719

Note: State, county, and private roads are not included as they are not subject to Forest Service Maintenance Level codes.

3.9.4. Types of NFS Road Activities

Maintenance

Road maintenance is ongoing upkeep of a road necessary to maintain or restore the road to the standard to which it was designed in accordance with its approved road management objectives. There are five general categories of road maintenance activities, as follows:

- 1) Vegetation: Clearing overgrown vegetation both in the road prism and along the road, brushing for sight clearance, and removal of hazard trees.
- 2) Drainage: Cleaning culverts and their inlets/outlets, replace under-functioning features, replace riprap, ditches, grading to restore surface drainage features, and incorporating erosion controls.
- 3) Surface and roadway: Restore surface, blade and compact, dust abatement, place spot rock, fill potholes, stabilize cut and fill slopes, and crack seal.
- 4) Traffic control: Implement traffic controls (signs, striping, pavement markings, delineators, etc.) commensurate with the OpML.
- 5) Structures: Maintain approaches, guardrails, surface and deck, superstructure, foundation, and channel to allow safe use of road bridges.

Where a NFS road has deteriorated to the point that the design vehicle can no longer use the road, more intensive maintenance must be performed. Where original water crossings installed have failed to meet actual flows, larger or alternative type crossings must be considered to prevent failure of the road and to maintain the investment in the road for current and future use. For roads that are classified as OpML-1, more intensive maintenance, that may approach the level of activity required for new construction, would be needed. This could include clearing vegetation in the road prism, restoring drivable drainage crossings, earthwork, and grading to accommodate design/critical vehicle access, and activities to “return to storage condition.”

Road maintenance is not intended to substantially improve conditions from the original construction of the road; however, there may be a need for adding to or modifying the original conditions without increasing the provided service level. For example, to accommodate implementation, OpML-2 roads may need to be maintained for critical vehicles during (e.g., surfaces are smooth-graded, water bars are removed, passenger cars maneuver more easily). However, upon Project completion those roads would be restored to the management and use as OpML-2 NFS roads.

Note: On-going Region 5 Post-disturbance Hazardous Tree Management Projects may overlap with the proposed Project area boundaries and are typically located along NFS roads managed for passenger vehicle use (OpML 3, 4, and 5).

Improvement

The 2001 Inventoried Roadless Rule defines road improvement as “activity that results in an increase of an existing road’s traffic service level, expansion of its capacity, or a change in its original design function.” While improvements may have the appearance of upgrading a NFS road, they do not change the level of service (flow of traffic, design speed, surface type), nor the capacity (traffic type and volume). An improvement still supports user safety, allows access by critical vehicles, and protects forest resources but does not change the management and operation of the NFS road and the areas they access.

Possible road improvements to support Project implementation may include occasional road widening, curve widening with end tapers, adding turnouts, stabilizing the road prism to support larger critical vehicle, adding spot surfacing or aggregate surface replacement for long term haul (the latter typically on OpML-3, -4, and -5 roads), and replacing drainage features. Curve widening and additional turnouts have potential to reduce future conflicts from occasional increased traffic flows in opposing directions, such as during times of emergency evacuations or responses to emergencies, wildfires, and significant road failures or washouts.

Curve widening addresses the off-tracking of long wheelbase vehicles, such as single trailer log truck or chip van, and facilitates their safe use on narrow winding roads. Design follows the American Association of State Highway and Transportation Officials’ *Guidelines for Geometric Design of Very Low-Volume Local Roads*. Chip vans have a longer wheelbase and smaller steering angle than log trucks, making many original OpML-2 roads unsuitable for their use. The longer the length of the road curve and the tighter the curve, the more curve widening is required, in both width and length. Tighter curves are typically located on terrain with steeper side slopes. Widening can be on the outside edge, inside edge, or both sides of the road. Beginning and ending tapers into and out of the curve are also required at each end of curve widened segments. If road widening cannot be achieved due to terrain limitations and resource impacts, other options for access (e.g., temporary roads), other vehicle options for chip removal (e.g., shorter trailer), or employing a treatment type that doesn’t include chip van access may be necessary. Temporary filling of inside

ditches for short segments may also eliminate the need for curve widening on some curves, with subsequent restoration of function after Project completion.

Turnouts on most single lane OpML-2 roads are only naturally occurring turnouts, such as additional width on ridges or other available areas on flat terrain. Additional turnouts are generally provided when the environmental impact is low and the investment is economically justifiable, with maximum spacing of less than ¼ mile. Like curve widening, turnout width and length, including tapers, are based on level of service, traffic mix, design speed, and traffic volume. Not all turnouts are intervisible. Addition of turnouts to NFS roads under Project implementation cannot result in changes to designation of affected roads without further analysis and public involvement, per 36 CFR 212.52. For example, a road managed for high clearance vehicle use (OpML-2) would not be able to accommodate use of passenger vehicles (OpML-3) by adding additional turnouts.

Additional constructed turnouts on single lane roads to address emergency evacuation cannot replace the ability provided by contraflow lane reversal on double lane roads. The segments of road without turnouts still present conflict as a bottleneck for both simultaneous opposing traffic and doubling up same-direction traffic. Exceptions are in areas with little to no side slope, but driving off the stabilized road prism presents risks to the user and potential resource damage. NFS roads are designed, constructed, and managed as single or double lane depending on average daily traffic.

Temporary Road Construction

New permanent road construction with addition to the NFTS is not proposed as part of this Project. Temporary roads may be required for Project implementation, which would be dictated by the location of and existing access to treatments units. Recommended realignment of some road segments to address unacceptable water quality impacts or to provide a more stable roadway may be necessary to facilitate access within Project boundaries during implementation and support allowed use after Project completion. Relocation of a road segment does not constitute a new road because it would replace a segment of an existing road, and the replaced portion would be obliterated.

A temporary road is defined as necessary for emergency operations or authorized by contract, permit, lease, or other written authorization; it does not become a NFS road, nor is it included in the forest transportation atlas (36 CFR 212.1). The Forest Plan Standards and Guidelines for Temporary Roads allow the construction of temporary roads when there is a need for short-term access. Construction is typically performed in a manner similar to permanent road construction, but with lower design standards. Temporary road construction activities could occur on previously undisturbed ground and include clearing, grubbing, blasting, excavation, compaction of soils defining the road prism and support drainage structures (e.g., culverts, catch basins), surface material placement and stabilization, and implementation of erosion control. Suitable aggregate materials would be sourced from approved, inventoried quarry sites. After project completion, temporary roads would be obliterated by restoring the original topography and drainage, and implementing erosion control measures in areas of disturbance.

Road Decommissioning

Some NFS roads within the Project boundary were identified as “likely not needed” in the PNF *Travel Analysis Report* (Forest Service 2016). The report contains a forest-level review of NFS roads, and their risks and benefits to forest resources. These roads may be decommissioned during or following project implementation.

3.9.5. Best Management Practices and Design Features

The implementation of all road activities would follow applicable BMPs, Forest Service Directives, mandated road maintenance, construction, and decommissioning specifications and standards, and Project design features. In addition, roads activities are subject to seasonal limitations due to wildlife activity, fire conditions, and other restrictions.

Design features would be implemented to support the Project implementation under all action alternatives while continuing to provide for safe public and administrative access on NFS roads and prevent or mitigate impacts to forest resources. Design Features are listed in Appendix A. For all NFS roads activities affecting forest resources, updated resource surveys will inform Project road activities during the design phase and prior to implementation.

3.9.6. Environmental Consequences

Direct and Indirect Effects

No Action Alternative

Under this Alternative, no vegetation or fuel treatments would be performed, eliminating the urgency for road activities within the Project area to support implementation. The condition of the existing NFS and County roads within the Project area would continue to deteriorate and the backlog of deferred maintenance would increase. Use of unauthorized routes within the Project area could continue to impact Forest resources. Impacts to other Forest resources, especially from road-water interaction, would continue. Access and egress for public and administrative use would become more unreliable and less safe. Carbon emissions from traffic would continue at the current rate.

Alternatives 1, 2, 3, and 4

Use, maintenance, and improvement of NFS roads within the Project boundary would support Project implementation. The ability to access and implement treatments in the Project areas requires suitable road conditions. However, there is currently a deferred maintenance backlog for all NFS roads, as discussed above. Roads would require maintenance or improvement to restore OpMLs prior to Project implementation and again after Project completion. If not restored to their design and operating standards, their condition could further deteriorate and cause negative impacts to forest resources and user safety.

Road maintenance and improvements are not expected to change the management of the roads from current direction in terms of road maintenance levels, user access, and allowable vehicles type or season of use. The extent of road maintenance and improvements necessary for Project implementation may be such that they change the appearance and potential use of the existing road. Where road widening and/or turnouts are necessary to facilitate access by vehicles larger than the original design vehicle, they would not be applied to the entire length of the road. Permanent changes would not be made to the OpML of any NFS road after Project completion. Except during project implementation, NFS road service level, vehicle type and season of use would return to pre-project OpMLs.

There is the potential for negative permanent impact to NFS roads in the Project area from any of the action alternatives if post implementation restoration of Project roads to approved RMO design condition is not enforced. Funding for Project implementation would address necessary road

maintenance and improvements in support of the selected alternative. Not all roads within the Project area need improvements, but many need maintenance. Execution of identified maintenance and improvements, after site-specific surveys and design would restore the condition of NFS roads and decrease the deferred maintenance backlog. This would result in safer, more dependable access for the public and administrative use, while reducing the impacts on forest resources, most notably water quality. Use of non-native surface NFS and local roads within the Project boundaries from loaded haul vehicles does affect the condition of the road surface and prism. Maintenance and restoration to mitigate impacts from increased use would be required to restore them to their original design condition prior to Project completion.

Direct and Indirect Effects

Implementation of the Project and associated road improvement activities would increase traffic on local roadways and on access roads to implement the vegetation treatments. Traffic would consist transporting vegetation and fuels treatment equipment (e.g., transport trucks hauling yarders, dozers, masticators, or loaders), forest product transit vehicles (log trucks and chip vans), fire protection and response vehicles, and vehicles for transporting implementation personnel in and out the Project area. Public traffic would consist of both highway legal and high-clearance vehicles, recreation-based traffic, and Forest Service administrative vehicles. Conditions for safe emergency egress by the public and responder ingress would be improved within the Project area by improving the condition of existing roads prior to and following project implementation. However, collector and arterial NFS roads and county roads outside the Project area would likely experience surface deterioration from repeated forest product haul if not maintained before, during, and after Project implementation. For public safety, temporary road closures would be imposed during periods of roadside vegetation and hazard tree removal, and during road activities. Measures to reduce the effect of increased traffic and associated safety risks on roads used for project implementation include temporary NFS road closures, job safety hazard analysis, implementation of safety plans, hazardous materials transport planning, and development and implementation of traffic control plans. These measures would reduce the risks to workers, the public, and the environment.

Cumulative Effects

The short-term combination of traffic from the removal of forest product associated with this Project, and other local PNF initiatives involving similar activities or other activities that would increase traffic would represent an increase from current traffic levels, and would require adequate traffic control, temporary public road closures, and proper public communications to maintain safe and efficient traffic flow. Main collector and arterial forest roads would receive most of the traffic and could experience some surface deterioration.

After project implementation, decommissioning of temporary roads would provide for resource protection and allow for better vegetative and hydrologic function of their footprints on the land. Travel on these roads, both public and administrative, would increase because road conditions and safety would be improved from removal of hazard trees along priority and strategic roads and road maintenance associated with the Project.

Supporting the Purpose and Need

Proposed road activities' ability to meet the Project purpose and need vary depending on alternative. Table 3.9-2 shows the comparative ability for road activities under each alternative to meet the purpose and need.

Table 3.9-2 Do Road Activities Meet Project Purpose and Need?

Purpose and Need	Alternative 1 - Vegetation Treatments to Protect Communities and Achieve Landscape Resilience	Alternative 2 - Vegetation Treatments to Protect Communities Consistent with the Existing Forest Plan	Alternative 3 - Vegetation Treatments to Protect Communities with Reduced Intensity Treatments	Alternative 4 – Vegetation Treatments to Protect Communities and CSO Territories	No Action
Reduce risk of wildfire impacts on communities and critical infrastructure	More than No Action, more than Alts 2 and 3	More than No Action and Alt 3, less than Alt 1	More than No Action, less than Alts 1 and 2	More than No Action, like Alt 1	Less than Action Alternatives, only programmatic road activity
Reduce the potential for extreme fire behavior in the wildland-urban interface	More than No Action, more than Alts 2 and 3	More than No Action and Alt 3, less than Alt 1	More than No Action, less than Alts 1 and 2	More than No Action, like Alt 1	Less than Action Alternatives, only programmatic road activity
Maintain road systems for emergency access and evacuations	More than No Action, more than Alts 2 and 3	More than No Action and Alt 3, less than Alt 1	More than No Action, less than Alts 1 and 2	More than No Action, like Alt 1	Less than Action Alternatives, only programmatic road activity
Foster an all-lands approach to fire and fuels management	More than No Action, more than Alts 2 and 3	More than No Action and Alt 3, less than Alt 1	More than No Action, less than Alts 1 and 2	More than No Action, like Alt 1	Less than Action Alternatives, only programmatic road activity

Road activities that would be carried out under any of the action alternatives would meet the purpose and need for the Project; the ability to meet the identified purpose and need statements vary only in degree based on the amount of road maintenance and improvement under each alternative. Since Alternative 1 proposes the most aggressive treatment, there will be more road maintenance and improvement to support its implementation. It includes the most mechanized activity, requiring road access with more and larger haul vehicles, and in areas with steeper side slopes. The steeper slopes prompt the potential need for more curve widening. Also, with more areas being allowed access for treatment, more deferred road maintenance could be addressed, along with better resource protection and user safety.

By comparison, Alternative 2 would involve slightly less mechanical treatment and therefore would have fewer roads requiring maintenance and improvement than under Alternative 1. Nevertheless, deferred road maintenance could be addressed, providing better resource protection and user safety.

Alternative 3 has the least amount of allowable area available for mechanized fuels and vegetation treatment, with the most restrictive considerations for wildlife. With less mechanized treatment allowed, fewer roads could need curve widening. While not as extensive mileage-wise,

proportionally less deferred road maintenance would be completed, while still protecting Project area forest resources and providing user safety.

Alternative 4 is similar to Alternative 1 with the second highest amount of mechanical treatment and need for more road maintenance and improvement to support its implementation.

Meeting Desired Conditions

All action alternatives and associated road activities would move the project toward desired conditions (see Chapter 2, Section 2.1.1., “Desired Conditions”) to varying degree based on the intensity of treatment. The No Action alternative would not move the project area toward desired conditions.

3.10. Vegetation

3.10.1. Introduction

This section describes existing conditions and analyzes the potential effects of treatments to forest resiliency and forest health under the Project

3.10.2. Current Management Direction

The Project is designed to fulfill the management direction specified in the National Forest Management Act of 1976, the 1988 LRMP, and the 2004 Record of Decision on the SNFPA final supplemental EIS. Fuel and vegetation management activities under the Project would comply with the standards and guidelines described in the 2004 Record of Decision on the SNFPA final supplemental EIS, except where specific standards and guidelines are proposed for amendment as described in Chapter 2. Implementation of the Project, in combination with other past projects on the Plumas National Forest and adjacent private lands, would aid in the implementation of the Plumas County Communities Wildfire Protection Plan (CWPP) (PCFSC 2019) and the Plumas County Hazardous Fuel Assessment Strategy (Callenberger and Lunder 2006). The Plumas County CWPP was approved by the Plumas County Board of Supervisors on April 19, 2005, and Amended and approved by the Plumas County Office of Emergency Services on September 25, 2019. Vegetation treatments would support the national strategy to reduce wildfire risk.

3.10.3. Affected Environment

Communities at Risk

The Project area covers portions of Plumas, Yuba, Butte, and Sierra Counties. The Plumas County Fire Safe Council has identified geographic areas containing communities at risk from wildfire. Within or near the Project area, these communities include Portola/Beckwourth, Mohawk Valley, Johnsville, Eureka Ridge Estates, Cromberg, Greenhorn, Spring Garden, Cutler, Massack, Quincy, Keddie, Meadow Valley, Bucks Lake, Faggs Ranch, South Fork, Little Grass Valley, Camel, Slate, and American House (PCFSC 2019). In Yuba and Butte Counties, several Communities are at risk within or near the Project area, including the communities of Challenge, Strawberry Valley, Concow, Feather Falls, Forbestown, and Clipper Mills (CAL FIRE, 2023). These communities have schools, community centers, water systems, critical infrastructure, business districts, and homes. Since 2018, nearly all of these communities have been directly threatened by wildfire and been issued either an evacuation warning or a mandatory evacuation order related to recent wildfires, including the Minerva Fire (2017), Camp Fire (2018) North Complex Fire (2020), Beckwourth Complex Fire (2021), and Dixie Fire (2021). Some communities, including Bucks Lake and Meadow Valley, were evacuated for more than 4 weeks, requiring residents, families, livestock, and family pets to be relocated to temporary shelters, hotels, cars, campgrounds, or the homes of friends or local community members who helped house fire evacuees.

Forest Management History and Resulting Contemporary Forest Structure

The past management history of the Project area has strongly influenced stand structure, species composition, fuel loads, and potential fire behavior at both stand and landscape levels. At the landscape level, past management activities have had a marked effect on forest structure and potential fire behavior. As a result of these past management activities, trees and forest stands

across the Sierra Nevada have been described as “generally younger, denser, smaller in diameter, and more homogeneous” (McKelvey et al. 1996, Forest Service 2023); this condition is typical of forests in the Project area. As with many areas in the Sierra Nevada, the landscape in this Project area has been heavily influenced over the last 150 years by mining; grazing; timber harvesting; fire exclusion; large, high-severity fires (Young 2003; Beesley 1996); and more recent drought-related mortality (Restaino et al. 2019; Guarin and Taylor 2005).

Past harvest activities on the Project area landscape were focused primarily on overstory removal and sanitation or salvage harvest, with a shift toward even-aged forest management systems in the 1980s. Past use of these harvest systems is consistent with well-documented overall management practices that occurred over vast areas of the Sierra Nevada during the 20th century (UC 1996; Leiberg 1902).

3.10.4. Analytical Approach

Measurement Indicators

These measurement indicators (Table 3.10-1) are based on quantifiable stand attributes that can be measured pre-and post-treatment to indicate the trajectory of no action or how well proposed actions have met the desired conditions.

Table 3.10-1 Resource condition indicators and measures for assessing effects

Resource Element	Indicator or Measure	Threshold or Significance	Source
Forest Resiliency	Relative Stand Density Index (rSDI)	rSDI at or above 35% indicates stands are at maximum stocking and entering the inter-tree competition zone with higher risks of mortality	North et al. 2022
Forest Resiliency/Forest Health	Basal Area	Leave stands no more than 100 – 200 square feet of basal area	Region 5 Silviculture Direction (2004)
Forest Resiliency	Tree Species Composition	Promote shade-intolerant tree species	2004 SNFPA: Appendix A – Management Standards and Guidelines #12
Forest Health /Resiliency	Average Stand Diameter (QMD)	Increases in QMD would indicate growth....	2004 SNFPA: Appendix A Management Direction

Relative Stand Density

The concept of stand density index (SDI) was first developed for even-aged stands by Reineke (1933) to compare “the density of stocking of various stands.” SDI is based on the relationship between tree size and number, and the changes in both as a stand develops and self-thins as it matures (Shaw and Long 2010). Maximum SDI (SDImax) is defined as the maximum trees per

acre that can exist for a given mean tree size in a self-thinning population. The closer a stand moves towards SDI_{max}, the more mortality occurs due to competition and decreased vigor. While SDI has most often been used to manage timber stands to maximize stand growth (i.e., thinning to capture mortality and influence stand development), it could be used to maximize individual tree growth and vigor by creating a low competition environment which minimizes density-driven stress and mortality (North et al., 2022).

The relative stand density index (rSDI) concept describes a stand's density relative to the maximum possible density and may serve as a proxy for a stand density relative to its carrying capacity. In general, the concept of stand density as a measure has been further developed for forest management applications for both even-aged and uneven-aged stands (Helms and Tappeiner 1996; Woodall et al. 2002).

A relative density of between 55 and 60 percent has been described as the lower limit of the “Zone of Imminent Competition Mortality” above which trees begin to die because of competition-related stress (Jack and Long 1996). Sixty percent relative density was used as a conservative measure of the onset of competition-related mortality (zone of imminent mortality) because stress induced by competition decreases tree vigor and increases tree susceptibility to drought, insects, disease, and fire. This threshold serves as an appropriate measure for forest health because stands managed below this threshold are less likely to incur mortality as a result of the agents mentioned above. The desired relative densities immediately post treatment are between 23 and 28 percent, which is consistent with stand densities quantified in 1911, which facilitated low tree to tree competition and related mortality (North et al. 2022). These levels are substantially below the 60-percent threshold of the zone of imminent mortality. Table 3.10-2 displays anticipated competitive interactions within different rSDI values. Treatments that achieve the desired range should maintain forest health for at least 20–30 years before reaching densities at which competition mortality is expected to occur, particularly with ongoing prescribed fire or other maintenance treatments.

Furthermore, utilizing a rSDI of 60 percent aligns with Regional Forester direction which guides land managers to design thinning treatments to “ensure that density does not exceed an upper limit (for example: 90 percent normal basal area, or 60 percent of maximum stand density index)” to avoid the health risks associated with density, and that the upper limit “will not be reached for at least 20 years” after treatment (Blackwell 2004) .

Long and Shaw suggests a maximum SDI of 550 for fir-dominated mesic-mixed conifer stands (2012). Additionally, a more recent publication suggests that a maximum SDI of 450 should be used for xeric-mixed conifer (North et al. 2022).

Table 3.10-2 Anticipated competitive interactions within different relative SDI value ranges (Coppoletta et al., 2022)

Relative SDI (rSDI)	Competitive Interactions
<25%	• Less than full site occupancy • No competition between trees • Little crown differentiation • Maximum individual tree diameter growth
25-34%	• Less than full site occupancy

	• Onset of competition among trees • Onset of crown differentiation • Intermediate individual tree growth
35-59%	• Full site occupancy • Active competition among trees • Active crown differentiation • Declining individual tree growth
>=60%	• Full site occupancy • Severe competition among trees • Active competition-induced mortality • Minimum individual tree growth, stagnation • Considered to be 'zone of imminent mortality'

Basal Area

An additional useful measure of stand density is basal area. Basal area (BA) is the cross-sectional area of a single stem, including the bark, measured at breast height (4.5 feet above the ground). Basal area per acre (BA/A) is the sum of the cross-sectional area of all trees in a one-acre area and used to describe the stand. .

Basal area, like rSDI, can be used to determine whether a stand has reached a critical threshold. For example, Landram (2004) used basal area to develop general insect risk thinning guidelines, distinguished by three zones based on precipitation, for the Plumas National Forest. These guidelines recommend thinning to a desired stocking level (the maximum basal area per acre that should be retained) to ensure stand health for at least 20 years. The desired stocking level for the eastside zone/eastside pine (<30" of precipitation) is 100 square feet of basal area per acre, for the transition zone (30-45" of precipitation) 150 square feet of basal area per acre, and for the westside zone 200 square feet of basal area per acre. Additionally, with warmer droughts and greater variability in weather conditions increasing in our warming climate, reducing forest basal area may be critical for decreasing the severity of drought induced mortality in the future (Bradford and Bell, 2017; Vose et al., 2018). No eastside pine types were utilized in this analysis, therefore, the desired stocking level is not displayed throughout the analysis.

Quadratic Mean Diameter

Average stand diameter is an important metric that is an integral component in describing stand structure and assessing forest health. Inferences can be made how stand diameters react to different forest treatments.

The "average" stand diameter often used in forest management is the quadratic mean (QMD), not the more common arithmetic mean. The use of QMD is related to basal area where QMD is defined as "...the diameter at breast height outside bark of the tree of average basal area" (Deal 2018). The use of QMD has many applications in land resource management including SDI calculations. Additionally, when stands are classified using the California Wildlife Habitat Relationship (CWHR) system, QMD is used to determine size class.

Past forest management, including fire suppression and widespread high-severity fire, have greatly reduced the large tree component in many stands across the Plumas National Forest (PNF). In the Sierra Nevada, North et al. (2007) found a large decrease in overall average stand diameters. In pyrogenic ecosystems, thick bark allows trees to minimize or escape fire damage. Since bark thickness increases as a function of stem diameter as a stem grows, the rate of bark accumulation depends in part on the rate of stem growth (Midgley et al 2010; Gignoux et al., 1997; Hoffman et al., 2009; Hoffman et al., 2012; VanderWeide and Harnett 2011).

The 1988 LRMP, as amended by the SNFPA ROD (USDA 2004x) provides standards and guidelines for forest vegetation management in the project area. Therefore, the CWHR vegetation typing system (Mayer and Laudenslayer 1988) is utilized for displaying diameter distribution and assessing stand transition between size classes. One of the characteristics of the CWHR system is average tree size (quadratic mean diameter). To move from a mid-seral stand (CWHR size class 4) to a later seral stand (CWHR 5 or 6), increasing average stand diameter is a key component. Table 3.10-3 displays the CWHR size classes.

Table 3.10-3 CWHR Size Classes

	CWHR Size Classes					
	1	2	3	4	5	6
Diameter Range	<1" DBH	1-6" DBH	6-11" DBH	11-24" DBH	>24" DBH	>24" DBH
Description	Seedling	Sapling	Pole Tree	Small Tree	Medium/ Large	Multilayered Canopy with Dense Cover

Species Composition

Species composition is analyzed because trees have important ecological traits and tolerances, and silvicultural treatments may have an effect at the stand and project level on future disturbance patterns and degree of disturbance. Tree species are differentially adapted to the physical and biotic environment and the different tolerances of tree species plays a major role in determining forest composition, structure, and function. Major tree species in the project area include white fir (*Abies concolor* var. *lowiana*), Douglas-fir (*Pseudotsuga menziesii* var. *menziesii*), incense cedar (*Calocedrus decurrens*), ponderosa pine (*Pinus ponderosa* var. *ponderosa*), Jeffrey pine (*Pinus jeffreyi*), and sugar pine (*Pinus lambertiana*). Considering the overwhelming importance of fire and water availability to forest ecology and management, perhaps the most important distinction to be made is between those species that are highly tolerant of fire and drought but not tolerant of shade (ponderosa pine and Jeffrey pine) versus those that are less tolerant of fire and drought but grow relatively well in low light conditions, such as white fir (Safford and Stevens 2017). White fir is less tolerant of fire as it does not have common fire-tolerant characteristics (i.e., thick bark when young, insulated buds, self-pruning). Table 3.10-4 ranks tree species by their relative tolerances to shade, frost, temperature, drought, and fire.

Much of the scientific literature has indicated that species composition in the northern Sierra Nevada mixed conifer forests has shifted from shade-intolerant species such as yellow pine

(ponderosa and Jeffrey pine) and black oak to shade-tolerant species such as white fir (Skinner and Chang 1996; Ansley and Battles 1998). Current direction in the 2004 Sierra Nevada Forest Plan Amendment ROD (USDA 2004) emphasizes and directs project design on affected National Forests to “promote shade-intolerant pines (sugar and ponderosa) and hardwoods.

Current species composition is interpreted and analyzed using two metrics: trees per acre per species and basal area per acre distribution by species. Trees per acre by species accounts for a species general abundance, the number of individual trees per acre, but does not account for their size. Basal area per acre by species considers tree size and gives a better understanding of the dominance of species.

Table 3.10-4 Comparative Ecological Tolerances of Tree Species^a (Safford and Stevens 2017)

Shade	Frost	Temperature ^b	Drought	Fire ^c
Black oak/western juniper	Madrone	Lodgepole pine	Red fir	Lodgepole pine
Ponderosa pine Lodgepole pine	Douglas-fir White fir	Red fir Jeffrey pine	White fir Western white pine	Sugar pine/White fir Incense cedar
Sugar pine	Sugar pine	White fir	Sugar pine	Jeffrey pine /ponderosa pine/Douglas-fir
Incense cedar Western white pine	Incense cedar	Douglas-fir/sugar pine/incense cedar	Douglas-fir	
Douglas-fir	Ponderosa pine/Jeffrey pine/red fir	Ponderosa pine Black oak	Lodgepole pine Incense cedar	
Red fir	Lodgepole pine Western white pine		Ponderosa pine	
White fir			Jeffrey pine Black oak	

^aSpecies arranged from low tolerance (top) to high tolerance (bottom).

^bLeast heat tolerant/most cold tolerant on top.

^cFire tolerance of mature trees. Fir and Douglas-fir seedlings and saplings are less tolerant of fire than ponderosa pine and Jeffrey pine and sugar pine.

Source: Burns and Honkala 1990. Minore 1979. USDA FS 2013b

Methods and Assumptions

The following analytical methods and assumptions informed the analysis of the alternatives.

Specific Assumptions

There are basic assumptions associated with modeling silvicultural prescriptions and stand growth. It is important to understand that parameters describing stand conditions, and the underlying growth of stands are outcomes of the Forest Vegetation Simulator (FVS), a model for predicting forest stand dynamics. These outcomes are statistical in nature and are an attempt to represent

current stand conditions and future stand conditions, under varying scenarios, over time. Outputs from FVS represent averages and interpretation should consider the modeling a tool in understanding ecological processes. Modeling results are used to highlight relative differences, not absolute conditions. The output data reflects silvicultural assumptions and the variability inherent in the input data.

- **Assumption 1:** The collected Common Stand Exam (CSE) inventory plot data statistically represented the current “average” stand condition by vegetation type at the time of collection.
- **Assumption 2:** The FVS model and the underlying equations of the Western Sierra variant statistically represent future tree/stand growth and mortality. The model’s output of stand conditions provides a statistically non-biased representation of silvicultural activities and stand conditions over time.

Geographic and Temporal Boundary

Vegetation management activities have localized effects on vegetation attributes and are generally confined to the treated area. Therefore, historic, desired and existing conditions in addition to the direct and indirect effects analysis of vegetation resources are geographically bounded to the project area. Silviculture analysis was done at the “stand level” and “project level”.

Stand level analysis for forest vegetation is based on individual stand attributes and conditions. Stand attributes such as tree species, tree size, and tree densities are calculated from CSE plot data. Stand level data was combined to display resulting averages for the project level.

For the vegetation analysis, the temporal bounds include a short-term timeframe of less than five years and a long-term horizon of thirty years.

The short-term timeframe allows for assessment of proposed actions post-treatment. Short-term effects can usually be observed immediately after treatment has been implemented. Forested vegetation generally responds, at most, a few years after thinning and other forest vegetation treatments

The long-term timeframe allows for ensuring designed treatment activities are consistent with past direction from the Regional Forester (Blackwell 2004) and effective for at least 20 years. (Landram 2004; Blackwell 2004). Taking the analysis to 30 years would meet this intent and allow decision makers to make inferences for long-term effects. Also, within 20 years, treated stands would approach the typical re-entry cycle for managed stands.

Cumulative Effects Boundary

Direct effects would likely be limited to the project implementation phase. Indirect effects would last beyond the implementation period and occur within the temporal bounds of the cumulative effects analysis as described in the “Geographic and Temporal Boundary” section.

To understand the contribution of past actions to the cumulative effects of Alternative 1, Alternative 2, Alternative 3, Alternative 4, and the No-action Alternative, 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.

Specific Analysis Methodology

Vegetation analysis primarily utilized the following sources of information: Geographical Information System (GIS) feature class polygons associated with the proposed project area, a Region 5 (R5) Field Sampled Vegetation (FSVeg) polygon feature class and stand inventory data.

The R5 FSVeg polygon feature class displays stand level delineations across the forest. Stands are assigned identifying location and stand numbers associated with timber compartments and management areas in addition to Region, Forest, and District numbers. The final concatenation of these values makes up a unique Setting ID number used to distinguish individual stands (polygons) and is found in the feature class attribute table. Common Stand Exam (CSE) or vegetation inventories collect data at the stand level which is then stored within the FSVeg database utilizing these unique Setting IDs.

The proposed project boundary GIS feature class was overlaid with the R5 FSVeg polygon feature class to identify stands within the project area. The FSVeg database was then reviewed to determine stands within the project boundary with CSE data and when the data was collected. A sample of five stands representing the CWHR habitat type Sierran mixed conifer (hereinafter mixed conifer) were selected for analysis purposes. Mixed conifer was chosen since it makes up the plurality (53%) of CWHR habitat types within the project area, followed by white fir which makes up approximately 15 percent of the project area (see Table 3.2-1). Furthermore, the selected stands represent mature mid-to-late seral forest habitats (4M, 4D, 5M, and 5D) under the CWHR classification system (see section 3.2.2 for a description of mature forest habitats), which makes up approximately 61 percent of the project area. Data for selected stands was collected between 2013 – 2019 and encompasses the Beckwourth, Mt. Hough, and Feather River Ranger Districts.

For analysis purposes, data for the selected stands was extracted from the FSVeg database and converted to a format compatible for use in FVS. FVS is a forest growth model used for predicting stand dynamics (Dixon 2024) and is calibrated to unique geographic regions producing individual variants that the user may select when operating the model. The Western Sierra Nevada variant of FVS is the most appropriate for the PNF. The model was used to give an overview of stand characteristics found within the project area by quantifying existing stand conditions and to predict the effect of alternate treatments on measurement indicators over time. Stand growth was simulated from the time of inventory to the present to represent existing conditions. The stand attributes analyzed include trees per acre, basal area, quadratic mean diameter, SDI, and species composition. Model results are used to highlight relative differences, not absolute conditions and are discussed based on overall stand averages understanding that there is an inherent range. No future activities such as maintenance burning or natural regeneration were included in the growth simulation due to the variable and unpredictable nature of such events. Considering that both xeric- and mesic-mixed conifer types are found within the project area, a middle value of maximum SDI (500) was chosen to generally represent mixed conifer types across the project area.

3.10.5. Environmental Consequences

Direct and Indirect Effects

No Action Alternative

The existing rSDI for mid-to-late seral mature mixed conifer stands is approximately 74 percent based on a maximum SDI of 500 (midpoint between xeric and mesic mixed conifer maximum SDIs). There is a high degree of inter-tree competition for nutrients, water, growing space and stands are at an elevated risk to insects, disease and drought. Under the No Action Alternative, average rSDI would remain above the lower boundary of the onset of competition related mortality or the zone of imminent mortality for the next 30 years (Figure 3.10-1).

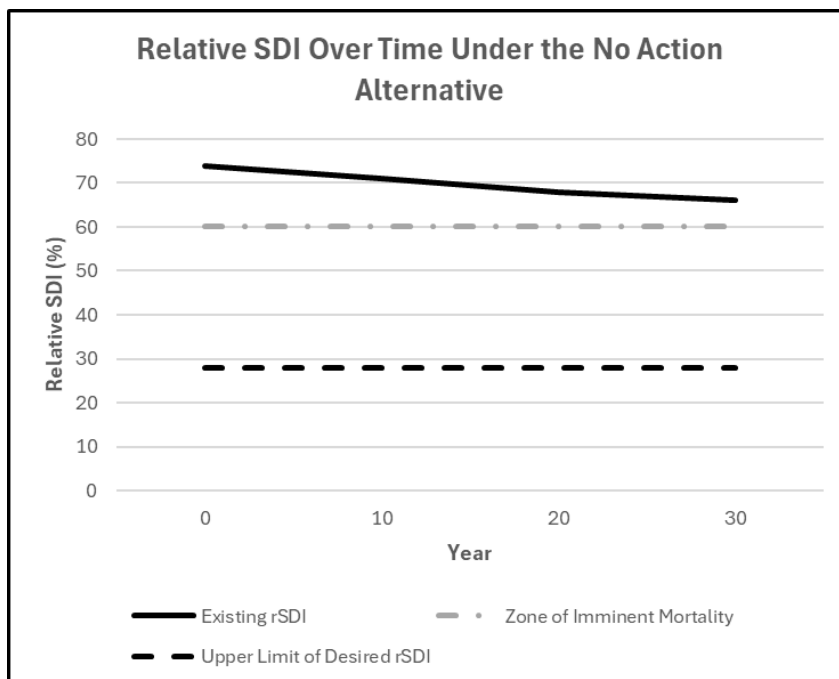


Figure 3.10-1 Existing and projected rSDI over time under the No Action Alternative

As with rSDI, existing stand basal area for mid-to late-seral mixed conifer stands is high when compared to the desired stocking levels (Figure 3.10-2) recommended for forest health (Landram 2004). Average stand basal area is approximately 247 square feet per acre, indicating stands have an increased risk to insect attack. Even stands that may receive higher levels of annual precipitation (westside zone) exceed the desired stocking level of 200 square feet of basal area per acre. Under the No Action Alternative, stands over time are projected to maintain a basal area near the existing level (Figure 3.10-2) and have an elevated risk to insect attack. As can be observed in Figure 3.10-2, there is only minor fluctuations in basal area over time. As stands develop over the next 30 years, mortality would occur throughout all diameter classes but would be greatest in the smaller diameter classes. There would remain a highly competitive environment for limited resources and growing space. As trees die, limited growing space is reallocated to adjacent live trees which increases individual tree basal area which contributes to minor fluctuations of stand level basal area.

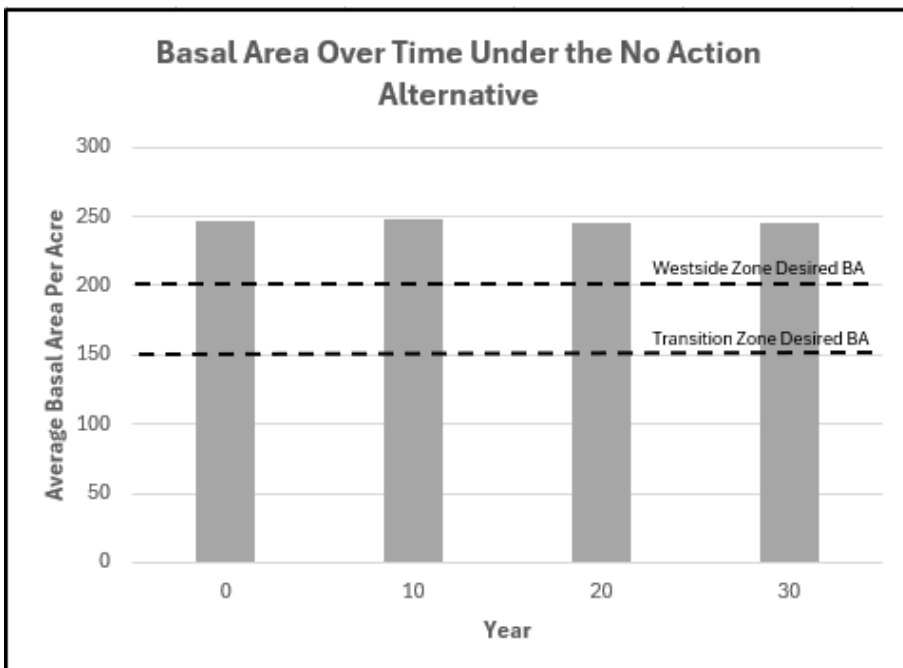
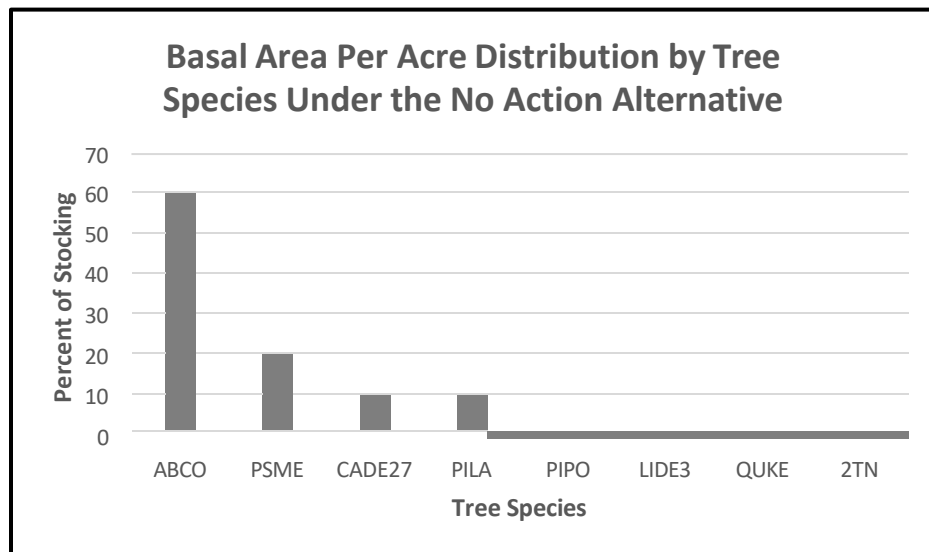


Figure 3.10-2 Existing and Projected Basal Area (BA) Under the No Action Alternative with Line Overlays Indicating Maximum Desired Stocking Levels

Currently, species composition of mid-to-late seral mixed conifer stands is dominated by shade-tolerant white fir and Douglas-fir, which make up approximately 80 percent of stocking based on basal area (Figure 3.10-3).

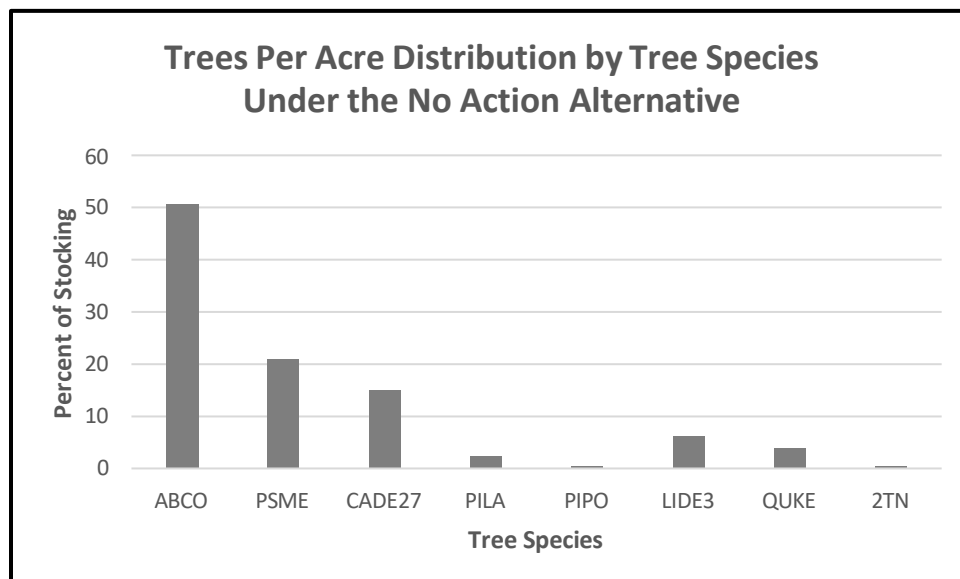


2TN = other softwoods, ABCO = white fir, CADE27 = incense cedar, LIDE3 = tan oak, PILA = sugar pine, PIPO = ponderosa pine, PSME = Douglas-fir, QUKE = black oak

Figure 3.10-3 Current Species Distribution by Basal Area Per Acre

The dominance of white fir and Douglas-fir is reiterated in the distribution of individual trees per acre (Figure 3.10-4). Historically, frequent fire mixed conifer forests generally had equal percentages of shade-tolerant and shade-intolerant tree species (North et al., 2007). Average existing total trees per acre is approximately 694 for the sampled stands with the majority of

stocking being in the seedling/sapling and pole size classes (Table 3.10-5) and dominated by white fir.



2TN = other softwoods, ABCO = white fir, CADE27 = incense cedar, LIDE3 = tan oak, PILA = sugar pine, PIPO = ponderosa pine, PSME = Douglas-fir, QUKE = black oak.

Figure 3.10-4 Current mixed conifer species distribution by trees per acre

Table 3.10-5 Existing Tree Distribution by Diameter Class Under the No Action Alternative

Size Classes	0-5.9" (Seedlings/Saplings)	6.0-10.9" (Pole Tree)	11.0-23.9" (Small Tree)	≥24.0" (Medium-Large Tree)	Total
Trees Per Acre	537	71	65	21	694

With a high shade environment due to high stand densities, it is expected that more shade-tolerant species (e.g., white fir, Douglas-fir, incense cedar) would continue to regenerate over time. The Project area would continue to be dominated by white fir, which is less tolerant of fire and drought and with high stand densities may be more susceptible to fir engraver (*Scolytus ventralis*), which in turn could lead to fuel pulses. It has been shown that white fir basal area is positively related to woody surface fuel loads (Fry and Stephens 2010, Lydersen et al. 2015).

Opportunities may exist for the recruitment of desirable shade-intolerant species within canopy gaps created by overstory tree mortality. Recruitment of shade-intolerant species would be dependent on factors such as proximity to available seed source and the size and orientation of canopy gaps with regards to amount and duration of sunlight.

Average stand diameter (QMD) for mid-seral stands (CWHR size class 4) is approximately 17.7 inches dbh and 25.5 inches for late-seral stands (CWHR size class 5). Under the No Action Alternative, QMD for mid-seral stands is projected to remain below the lower threshold of CWHR

size class 5, with a QMD of 22.9” dbh after 30 years. There would be a continued high presence of less fire-resistant, smaller size trees across the Project area. Larger trees are generally protected by their thick bark and/or lack of lower branches but with high densities of seedling/sapling and pole size trees there is high fuel continuity both vertically and horizontally, putting the large tree component at risk.

Historical fire suppression, logging, and other land uses have increased densities of shade-tolerant trees and fuels buildup in the Lassen and Plumas National Forests of northern California, which has reduced the resilience of these forests to natural disturbances (Loverin et al., 2024). Under the No Action Alternative, existing stand conditions in the Project area would persist and develop unaltered by active management, except for continued fire suppression activities. The landscape would maintain relatively homogenous tree spatial patterns, which recent research has found, can increase wildfire severity. Also, forested landscapes that contain little heterogeneity promote the creation of large contiguous areas susceptible to bark beetle outbreaks (North 2012).

Trees within the Project area would continue to experience a high level of competition resulting in decreased vigor, greater susceptibility to insect attacks and density related mortality. Wildfire, drought, disease, and insect-related mortality and recruitment would continue to occur. Tree mortality would further surface fuel loading as standing trees lose limbs and tops and eventually fall over, contributing to a greater than normal risk of high-severity wildfire. High stand densities and heavy surface, ladder, and canopy fuels would not be modified from existing conditions. These conditions can facilitate fire behavior and effects like those seen in the 2020 North Complex fires and 2021 Dixie Fire, which both burned in forests immediately adjacent to the Project area. Landscape resiliency would not improve.

The No Action Alternative would not facilitate low-density reforestation in areas deforested by previous wildfires, not allow more effective shrub control in established fuel treatments and plantations, nor reduce future hazard tree risk along roads and private-public property.

Alternative 1: Vegetation Treatments to Protect Communities and Achieve Landscape Resilience

When compared to the No Action Alternative, stands mechanically thinned utilizing a desired rSDI of 23-28 percent are projected to stay well below the lower limit of the zone of imminent mortality (60 percent rSDI) for the next 30 years while untreated stands would continue to be at elevated risk of high mortality. Treated stands, to a rSDI of 24 percent, are expected to exceed 28 percent rSDI over time as residual trees grow and new trees become established. Stands are projected to meet full site occupancy (rSDI of 35 percent) or the suggested maximum (North et al., 2022) after 30 years (Figure 3.10-5). With ongoing drought conditions in California, reducing stand densities would be critical to increasing resiliency to insects and disease. In addition to increased resistance to insect attacks, maintaining stands at a lower rSDI encourages individual tree growth (Long 1985). This encourages growth of trees in CWHR size class 4 to grow to size class 5 in a decreased amount of time. During project implementation, more site and stand specific data would be incorporated to determine the appropriate maximum SDI to use which would slightly alter effects, but it is anticipated that for all treated stands, rSDI would follow the same trend.

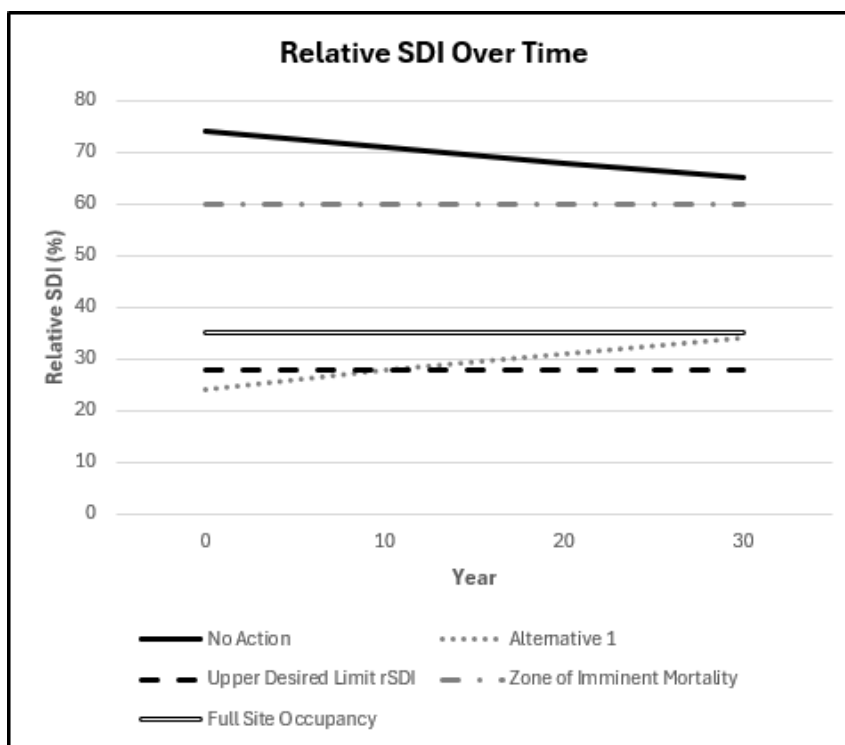


Figure 3.10-5 Comparative Changes to rSDI Over Time of Alternative 1 Versus the No Action Alternative

Treating stands under this alternative down to a target rSDI of 23-28 percent reduces basal area to healthy levels associated with insect risk and could reduce the effects of drought. Treated stands are projected to maintain a low basal area associated with insect risk for approximately 30 years or longer (Figure 3.10-6). Compared to the No Action Alternative, treated stands show an increase in basal area

over time, which can be attributed to the increased availability of limited resources (e.g., water and nutrients), growing space and available sunlight after treatments.

As noted in the “Specific Analysis Methodology” section, a middle value of maximum SDI was utilized for mixed conifer stands, hence, the post-treatment basal areas displayed represent a potential middle value but represent the general effect. Xeric mixed conifer stands may have a lower residual basal area post-treatment while mesic mixed conifer stands may have a higher residual basal area after treatment.

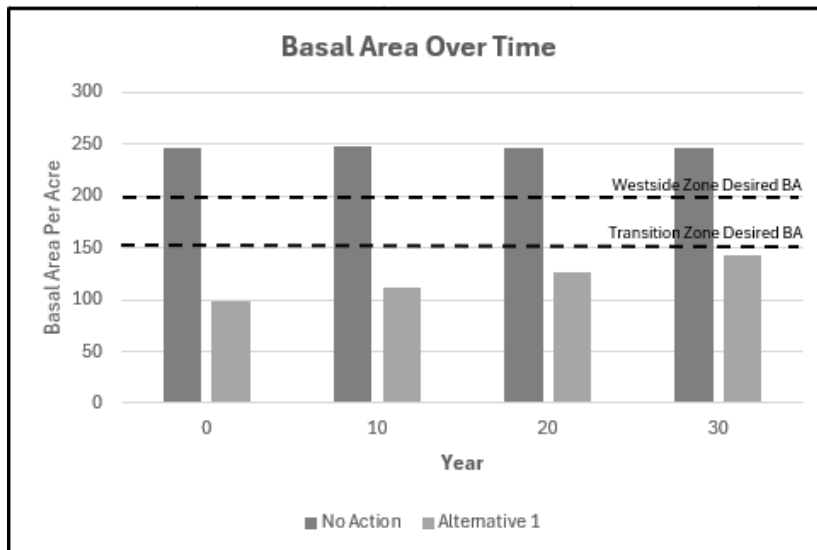


Figure 3.10-6 Basal Area Over Time Under the No Action Alternative Compared to Alternative 1 with Line Overlays Indicating Maximum Desired Stocking Levels

Implementation of rSDI treatments would generally improve species composition towards the desired condition of greater representation of shade-intolerant species based on trees per acre and basal area per acre (Figures 3.10-7 and 3.10-8, respectively). Treatments would favor the removal of more shade-tolerant species over pine species where appropriate and oak species would be retained. Rust resistant sugar pine would be protected and retained.

White fir does not have common fire-tolerant characteristics (i.e., thick bark when young, insulated buds, self-pruning), is less tolerant of drought, and white fir basal area is positively related to woody surface fuel loads (Fry and Stephens 2010, Lydersen et al. 2015). Leaving pine and thinning white fir, Douglas-fir, and incense cedar would help restore historical species composition and increase the forest’s resiliency (North et al., 2009).

Reducing the amount of white fir could dramatically alter stand health and resilience throughout future years. Reducing more drought intolerant species could reduce future fuels pulses that may occur during prolonged drought periods. Reducing potential future fuel sources reduces the likelihood of widespread high-severity fire due to unplanned ignitions.

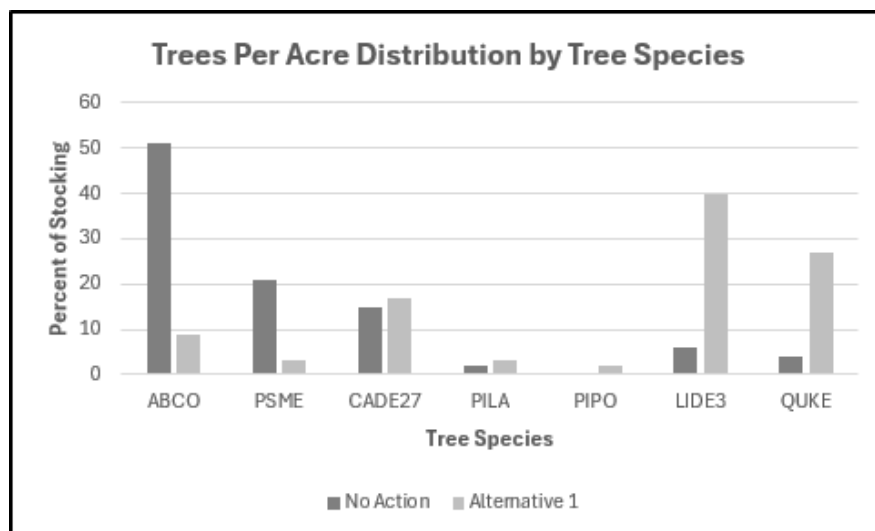


Figure 3.10-7 Comparative Changes to Trees Per Acre Between the No Action Alternative and Alternative 1

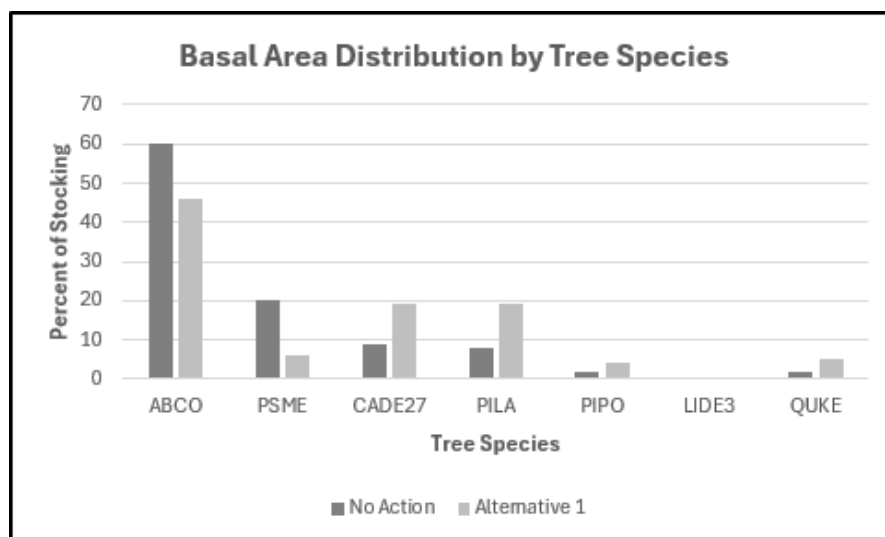


Figure 3.10-8 Comparative Changes to Basal Area Per Acres Between the No Action Alternative and Alternative 1

There would be a significant decrease in the number of trees per acre under Alternative 1 (Table 3.10-6). After treatment, trees per acre would be near the historical densities associated with the desired rSDI range as suggested by North et al., 2022, where xeric mixed conifer stands supported around 25 trees per acre and mesic mixed conifer stands supported around 29 trees per acre. These values did not include oak species, as historical inventories did not record any hardwoods (North et al., 2022). The amount of white fir and Douglas-fir would significantly decrease since they comprise a majority of the seedling/sapling and pole size component of stands. Oak species show an increase in representation by trees per acre since no oak species were cut in modeling scenarios. While representation, by trees per acre, of white fir significantly decreased it would still maintain dominance based on basal area per acre since they make up a significant part of the dominant and codominant trees. Conversely, oak species increase in representation based on trees per acre, but they only make up a small portion of overall basal area since most are seedling and sapling size. Stands that have a greater component of pine

species would see an increased shift towards desired condition of greater representation of shade-intolerant trees.

Table 3.10-6 Comparative densities based on trees per acres between the No Action Alternative and Alternative 1 rSDI Treatment (approximately 67 individual oaks were discounted, around 56 seedling/saplings and 12 pole size to represent densities in the context of historical inventories)

Size Classes	0-5.9"	6.0-10.9"	11.0-23.9"	24.0-29.9"	30.0"+	Total
No Action	536.95	71.02	65.25	14.63	6.48	694.37
Alternative 1 Post Treatment	<1	12	7	6	7	33

Additionally, thinning to a desired rSDI of 23-28 percent with prescribed fire would create an environment favorable to the regeneration of shade-intolerant tree species by increasing the amount of sunlight hitting the forest floor through the reduction of canopy cover. By maintaining ponderosa pine and sugar pine in the overstory, there would be a direct seed source available for these species to become established.

Average stand diameter (QMD) for mid-seral stands (CWHR size class 4) would significantly shift due to the reduction of smaller diameter trees. The average stand diameter (QMD) would increase from 17.7 inches dbh to 23.6 inches dbh after treatment. Over the next thirty years, QMD is projected to increase to around 28.3 inches dbh. These large trees support many key services such as wildlife habitat, stable carbon stores, and diversified microclimates (Lutz et al., 2009) and are protected from fire by their thick bark and lack of lower branches. Under the No Action Alternative, after 30 years QMD is projected to only increase to about 22.9 inches dbh.

In low- and moderate-productivity PACs tree densities would be reduced significantly relative to the existing condition (694 trees per acre). However, since primarily smaller trees would be removed, rSDI would remain high. Where canopy cover is maintained at or above 60 percent, rSDI would be reduced just below the zone of imminent mortality (Table 3.10-7).

However, in dense low- and moderate-productivity PACs, where canopy cover could be reduced to 50 percent, there would be an improvement in rSDI and basal area could be reduced near the desired level for stands in the transition zone (Table 3.10-7). Over the next 30 years it is projected that rSDI would increase to about 57 percent, just below the zone of imminent mortality. The removal of seedlings/saplings up to smaller trees would decrease ladder fuels and decrease the potential for a surface fire to transition to a crown fire, increasing PAC resistance to fire.

Within low- and moderate-productive PACs changes to the average diameter (QMD) would be variable. The more significant change would occur where canopy cover is reduced to no less than 50 percent. CWHR size class 4 stands that are near the upper diameter threshold would shift to CWHR size class 5 within the next ten years. However, those CWHR size class 4 stands that are at the low to mid-point of the class diameter range would not shift into the next size class within 30 years.

Within high-productivity PACs, rSDI would slightly improve from greater than 70 percent to around 60 percent, the onset of the zone of imminent mortality. This is attributed to maintaining desired canopy cover levels and the removal of only seedlings/saplings and some pole size trees. Tree density would remain high averaging around 191 trees per acre and around 217 square feet of basal

area per acre. (Table 3.10-7). However, treatments would decrease ladder fuels represented by seedlings, saplings and some pole size trees, improving PAC resistance to fire.

Within HRCAs, tree densities would be reduced to around 118 trees per acre and basal area to around 144 square feet per acre, using the low end of desired canopy cover (40 percent) as a goal. Relative SDI would be reduced from 74 percent to around 36 percent, just above full stocking. Over the next 30 years, rSDI would remain below the zone of imminent mortality, reaching about 48 percent rSDI. Treatments outside of mature forest within HRCAs would reduce the representation of seedlings/saplings and small trees and contribute to overall resistance to fire and overstory tree survival.

Table 3.10-7 Comparison of PAC Planning Unit Attributes After Treatment

Planning Unit	Trees Per Acre	Basal Area Per Acre (ft ² /ac)	rSDI
Low and Moderate-Productivity PACs 60% Canopy Cover	124	220	59%
Low and Moderate-Productivity PACs 50% Canopy Cover	96	159	42%
High Productivity PACs	191	217	60%

Under this alternative, the proposed action would reduce surface, ladder, and crown fuels using common treatments, including mechanical thinning, manual treatments, mastication, pile burning, and prescribed fire. Where rSDI is utilized in conjunction with VDT, high stand densities would be reduced and spatial variability at the Project and stand scale would be significantly increased. Increasing spatial heterogeneity has been highlighted in recent research as being an important factor that can reduce wildfire severity (Knapp et al., 2017; Koontz et al, 2020) and bark beetle-caused mortality (North 2009).

Thinning designed to increase structural heterogeneity, prior to burning, adds another wrinkle to habitat enhancement, potentially benefiting a broader array of forest species. The reduction of tree densities would create a low competitive environment which would improve individual tree growth and vigor while minimizing density-driven stress. Future tree mortality related to drought, insects, and disease would be expected to be reduced from current conditions. Treatments in PACs would remove understory trees limiting the ability of a surface fire to transition to the overstory. Treatments in HRCAs, outside of PACs, would improve conditions associated with stand densities and reduce rSDI to 36 percent, but there would still be active competition amongst trees and declining individual tree growth.

The dominant and codominant crown class trees which commonly have thicker bark and a higher canopy base height would generally be favored for retention. The retention of larger, more fire-resistant trees, in conjunction with an overall heterogenous spatial arrangement, would greatly improve landscape resiliency to disturbances. With climatic variation, including extreme droughts, predicted to increase (Swain et al., 2018), retaining and enhancing a variety of stand structures and species assemblages may allow forests to adapt to a greater range of uncertain future conditions (Millar et al., 2007; O’Hara and Ramage, 2013) and improve resilience to wildfire (Koontz et al., 2020).

The combination mechanical thinning and prescribed fire has been shown in numerous studies to most rapidly restore ecological processes (McIver et al., 2013). The treatments that would be utilized have been shown to reduce flame lengths and burn severity both under modeled conditions and in real wildfires (Moghaddas et al. 2018). Fuel treatments may better protect residual forest carbon stocks (Stephens et al. 2012) and reduce potential future wildfire emissions (Vaillant et al. 2013). Wildfire-, drought-, disease-, and insect-related mortality and recruitment would be reduced (Restaino et al. 2019). In a recent study, researchers found that forest thinning treatments were effective in reducing drought-related tree mortality during the 2012-2016 severe drought (Restaino et al. 2019).

As with Alternatives 2, 3 and 4, this alternative would facilitate low-density reforestation in areas deforested by previous wildfires, allow more effective shrub control in established fuel treatments and plantations, and reduce future hazard tree risk along roads and private-public property lines.

Alternative 2: Vegetation Treatments to Protect Communities Consistent with the Existing Forest Plan

Alternative 2 treatment effects, where canopy cover would be reduced to 30%, would be similar to Alternative 1 treatments where a desired rSDI was utilized. However, the use of a canopy cover limit is anticipated to retain higher stand densities, especially on xeric sites, and does not allow the flexibility that a desired rSDI range allows (Alternatives 1 and 4). The maximum number of acres that could be treated mechanically under Alternative 2 is 25,239 acres less than Alternative 1, which would lead to a decrease in spatial variability which can increase wildfire severity (North et al, 2022). Additionally, the number of acres to be treated manually under Alternative 2 is 44,926 while under Alternative 1 manually treatments would only occur on a maximum of 13,836 acres. The decrease in mechanical treatments and increase in manual treatments, relative to Alternative 1 would retain higher densities (trees per acre, rSDI, and basal area). For example, treatments in mature forests outside the WUI Defense Zone are significantly different between Alternative 1 and 2 (Figure 3.10-9). Alternative 1 treatments would reduce stand densities below a rSDI of 35 percent (the suggested maximum by North et al., 2022 and displayed as full site occupancy) for 30 years where as Alternative 2 treatments would only reduce stand densities to the suggested maximum.

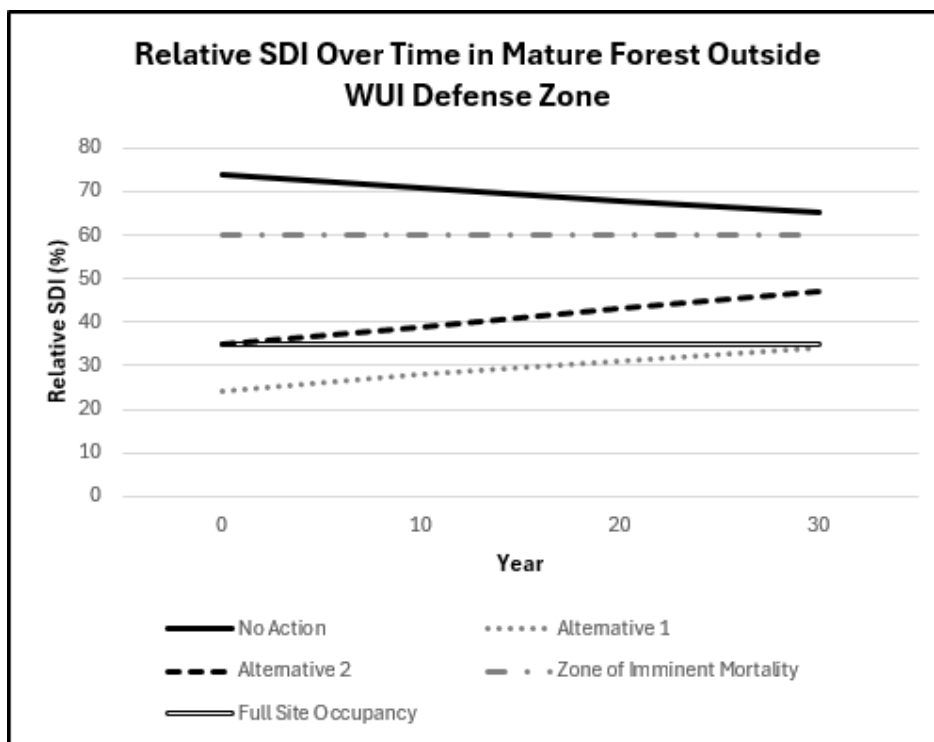


Figure 3.10-9 Comparative Relative Stand Density Over Time in Mature Forest Outside WUI Defense Zone Between the No Action Alternative, Alternative 1, and Alternative 2

Alternative 2 would retain higher stand densities, relative to Alternatives 1 and 4, which would maintain a more homogenous landscape and lead to greater inter-tree competition and density related mortality. There would be decreased tree vigor, increased susceptibility to insect attack, and potentially higher levels of drought-related future mortality.

The increase in manual treatments would decrease the ability to improve species composition and white fir would continue to make up the plurality of composition. White fir does not have common fire-tolerant characteristics (i.e., thick bark when young, insulated buds, self-pruning) and white fir basal area is positively related to woody surface fuel loads (Fry and Stephens 2010, Lydersen et al. 2015). Landscape resiliency would be improved when compared to the No Action, however, Alternative 1 makes a greater improvement to landscape resiliency than Alternative 2.

As with Alternatives 1, 3 and 4 this alternative would facilitate low-density reforestation in areas deforested by previous wildfires, allow more effective shrub control in established fuel treatments and plantations, and reduce future hazard tree risk along roads and private-public property lines.

Alternative 3: Vegetation Treatments to Protect Communities with Reduced Intensity Treatments

Implementing Alternative 3 would substantially decrease, by at least 66,294 acres, the number of acres available to treat mechanically utilizing VDT when compared to Alternatives 1 and 2. The number of acres proposed for manual treatment would markedly increase by around 55,648 acres. Alternative 3 would maintain more acres in a homogenous pattern with high stand densities and relative stand density which would lead to greater inter-tree competition and density related mortality, decreased tree vigor, increased susceptibility to insect attack, and potentially higher levels of drought-related future mortality. Alternative 3 would maintain more of the Project area, compared to Alternatives 1, 2, and 4, with a homogenous tree spatial pattern decreasing landscape resiliency and potentially increasing wildfire severity.

This treatment would facilitate low-density reforestation in areas deforested by previous wildfires, allow more effective shrub control in established fuel treatments and plantations, and reduce future hazard risk along roads and private-public property lines.

Alternative 4: Vegetation Treatments to Protect Communities and CSO Territories

Alternative 4 would include the same set of treatments as Alternative 1. The post-treatment effects to vegetation under Alternative 4 would be comparable to those described for Alternative 1 where rSDI is proposed and treatments within PACs.

Treatment effects within wildlife corridors would be akin to a combination of treatments proposed under Alternative 1. Within wildlife corridors, where treatments are required to maintain at least 40 percent canopy cover, effects would be like HRCA treatments under Alternative 1, where analysis used the less restrictive limit of 40 percent canopy cover. Where CWHR 5D exists, within wildlife corridors, treatment effects would be comparable those associated with low- and moderate-productivity PACs under Alternative 1, where 60 percent canopy cover retention is required.

The primary difference between Alternatives 1 and 4 is how areas around PACs are treated and how much suitable CSO habitat is retained. Under Alternative 1, all suitable CSO habitat would be retained within HRCAs. However, under Alternative 4, not all suitable habitat within territories is required to be retained. Territory suitable CSO habitat retention is dependent on-site conditions, xeric or mesic, or if a territory is within WUI Defense Zone. Where habitat is retained, treatment effects would be like those associated with HRCA treatments under Alternative 1, using the less restrictive canopy cover limit of 40 percent. Where suitable habitat is no longer retained, treatment effects at the most would mirror rSDI treatments, creating a more heterogenous and fire-resistant area around PACs (Figure 3.10-10)

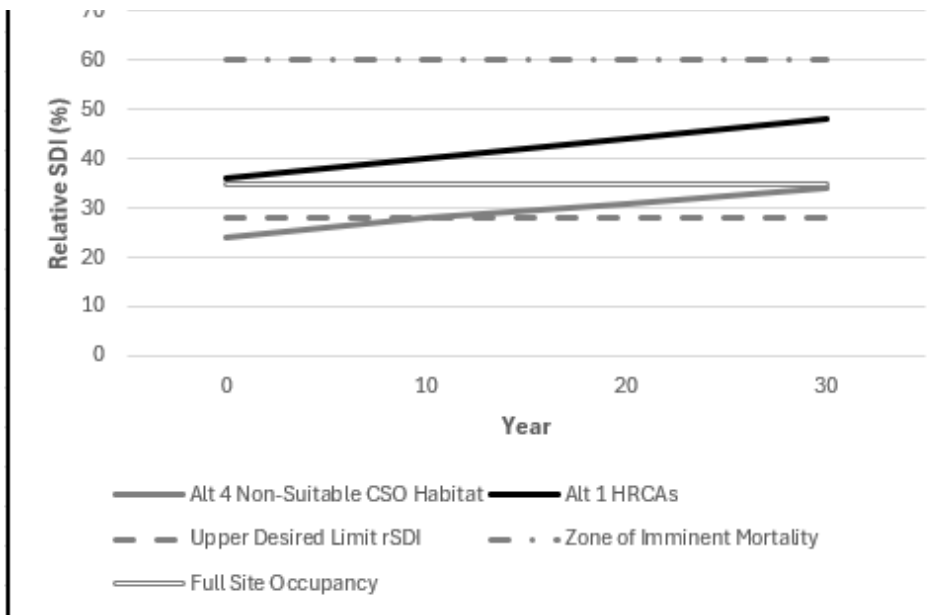


Figure 3.10-10 Comparison of Relative SDI between Alternative 1 HRCAs and Alternative 4 Non-Suitable Habitat.

Alternative 4 would achieve a more resilient landscape with greater heterogeneity when compared to the No Action Alternative and Alternatives 1, 2, and 3. Alternative 4 would best meet the Project's Desired Conditions and the intent of the Project's Purpose and Need. There would be a significant increase of heterogeneity within territories, and coupled with rSDI treatments, improving territory resistance to high severity wildfire and other stressors when compared to HRCAs under Alternative 1. Under this alternative, actions would reduce surface, ladder, and crown fuels using common treatments, including mechanical thinning, manual treatments, mastication, pile burning, and prescribed fire. Utilizing rSDI in conjunction with VDT, high stand densities would be reduced and spatial variability at the project and stand scale would increase. The reduction of tree densities would create a low competitive environment which would improve individual tree growth and vigor while minimizing density-driven stress. Future tree mortality related to drought, insects, and disease would be expected to be reduced from current conditions. Table 3.10 displays measurement indicators for the No Action (Existing Condition) and Alternatives 1 - 4. Measurement indicators for Alternative 3 are derived from similar treatments under Alternatives 1 and 2.

As with Alternatives 1, 2, and 3 this alternative would facilitate low-density reforestation in areas deforested by previous wildfires, allow more effective shrub control in established fuel treatments and plantations, and reduce future hazard tree risk along roads and private-public property lines.

Table 3.10-8 Measurement Indicators for the No Action (Existing Condition) Alternative and Alternatives 1-4.

Alternative/Planning Unit	rSDI (%)	Trees Per Acre	Basal Area Per Acre
Existing Condition	74	694	247
Alternative 1			
WUI Defense Zone: General Forest-Westside, General Forest-Eastside, Burned Areas, Mature Forest	24	33 (100)	99
Outside the WUI Defense Zone: Mature Forest, General Forest-Westside, Burned Areas	24	33 (100)	99
Outside the WUI Defense Zone: General Forest-Eastside	24	33 (100)	99
Low- and moderate-productivity PACs 60 Percent Canopy Cover	59	124	220
Low- and moderate-productivity PACs 50 Percent Canopy Cover	42	96	159
High Productivity PACs	60	191	217
HRCAs	36	118	144
Alternative 2			
WUI Defense Zone: General Forest-Westside, General Forest-Eastside, Mature Forest, HRCAs, Burned Areas	24	33 (100)	99
Outside the WUI Defense Zone: General Forest-Westside, Burned Areas	24	33 (100)	99
General Forest-Eastside Outside the WUI Defense Zone	24	33 (100)	99
Mature Forest Outside the WUI Defense Zone	35	117	140
PACs in the WUI Defense Zone	47	138	183
PACs in the WUI Threat Zone	57	159	214

Alternative/Planning Unit	rSDI (%)	Trees Per Acre	Basal Area Per Acre
PACs Outside the WUI	64	211	230
HRCAs Outside the WUI Defense Zone	47	138	183
Alternative 3			
WUI Defense Zone: General Forest-Westside, General Forest-Eastside, Burned Areas	24	33 (100)	99
Outside the WUI Defense Zone: General Forest-Westside, Burned Areas	35	117	140
General Forest-Eastside Outside the WUI Defense Zone	35	117	140
Mature Forest in the WUI Defense Zone	47	138	183
Mature Forest Outside the WUI Defense Zone	64	211	230
PACs in the WUI Defense Zone	57	159	214
PACs Outside the WUI Defense Zone	64	211	230
HRCAs in the WUI Defense Zone	35	117	140
HRCAs Outside the WUI Defense Zone	64	211	230
Alternative 4			
Territories – Suitable Habitat CSO	35	117	140
Territories – Non-Suitable Habitat (CSO)	24	95	112

Cumulative Effects

No Action Alternative

High stand densities would persist under the No Action Alternative, thereby reducing growth rates and tree vigor and increasing risk of mortality related to intertree competition and increased incidence of insect activity. High densities of small trees may cause competition for soil moisture and nutrients, which could contribute to increased stress on larger, older trees. Over time, stands currently at high stand density or near maximum stand density would continue to increase beyond 55 percent of maximum density and begin to die from intertree competition. This threshold is referred to as the “lower limit of the zone of imminent competition mortality.” The increasing stand density and consequent mortality from intertree competition and increased incidence of insect activity may have a major adverse effect on forest health by decreasing tree vigor and growth; increasing susceptibility to insects, disease, and drought; and increasing susceptibility to intense fire behavior (Restaino et al. 2019; Powell 1999). When drought related mortality occurs, the dead material, including branches and tree boles, will fall to the ground, accumulate at surface fuels, and increase potential fire hazard (flame length) (Reed et al. 2023), contributing to an increase in fire severity and greater difficulty in suppressing wildfires within the project area. Since no actions are proposed Under the No Action Alternative there would be no cumulative effects.

Alternative 1: Vegetation Treatments to Protect Communities and Achieve Landscape Resilience

Treatments utilizing rSDI with VDT would significantly reduce stand densities and create a highly heterogenous landscape more resilient to stressors such as insects, disease, drought, and high severity wildfire. The combination of mechanical thinning and prescribed fire has been shown in numerous studies to most rapidly restore ecological processes (McIver et al., 2013). Additionally, numerous studies (Moghaddas et al. 2018; Stephens and Moghaddas 2005) have shown that where mechanical thinning from below followed by prescribed fire to be effective at moderating fire behavior and severity. In mechanically treated areas, reduced stand densities would facilitate tree vigor and improve overall stand resilience in treated areas (Restaino et al. 2019). Mechanical plus fire treatments on the Plumas National Forest have been documented to be effective for 15-20 years before needing maintenance treatments (Low et al. 2023; Chiono et al. 2012), . Alternative 1 proposes up to 34,850 acres of hand thinning (Table 2-8), which may result in higher post treatment density, leading to increased drought related mortality and surface fuel accumulation (Reed et al. 2023), when compared post treatment with lower density mechanically treated stands. When combined with the effects of nearby fuel treatment projects, including the Claremont and North Quincy Project, reduced future mortality across the broader landscape would lead to potentially reduced surface fuel loading from dead and dying trees, improving fire suppression efficiency and reducing risk of snags to firefighters.

The effectiveness of this alternative would be enhanced by implementing adjacent fuel treatments under the North Quincy, Claremont, and other future fuels reduction projects. Treatments that use mechanical thinning in combination with prescribed fire had the greatest reduction in fire risk and density in previous studies (Stephens and Moghaddas, 2005). On the Plumas National Forest, treatments that combine mechanical treatment with prescribed fire have been effective for 15-20 years after completion (Low et al. 2023; Chiono et al. 2012). Over time, reduced flame lengths and fire severity would lessen potential future fire-related impacts on local communities. These

impacts include potential losses of structures and critical infrastructure, as well as a potential decrease in the postfire recovery, rehabilitation, and reforestation costs typically seen after communities and ecosystems are affected by wildfire (Troy et al. 2022b).

Low-density reforestation of burned areas under Alternative 1 would allow for more rapid establishment of forest cover. Management of hazard trees along roads and public-private property lines under this alternative would reduce the potential impacts of hazard trees on road networks, private property owners, and individuals. This would increase the safety of roadways for emergency evacuation and fire suppression efforts within and near the project area. Shrub management using herbicide in fuel treatments would improve the longevity of existing and newly established fuel treatments. Hazard tree and shrub management would reduce the potential fire hazard in areas treated and enhance the protection provided by nearby defensible space and fuel reduction efforts.

Alternative 2: Vegetation Treatments to Protect Communities Consistent with the Existing Forest Plan

Individual treatment type effects (i.e., manual thinning, mechanical thinning plus prescribed fire, prescribed fire only, and mastication) for Alternative 2 would have effects similar to those described for Alternative 1. The intensity of mechanical treatments would be reduced under this alternative, resulting in potential decreased drought resiliency over time compared with those mechanical treatments implemented under Alternatives 1 and 4. Alternative 2 proposes up to 44,926 acres (Table 2-7) of manual thinning, which may result in higher post treatment density, leading to increase drought related mortality and surface fuel accumulation (Reed et al. 2023), when compared to post treatment lower density mechanically treated stands. These manually thinned, relatively higher-density stands would remain more susceptible to drought-related mortality into the foreseeable future. Future drought-related mortality would lead to standing dead trees, which would shed branches and bark and eventually fall, leading to increased fuel loads. These loads would contribute to future increased fire hazard. Wildfire emissions from treated forests are expected to be lower than those from untreated stands (Stephens et al. 2012).

Low-density reforestation of burned areas under Alternative 2 would allow for more rapid establishment of forest cover. Management of hazard trees along roads and public-private property lines under this alternative would reduce the potential impacts of hazard trees on road networks, private property owners, and individuals. This would increase the safety of roadways for emergency evacuation and fire suppression efforts within and near the project area. Shrub management using herbicide in fuel treatments would improve the longevity of existing and newly established fuel treatments. Hazard tree and shrub management would reduce the potential fire hazard in areas treated and enhance the protection provided by nearby defensible space and fuel reduction efforts.

Alternative 3: Vegetation Treatments to Protect Communities with Reduced Intensity Treatments

Individual treatment type effects (i.e., manual thinning, mechanical thinning plus prescribed fire, prescribed fire only, and mastication) for Alternative 3 would have effects like those described for Alternative 2. A key difference with Alternative 3 is that the extent of manual treatment areas would be larger under this alternative. Alternative 3 proposes up to 100,574 acres (Table 2-7) of

manual thinning, which may result in higher post treatment density, leading to increase drought related mortality and surface fuel accumulation (Reed et al. 2023), when compared post treatment lower density mechanically treated stands. These manually thinned areas would likely remain at high stand density. These high-density stands would remain susceptible to drought-related mortality into the foreseeable future over a larger area when compared with Alternative 1 and Alternative 2. Future drought-related mortality would lead to standing dead trees that would shed branches and bark and eventually fall, leading to increased fuel loads. These loads would contribute to future increased fire hazard, shortening the potential duration of fuel treatment effectiveness compared with more intensive treatments implemented under Alternatives 1 and 2. Because this alternative would have substantially more manually treated area, more of the project area would remain at risk of future drought-related mortality.

Low-density reforestation of burned areas under Alternative 3 would allow for more rapid establishment of forest cover. Management of hazard trees along roads and public-private property lines under this alternative would reduce the potential impacts of hazard trees on road networks, private property owners, and individuals. This would increase the safety of roadways for emergency evacuation and fire suppression efforts within and near the project area. Shrub management using herbicide in fuel treatments would improve the longevity of existing and newly established fuel treatments. Hazard tree and shrub management would reduce the potential fire hazard in areas treated and enhance the protection provided by nearby defensible space and fuel reduction efforts.

Alternative 4: Vegetation Treatments to Protect Communities and CSO Territories

Treatments utilizing rSDI with VDT would significantly reduce stand densities and create a highly heterogenous landscape more resilient to stressors such as insects, disease, drought, and high severity wildfire. The combination of mechanical thinning and prescribed fire has been shown in numerous studies to most rapidly restore ecological processes (McIver et al., 2013). Additionally, numerous studies (Moghaddas et al. 2018; Stephens and Moghaddas 2005) have shown that where mechanical thinning from below followed by prescribed fire to be effective at moderating fire behavior and severity. In mechanically treated areas, reduced stand densities would facilitate tree vigor and improve overall stand resilience in treated areas (Restaino et al. 2019). Mechanical plus fire treatments on the Plumas National Forest have been documented to be effective for 15-20 years before needing maintenance treatments (Low et al. 2023; Chiono et al. 2012), . Alternative 1 proposes up to 34,850 acres of hand thinning (Table 2-8), which may result in higher post treatment density, leading to increased drought related mortality and surface fuel accumulation (Reed et al. 2023), when compared post treatment with lower density mechanically treated stands. When combined with the effects of nearby fuel treatment projects, including the Claremont and North Quincy Project, reduced future mortality across the broader landscape would lead to potentially reduced surface fuel loading from dead and dying trees, improving fire suppression efficiency and reducing risk of snags to firefighters.

The effectiveness of this alternative would be enhanced by implementing adjacent fuel treatments under the North Quincy, Claremont, and other future fuels reduction projects. Treatments that use mechanical thinning in combination with prescribed fire had the greatest reduction in fire risk and density in previous studies (Stephens and Moghaddas, 2005). On the Plumas National Forest, treatments that combine mechanical treatment with prescribed fire have been effective for 15-20 years after completion (Low et al. 2023; Chiono et al. 2012). Over time, reduced flame lengths

and fire severity would lessen potential future fire-related impacts on local communities. These impacts include potential losses of structures and critical infrastructure, as well as a potential decrease in the postfire recovery, rehabilitation, and reforestation costs typically seen after communities and ecosystems are affected by wildfire (Troy et al. 2022b).

Low-density reforestation of burned areas under Alternative 4 would allow for more rapid establishment of forest cover. Management of hazard trees along roads and public-private property lines under this alternative would reduce the potential impacts of hazard trees on road networks, private property owners, and individuals. This would increase the safety of roadways for emergency evacuation and fire suppression efforts within and near the project area. Shrub management using herbicide in fuel treatments would improve the longevity of existing and newly established fuel treatments. Hazard tree and shrub management would reduce the potential fire hazard in areas treated and enhance the protection provided by nearby defensible space and fuel reduction efforts.

4. CONSULTATION AND COORDINATION

Plumas National Forest staff coordinated and consulted with the following individuals and organizations during the development of this environmental assessment.

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4.2. Entities Consulted

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Chapter 4, "Consultation and Coordination"

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